

Spokane Public Schools East 2815 Garland Spokane, WA 99207

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## SPOKANE PUBLIC SCHOOLS SPOKANE, WASHINGTON LINWOOD ELEMENTARY SOLAR ADDITION

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#### DIVISION 0 QUOTATION AND CONTRACT REQUIREMENTS

THE OWNER: Wherever the term "Owner" is used in the documents, it refers to Spokane Public Schools, Spokane, Washington.

**<u>THE OWNER'S CORRESPONDENT</u>**: When required to correspond with the Owner all such correspondence shall be addressed to Greg Forsyth, Director, Capital Projects and Planning, Spokane Public Schools, 2815 East Garland Avenue, Spokane, WA 99207, unless otherwise directed.

**EXAMINATION OF SITE AND DOCUMENTS:** Before submitting a proposal, the respondent shall carefully examine plans and specifications, visit site of the work, become fully informed of existing conditions and limitations, include in Quotation the sums sufficient to cover all items required by the documents and conditions, and shall rely entirely upon the respondents own examinations in making the proposal.

All prospective respondents or contractors who wish to enter the premises must first notify the school principal or Capital Projects and Planning department and make known their presence and purpose.

A prospective respondent may submit to the Owner a written request for an interpretation of the Quotation documents, at least five (5) days prior to the Quote due date. Any interpretation of the documents will be made only by Addendum. All addenda issued during the quotation period will be included in the Quote proposal and the Contract.

<u>ACCOMMODATIONS FOR THE DISABLED</u>: Individuals with disabilities who may need accommodation to participate in the visitation, the pre- Quote conference, should contact the office of the Purchasing Services Office at 509-354-7186 no later than three days before the scheduled date of the meeting, so that arrangements for the accommodation can be made.

**INTENT OF DOCUMENTS:** The intent of the documents is to include all labor, materials, equipment, and transportation necessary for the proper execution of the work. The Contractor, as part of his services, shall carefully study and compare all drawings, specifications, and other information approved by the Owner as to dimensions, materials, and methods of construction, bringing into play the skill and experience for which the Contractor is compensated under the contract. All working measurements shall be taken from the site, checked with those shown on the drawings, and if they are found to vary from the latter, the Contractor shall immediately report the same to the Owner for adjustment before the Contractor proceeds with his work. Should the Contractor fail to comply with the above instructions, the Contractor shall alter his work at his own expense as directed by the Owner.

**<u>QUOTATIONS</u>**: Proposals shall be made upon the form provided. The Owner reserves the right to reject any or all Quotes, or to accept the proposal deemed best for Spokane Public Schools, and to waive informalities at its sole discretion.

**LAWS AND ORDINANCES:** Comply with all applicable federal, state, county, and city laws and ordinances, including but not limited to, the latest publication of: 1. IMC, NEC, UPC, IBC

- 2. Washington State Energy code.
- 3. Washington State Ammended Codes (WAC) and the Revised Code of Washington (RCW)
- 4. Section 504 of the Civil Rights Laws.
- 5. Title II of the Americans with Disabilities Act.
- 6. International Code Council/American National Standard "Accessible and Usable Buildings and Facilities"ICC/ASNI A.117.1

#### **QUOTER RESPONSIBILITY:**

- 1. Before award of a Public Works Contract, a quoter must meet the following responsibility criteria to be considered a responsible quoter and qualified to be awarded a public works project.
  - A. At the time of quote submittal, have a certificate of registration in compliance with all provisions stipulated in **RCW 18.27**;
  - B. Have a current state unified business identifier number;
  - C. If applicable, have industrial insurance coverage for the quoter's employees working in Washington as required in Title 51 RCW; and employment security department number as required in Title 5' RCW; and a state excise tax registration number as required in Title 82 RCW;
  - D. Not be disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065 (3);

- E. If bidding on a public works project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the quote solicitation;
- F. Have received training on the requirements related to public works and prevailing wage under this chapter and chapter 39.12 RCW. The quoter must designate a person or persons to be trained on these requirements. The training must be provided by the department of labor and industries or by a training provider whose curriculum is approved by the department. The department, in consultation with the prevailing wage advisory committee, must determine the length of the training. Quoters that have completed three or more public works projects and have had a valid business license in Washington for three or more years are exempt from this subsection. The department of labor and industries that have satisfied the training requirement or are exempt and make records available on its web site. Responsible parties may rely on the records made available by the department regarding satisfaction of the training requirement or exemption; and
- G. Within the three-year period immediately preceding the date of the quote solicitation, not have been determined a final and binding citation and notice of assessment issued by the department of labor and industries or through a civil judgement entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, or violated more than one time, any provision of chapter 49.46, 49.48, or 49.52 RCW.
- 2. At the time of quote submittal, a quoter will submit with their quote, a signed statement in accordance with RCW 9A.72.085 verifying under penalty of perjury that the quoter is in compliance with the quoter responsibility criteria requirement of subsection (1) (G) of this section.

**PREVAILING WAGE REQUIREMENTS**: No workman, laborer, or mechanic employed in the performance of any part of this contract shall be paid less than the prevailing rate of wage as determined by the Department of Labor and Industries under RCW 39.12. The schedule of prevailing wage rates for the locality where this contract will be performed is by reference made a part of this contract as though fully set forth herein. Current prevailing wage information is available on the Department of Labor and Industries website at www.lni.wa.gov/prevailingwage. Prior to disbursement of payment for work performed under this contract, the prime contractor and all subcontractors must electronically file a statement of Intent To Pay Prevailing Wage with the Department of Labor and Industries at www.lni.wa.gov/TradesLicensing/PrevWage/IntentAffidavits.. For contracts in an amount exceeding \$2,500.00 including tax, each statement of Intent To Pay Prevailing Wages must be approved by the industrial statistician of the Department of Labor and Industries. Prior to disbursement of final retainage payment, the prime contractor and all subcontractors must electronically file a sasociated with the filing of Intent to Pay Prevailing Wage and the Affidavit of Wages Paid with the State. All fees associated with the filing of Intent to Pay Prevailing Wage and the Affidavit of Wages Paid shall be the responsibility of the contractor. Spokane Public Schools must receive confirmation of the State's approval prior to release of retainage.

<u>**TAXES</u>**: Quotation amount and any agreed variations thereof shall include all applicable federal, state and local taxes and fees imposed by law, which are properly chargeable to the project, <u>except</u> Washington State sales tax.</u>

<u>**PERMITS</u>**: The Contractor shall obtain and pay for the building permit or other permits, inspection fees, licenses, royalties, bonds, social security and unemployment compensation.</u>

#### HOT WORK

- A. Before initiating any hot work, the contractor shall contact the Owner and issue a work plan for review and approvl. Hot work includes, but is not limited to, brazing, cutting, grinding, soldering, welding, and torch applied roofing.
- B. Hot Work activities shall comply with the requirements stipulated under Section 01010.
- C. Contractor shall be liable for any damages resulting from hot work.

**INSURANCE**: The Contractor shall procure and maintain for the duration of the Agreement, insurance against claims for injuries to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the Contractor, its agents, representatives, employees or subcontractors. The limits of liability for comprehensive general liability and automobile liability shall be: <u>Commercial General Liability</u> insurance written on an occurrence basis with limits no less than \$1,000,000 combined single limit per occurrence and \$2,000,000 aggregate for personal injury, bodily injury, and property damage. Coverage shall include, but not be limited to: blanket contractual, products/ completed operations; broad form property damage; explosion, collapse and underground (XCU) if applicable; and employer's liability. <u>Automobile Liability</u> insurance with limits no less than \$1,000,000 combined single limit per accident for bodily injury and property damage.

The Owner shall be named as an additional insured on all certificates of insurance with the additional insured endorsement attached. Certificate shall also include the A.M. Best rating on the insurance company providing coverage."

Required insurance shall be primary and noncontributing to any insurance possessed or procured by the Owner. Any deductible provision in liability policy shall be the responsibility of the Contractor. Requirements for Contractor's insurance shall apply to the

work of the prime contractor and all subcontractors. Proof of insurance coverage in the form of Certificate of Insurance with Additional Insured Endorsement attached shall be submitted in writing to Spokane Public Schools Purchasing office, 2815 E. Garland Avenue, Spokane, WA 99207, prior to commencing work on this contract.

**PERFORMANCE BONDS**: A payment and performance bond for 100% of the Contract amount, including all change orders and State sales tax, shall be furnished for this Contract, no less than thirty (30) days prior to the construction start date as noted in the Contractor's previously submitted preliminary construction schedule, and the cost for such shall be included in the total Contract amount. No payments shall be made to the Contractor for the cost of this bond in addition to the Contract Quote price, except where the bond amount is increased due to an increase in the contract price due to properly approved change orders on the Contract. This bond will not be required if the Contract amount is \$35,000 or less and the Contractor agrees that the Owner may, in lieu of the bond, retain ten percent (10%) of the Contract amount for a period of forty-five (45) days after the date of Final acceptance, or until receipt of all necessary releases from the Department of Revenue, Employment Security and the Department of Labor and Industries and settlement of any lien filed under Chapter 60.28 R.C.W., whichever is later, as provided for in R.C.W. 39.08.010.

Bonds shall permit laborers and material suppliers to initiate legal action directly against the bond. Bonds shall be obtained from licensed companies rated A or better of AM Best, and the Bonding Company must be licensed to do business in the State of Washington.

**<u>SCHEDULE OF WORK:</u>** When requested, the Contractor shall furnish the Owner with a schedule of the work to be done. The work shall commence as stipulated on the written Notice to Proceed given by the Owner and shall be carried forward with all reasonable speed to completion. The Starting Date and Completion Date for the Contract shall be specified in Section 01010.

**DAMAGES FOR DELAYS:** Date of completion for the work specified in Section 01010 is an essential condition of this Contract and the Contractor shall be liable for delays beyond the Completion Date.

In the event that the Owner and Contractor have agreed that Liquidated Damages shall apply to this project because the costs of determining the actual damages are or will be difficult to measure and the parties agree that the stated liquidated damages amount is reasonable as of the Contract date, an amount for Liquidated Damages shall be listed in Section 01010. If the contractor neglects, fails or refuses to complete the work within the time herein specified (the Completion Date), then the Contractor agrees as part of the consideration for awarding this contract, to pay the Owner the amount specified in Section 01010 per calendar day as liquidated damages for such delay.

In the event that no Liquidated Damages are listed in Section 01010, this Contract shall not be subject to liquidated damages caused by a delay in completion of the Contract. Rather, if the Contractor neglects, fails or refuses to complete the work within the time herein specified (the Completion Date), then the Contractor shall be liable to the owner for the actual damages incurred as a result of such delay.

The Contractor shall not be assessed damages when the delay in completion of the work is due to unforeseeable cause beyond the control and without fault or negligence of the Contractor.

<u>SAFETY</u>: It shall be the responsibility of the Contractor to establish and maintain a safe and healthful working environment in accordance with the standards set forth by the Washington Industrial Safety and Health Administration as per the Washington Administration Code (WAC) 296-24 governing the same.

**PERSONAL IDENTIFICATION:** All contractor, sub-contractor, and vendor personnel shall be provided with a company identification card. At a minimum, this identification card shall display the name of the company, the name of the employee represented, and a photograph of the individual for whom the card has been issued. Contractor and vendor employees shall prominently display such ID cards at all times while on Spokane Public Schools property. If necessary, such identification cards may be obtained through Spokane Public Schools for a nominal fee of \$5.00 per card. For further information, or to make arrangements to obtain such photo ID cards, contact Spokane Public Schools Security Services at 354-7345.

**LOCKOUT/TAGOUT NOTIFICATION AND COMPLIANCE:** Contractors, installers or other non-District employees may be required to periodically work on systems or equipment that require locking and tagging out. Spokane Public Schools policies and procedures are established to ensure complete safety when operating, servicing, maintaining and installing machinery, equipment and/or systems and are available for review and compliance. The General Safety and Health Standards, WAC 296-24-110. The lockout/tagout procedures are mandatory requirements and shall be followed as outlined in that Standard.

Locks and tags for the lockout/tagout process are available from the Spokane Public Schools representative and are to be obtained from that source. When work is complete these items shall be returned to the Spokane Public Schools representative.

**<u>CHANGES AND EXTRAS</u>**: The Owner reserves the right to make changes in the work, for which adjustment in price shall be made if required. Such changes shall be made only on written agreement with the Owner setting forth the change and price. No extra cost

will be allowed the Contractor for anything necessary to proper completion of the original project, together with utility services thereto. Maximum allowable overhead and profit by the party actually performing the work is 15%. General contractor overhead and profit on the subcontractors work shall not exceed 8%.

Direct Supervision of the work shall not exceed 15%. If working supervisor's hours are included in the breakdown, no markup will be allowed. Bonds shall not exceed 2.5% of the direct labor costs.

In addition, no markup will be allowed for such things as small tools, shop burden, labor burden, or freight.

**<u>PAYMENT TO CONTRACTOR</u>**: Application for payment shall be based on percentage of completion for each work item included in the contract. Submit pay requests for 95 percent of labor and material delivered to the site with 5 percent of full payment to be held by the Owner as retainage unless contractor has opted for 10% retainage in lieu of a performance bond. Upon completion of the project, contractor shall invoice Spokane Public Schools for any remaining balance including retainage.

The contractor is responsible for electronically submitting the **Intent to Pay Prevailing Wage** statement to the Department of Labor and Industries for all contractors and sub-contractors, as well as for all related fees. Information regarding this process is available on the Department of Labor and Industries web site at: www.lni.wa.gov/prevailingwage. **Copies of all "approved" Intents must be sent to: SPS Capital Projects Accountant at 2815 E. Garland, Spokane, WA 99207** 

**Prevailing wage rates** are available on the Department of Labor and Industries web site at: <u>www.lni.wa.gov/prevailingwage</u> (If you are unable to obtain this information from the Department of Labor and Industries web site, please contact Capital Projects and Planning for assistance.)

Send invoices to the attention of the Owners Project Representative (see Notice to Proceed for the name and title of this individual) at Capital Projects and Planning, 2815 E. Garland Ave., Spokane, WA 99207.

The Following language **MUST** be included on each invoice: "Prevailing wages have been paid in accordance with the pre-filed statement of intent on file with the Department of Labor and Industries as approved by the industrial statistician. "An officer of the company MUST sign this statement.

It is the responsibility of the contractor to electronically submit the Affidavit of Prevailing Wages Paid to the Department of Labor and Industries. - copies of these documents must be sent to: SPS Capital Projects Accountant at 2815 E. Garland Spokane, WA 99207. It is also the responsibility of the contractor to electronically file on-line with the Department of Labor and Industries, Weekly Certified Payroll Reports on a monthly basis per RCW 39.12.120 (ESSB 5035).

The contractor is responsible for submitting an invoice for the retainage amount.

Retainage will be held for a period of forty-five (45) days after the date of Final Acceptance, or until receipt of all Affidavits of Wages Paid, necessary releases from the Department of Labor and Industries, Department of Revenue, and Department of Employment Security, and any settlement of any lien filed under Chapter 60.28 R.C.W., whichever is later, as provided for in R.C.W. 39.08.010.

**<u>PROTECTION OF MATERIALS AND EQUIPMENT</u>**: The Contractor shall be held responsible for any and all materials and equipment to be installed under this Contract and will be required to make good at his own cost any injury or damage which said materials or equipment may sustain from any source or cause whatsoever before final acceptance thereof.

**DAMAGE TO EXISTING WORK:** The Contractor shall be liable for any damage to existing property. Contractor shall be responsible for locating underground utilities prior to beginning excavations. Any and all damages incurred by the Contractor to existing structure, utilities, equipment, or landscape shall be replaced to the satisfaction of the Owner at the Contractor's expense.

<u>APPROVAL OF SUBSTITUTIONS</u>: Where the make or name of an article is stated, it shall be understood that the mention of such establishes a standard in that particular field of manufacturer for the purpose of quoting. Substitutions must be approved by the Owner and, in the event of acceptance, shall become binding to the Contractor. Wherever a particular manufacturer's product is hereinafter specified with the notation <u>"No Substitution,"</u> it is to be used, applied, or otherwise incorporated in the work in strict conformity to the manufacturer's recommendations for such usage. The Contractor shall submit for approval sufficient manufacturer's data to establish conformance with the specifications as required by Owner.

**STANDARDS OF QUALITY OF WORKMANSHIP AND MATERIALS**: Applies to all divisions and trades furnishing materials and labor incorporated in this contract. All materials incorporated in the work shall be new, undamaged, and of the grade and quality specified unless reuse of existing materials is specifically called for in the drawing and/or specifications. Damaged materials shall be removed from the site. All work shall be performed by skilled journeymen and shall equal the best standards of workmanship of the respective trade or craft.

**EMPLOYMENT PROHIBITION**: In accordance with Title 28A RCW: The Contractor shall prohibit any employee of Contractor from working at a public school who has contact with children at the school during the course of his or her employment who has pled guilty to or been convicted of any felony crime involving the physical neglect of a child under Chapter 9A.42 RCW, the physical injury or death of a child under Chapter 9A.32 or 9A.36 RCW (except motor vehicle violations under Chapter 46.61 RCW), sexual exploitation of a child under Chapter 9.68A RCW, sexual offenses under Chapter 9A.44 RCW where a minor is the victim, promoting prostitution of a minor under Chapter 9A.88 RCW, the sale or purchase of a minor child under RCW 9A.64.030, or violation of similar laws of another jurisdiction. Any failure by Contractor to comply with this section shall be grounds for Spokane Public Schools to immediately terminating the contract.

#### ASBESTOS:

- A. Most facilities operated by Spokane Public Schools have materials that contain asbestos. Locations of asbestos containing building materials within each facility are described in the Asbestos Management Plan on file in the Maintenance and Operations Department, 2815 E. Garland, Spokane, Washington. The Contractor shall be responsible for reviewing the Asbestos Management Plan and becoming fully informed of the presence of asbestos containing building materials in the work area of this Contract.
- B. The Contractor shall exercise the necessary precautions to avoid disturbance of asbestos containing building material when working in proximity to such materials.
- C. The Contractor shall immediately cease work and notify the Owner upon any accidental disturbances of asbestos containing building materials.
- D. The Contractor shall notify the Owner immediately if the work requires the abatement or disturbance of asbestos containing building materials that are not included in the Scope of Work. The Contractor shall not proceed until such time as the notification has been made and the situation has thoroughly been reviewed with the Maintenance and Operations Department AHERA Project Coordinator.
- E. Where disturbance or abatement of asbestos containing building materials is required in the Scope of Work, the Contractor shall comply with all asbestos safety regulations and requirements of the Washington State Department of Labor and Industries and as specified elsewhere in these Contract Documents.
- F. Asbestos containing materials shall not be used on any project. Upon completion of the project, the contractor shall issue a certificate which states "no asbestos containing building materials were used in the performance of the Work" as required.

<u>USE OF OWNER'S PROPERTY</u>: No use of the Owner's present school building facilities may be made by this Contractor without prior approval of the Owner, specifically all utilities such as water, toilets, telephones, etc. The Contractor is to recognize that causing any unwarranted nuisance whatsoever will not be tolerated. All work is to take place in such a way and time as to cause the minimum of nuisance; and such work is to be correlated with the operations of the Owner. The entire premises shall be kept reasonably clean and free from unnecessary debris at all times. The Contractor shall remove all debris prior to final acceptance by the Owner.

**TOBACCO/DRUG/WEAPON PROHIBITION:** Spokane Public Schools property is a tobacco free, drug free, and weapon free environment. Contractor personnel shall conform to this policy at all times while on Spokane Public Schools premises.

**<u>GUARANTEE</u>**: The Contractor shall guarantee the satisfactory operation of all material and equipment installed and shall repair or replace to the satisfaction of the Owner any defective material, equipment, or workmanship which may show itself within one (1) year from the date of final acceptance or according to manufacturer's listed warranty or technical specification, whichever is longest, and shall be held responsible for any damage to other work or excessive costs to Spokane Public Schools resulting therefrom. In the absence of a manufacturer's warranty or a guarantee period specified in the Technical Specification, the guarantee shall be for one (1) year.

**<u>FINAL INSPECTION:</u>** When ready for completion inspection, the Contractor shall notify the Owner in writing. The Owner's representative will make an inspection and compile a punchlist of items, which are not satisfactory or are incomplete. When the Contractor has completed the items on the punchlist, he shall notify the Owner in writing and request final payment.

DIVISION 0 QUOTATION AND CONTRACT REQUIREMENTS SECTION 00100 INSTRUCTIONS TO RESPONDENTS Page 1

#### **PART I - INSTRUCTIONS**

#### 1.01 EXAMINATION OF SITE AND DOCUMENTS

- A. Before submitting a proposal, respondent shall carefully examine plans and specifications, visit site of the work, become fully informed of existing conditions and limitations and include in Quote sums sufficient to cover all items required by contract and shall rely entirely upon the respondents own examinations in making the proposal. The respondent should assume that the exact location of any underground/under slab, in the walls or ceilings or hidden utilities may be somewhat different from any location indicated in the Contract Documents and shall be considered accordingly within their quotes.
- B All prospective respondents or contractors who wish to enter the premises must first notify the Facility's custodian or Facility Services and make known their presence.

#### 1.02 INTERPRETATION OF CONTRACT DOCUMENTS

A. If any contractor contemplating submitting a quotation for the proposed contract is in doubt as to the true meaning of any part of the Drawings, Specifications, or other Contract Documents, that contractor may submit to the Owner a written request for an interpretation thereof. Person submitting such request shall be responsible for its prompt delivery at least five (5) working days prior to quotation due date. Any requests for interpretations after this five (5) day period limitation shall not be considered. Any interpretation or change to the Contract Documents will be made only by addendum and a copy of the addendum will be mailed or delivered to each person holding a set of Contract Documents. All Addenda issued during the quotation period shall be acknowledged in the proposal and shall be included in the Contract. Failure to verify and acknowledge all addenda on the quotation form shall render the quote non-responsive.

## 1.03 <u>SUBSTITUTIONS</u>

- A. General: The materials, products, procedures and equipment described in the Contract Documents establish a standard of required function, dimension, appearance, and quality that must be met by any proposed substitution.
- B. Substitution Procedure: No substitution shall be considered prior to receipt of Quotes unless the Owner receives a written request for approval on a complete substitution request form at least ten (10) days prior to the date of receipt of Quotes. Each such request shall include the name of the material or equipment proposed to be replaced and a complete description of the proposed substitute, including drawings, data sheets, performance and test data and any other

DIVISION 0 QUOTATION AND CONTRACT REQUIREMENTS SECTION 00100 INSTRUCTIONS TO RESPONDENTS Page 2

information necessary for evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute would require shall be included. The proposer has the burden to prove the merit of the proposed substitute. By proposing the substitution, the Quoter represents that they have personally investigated the proposed material or product and determined that it is equal or better in all respects to that specified, that the same or better warranty will be provided for the substitution, that complete cost data, including all direct or indirect costs of any kind, has been presented, that the Contract Time will not be increased, and that it will coordinate the installation of the substitute if accepted and make all associated changes in the Work. The Owner's decision to approve or disapprove a proposed substitution shall be final. Written requests for approval shall constitute a guarantee by the Quoter that the articles or materials are, in all respects, including warranty and installation, equal or superior to those specified, unless otherwise noted. To the extent the proposed substitution will require additional services by the Owner, their representative or their consultant after quote award, the Respondent shall be required to pay for these services at their customary hourly rates.

- C. Addendum: If the Owner approves a proposed substitution prior to receipt of Respondent's quotes, the approval shall be set forth in a written Addendum. Respondents shall not rely upon approvals made in any other manner.
- D. Post-Quote Substitutions: After the Contract has been executed, the Owner may consider a written request for the substitution of materials or products in place of those specified in the Contract Documents only under exceptional circumstances as stipulated in Section 01600.
- E. Substitution Request Form: A substitution request form may be found at the end of Section 01600.

#### 1.04 FORM OF QUOTATION

A. Proposals shall be made upon the Quote Form contained in this package. Only the amounts and information asked for on the proposal form will be considered as the quote.

## 1.05 <u>SUBMISSION OF QUOTE</u>

 A. Return completed quote form and associated documents to Spokane Public Schools, Purchasing department at 2815 East Garland Avenue, Spokane, WA 99207-5889, or fax to (509) 354-7183.

#### 1.06 <u>MODIFICATIONS</u>

A. No oral or telephonic responses or modifications will be considered.

#### 1.07 ACCEPTANCE OF PROPOSAL

A. The Owner intends (but is not bound) to award the responsible Contractor submitting the lowest responsive quote, provided the Quote has been submitted in accordance with the requirements of the Quote Documents and does not exceed the funds available. The Owner has the right to waive any informality or irregularity in any Quote(s) received and to accept the Quote(s) which, in its judgment, is in its own best interest.

#### 1.08 <u>ALTERNATES</u>

A. The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specified in the quote documents and to determine the low Contractor on the basis of the sum of the Base Quote and the Alternates accepted.

#### 1.09 SUB-CONTRACTOR LIST

A. Respondents shall submit a list of their Sub-contractors along with their quotes. A form has been provided at the end of Section 00300, Quotation Form. Failure to submit this form may deem the Quote as non-responsive.

## **PART II - REQUIREMENTS**

#### 2.01 <u>TAXES</u>

Contract quote amount and any agreed variations thereof shall include all applicable Federal,
 State and local taxes imposed by law and properly chargeable to the project, except
 Washington State Sales Tax.

#### 2.02 <u>PERFORMANCE BOND</u>

A. See Specification Section 00600, Bonds And Certificates.

## 2.03 WITHDRAWAL OF QUOTATIONS

A. No respondent may withdraw the proposal after submission, or before award of the contract, unless said award is delayed for a period exceeding thirty (30) days.

#### 2.04 <u>SIGNATURE</u>

A. Each quotation must be signed in longhand by the respondent's representative with the usual signature.

#### 2.05 STATE OF WASHINGTON FEES

 A. The State of Washington requires payment of fees for approval of "Statement of Intent to Pay Prevailing Wages" forms and "Affidavit of Wages Paid" forms.

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- B. Such forms shall be submitted by the Contractor and each subcontractor to the Owner.
- C. Payment of State fees will be the responsibility of the Contractor.

### 2.06 PLAN CHECK AND BUILDING PERMITS

- A. The Owner will prepay the plan check fee. Do not include any such fee in the proposal.
- B. Contractor shall pay all other fees, permits, etc., per General Conditions. Furnish a copy of all required permits to Owner's representative prior to submittal of first pay request.
- C. The General Conditions and Contract Requirements are applicable to this work.
- D. Contractor is responsible for notifying local jurisdictional authorities for inspections as required per the current adopted model building codes and ordinances.

#### 2.07 <u>CERTIFICATION STATEMENTS</u>

- A. To ensure that the district does not enter into a Contract with a debarred or suspended company or individual, the District is requiring that each respondent include a certification statement with the proposal. By signing the certification statement, provided in the Quote Form Supplements, the respondent certifies that neither they nor any of their principals, (e.g., key employees) have been proposed for debarment, debarred, or suspended by a Federal agency. It is the responsibility of each respondent to sign the certification statement and submit it with their proposal.
- B. At the time of quote submittal, a quoter will submit with their quote, a signed statement, in accordance with RCW 9A.72.085 verifying under penalty of perjury that the quoter is in compliance with the Quoter Responsibility criteria requirement of subsection (1) (G) of Division 0, Quotation and Contract Requirements. This form is provided in the Quote Form Supplements.
- C. The District may contact the Federal or State Agency for confirmation of the respondent's status relative to debarment or suspension.

#### **PART III – PROJECT DOCUMENTATION**

#### 3.01 <u>GENERAL</u>

Reference the General Conditions and all sections of Division 1 for project documentation.

3.02 <u>CONTRACT DOCUMENTS</u>

DIVISION 0 QUOTATION AND CONTRACT REQUIREMENTS SECTION 00100 INSTRUCTIONS TO RESPONDENTS Page 5

- A. Copies:
  - 1. Respondents will be given one (1) complete set of the Contract Documents for the preparation of their quotes. If additional copies are desired, it is the Respondent's responsibility to obtain their own copies from a local printing vendor at their own expense.
  - 2. Sub-Contractors will not be issued a copy of the Contract Documents. It is the Respondent's responsibility to acquire and distribute copies of the Contract Documents to their Sub-Contractors at their own expense.
  - 3. Respondents shall use complete sets of the Contract Documents in the preparation of their quotes. The Owner assumes no responsibility for errors or misinterpretations resulting from the use of incomplete sets of the Contract Documents.
  - 4. Upon award of the Contract, the successful respondent shall be responsible for preserving their set of the Contract documents and if additional copies are required to perform the work and prepare record documents, it is the Respondent's responsibility to obtain their own copies from a local printing vendor at their own expense.

SPOKANE PUBLIC SCHOOLS SPOKANE, WASHINGTON LINWOOD ELEMENTARY SOLAR ADDITION DIVISION 0 QUOTATION AND CONTRACT REQUIREMENTS SECTION 00300 QUOTATION FORM Page 1

The undersigned hereby submits the following proposal to:

Spokane Public Schools 2815 E. Garland Spokane, WA 99207

#### 1.01 <u>QUOTATION:</u>

The Owner reserves the right to select and award either the base quote, alternates or both based

on the evaluation of the individual quotes and combined, as deemed in the best interest for the

District.

A. BASIC QUOTE:

Having carefully examined the Specifications entitled:

## SOLAR ADDITION LINWOOD ELEMENTARY

Dated: March 17, 2023

As well as the premises and conditions affecting the work, the undersigned proposes to furnish all labor and materials to perform all work required by and in strict accordance with the above named documents for an amount in the sum of:

Linwood Elementary \$

#### 1.02 <u>RESPONDENT</u>

Respondent Firm Name

Contractors Tax ID No.

By/Title (Print)

Contractors Registration No.

Signature

Dated

Address

City, State, Zip Code

Telephone

SPOKANE PUBLIC SCHOOLS SPOKANE, WASHINGTON LINWOOD ELEMEMTARY SOLAR ADDITION DIVISION 0 QUOTATION AND CONTRACT REQUIREMENTS SECTION 00300 QUOTATION FORM Page 2

## LIST OF SUBCONTRACTORS

Each Quoter shall list, on the form provided, the name, address, Washington Contractor's License and description of the work of each subcontractor to whom the Quoter proposes to sublet portions of the work. For the purpose of this paragraph, a subcontractor is deemed as one who contracts with the Contractor for the performance of part of the work at the site. Failure to list subcontractors may render a Quote non-responsive and may cause rejection of the Quote.

- A. The Quoter shall list below the name, business address, Washington Contractor's Public Works License, and description of work for each subcontractor who will perform work. After the opening of Quotes, no changes or substitutions will be allowed without the written approval of the Owner. The listing of more than one subcontractor for each item of work to be performed with the word "or" shall not be permitted.
- B. The Contractor shall not name any more than one (1) licensed subcontractor for each electrical, plumbing and mechanical work item.
- C. Failure to comply with the above requirements shall render the Quote non-responsive and shall cause its rejection.

DESCRIPTION OF WORK	LICENSE NUMBER	SUBCONTRACTOR'S NAME & ADDRESS
1.		
2.		
3.		
4.		

DIVISION 0 QUOTATION AND CONTRACT REQUIREMENTS SECTION 00600 BONDS AND CERTIFICATES Page 1

#### **PART I - BONDS**

#### 1.01 <u>BONDS</u>

- A. If required the Contractor shall provide a performance and payment bond for one hundred percent (100%) of the Contract amount written by a surety company licensed in the State of Washington and acceptable to Owner. Contractor is advised to thoroughly review Division 0 Quotation and Contract Requirements; Sub-paragraphs "Performance Bonds" and "Payment To Contractor".
- B. Bond shall permit laborers and material suppliers to initiate legal action directly against the bond.

#### **PART II – CERTIFICATES**

#### 2.01 CERTIFICATES OF INSURANCE

- A. Before starting any work, Contractor shall furnish Owner with certificates of insurance establishing that Contractor has complied with its insuring duties as required by the General Conditions and by this Section 201. Spokane Public Schools shall be named as additional insured on the Commercial General Liability insurance policy, as respects work performed by or on behalf of the Contractor and a copy of the endorsement naming Spokane Public Schools as additional insured shall be attached to the Certificate of Insurance. The Certificate shall also include the A.M. Best rating on the insurance company providing coverage. Spokane Public Schools reserves the right to receive a certified copy of all required insurance policies. Spokane Public Schools shall be given thirty (30) days prior written notice of any cancellation, suspension or material change in coverage. Insofar as there is any inconsistency as to the contractor's insuring obligations or between any term set forth in the General Conditions and any term set forth in this Section 201, it is agreed that the term which provides greater protection to Owner, or to the interests of any insurer that may provide insurance purchased and maintained separately by Owner, shall control.
- B. Without limitation or exclusion as to, and without diminishing any other insurance coverages required by the General Conditions, Contractor shall obtain Commercial General Liability insurance covering bodily injury, death, and property damage, from an

insurer acceptable to Owner, setting forth terms and coverages acceptable to Owner, and in any event such terms and coverages shall:

- 1. be written on an occurrence basis with limits no less than \$1,000,000 combined single limit per occurrence and \$2,000,000 aggregate for personal injury, bodily injury and property damage. Coverage shall include but not be limited to: blanket contractual; products/completed operations; broad form property damage; explosion, collapse and underground (XCU) if applicable; and employer's liability.
- shall endorse the Owner as an additional insured for purposes of any allegation, claim, demand, or cause of action asserted against owner, which arises from or is connected in any way with any act or omission by Contractor or its employees, relating to:
  - a. the Work; or
  - b. Contractor's or Owner's performance of this Agreement; or
  - c. Any alleged event, act, or omission connected with the subject matter of this Agreement; and
- 3. shall be primary and non-contributory with respect to any insurance possessed or procured by Owner, regardless of the
- 4. "Other Insurance" clause provisions of any such insurance policy possessed or procured by Owner; and
- 5. provide coverage to Contractor for the liabilities assumed by Contractor under this Agreement, including without limitation the liabilities assumed by Contractor under the defense, indemnification, and hold harmless obligations owed by Contractor to Owner as separately set forth in this Agreement.

## **PART III – WARRANTIES**

## 3.01 PROJECT WARRANTY

A. Furnish warranty for materials, equipment, and workmanship for all construction and installations by contractor and sub-contractors. Refer to the General Conditions and Division 1, Section 01010 and 01740 for conditions of warranties.

END OF SECTION 00600

#### PART I - GENERAL

#### 1.01 DESCRIPTION OF WORK

- A. The Contractor shall furnish and install, in accordance with the Contract Documents, all labor, equipment and materials required for the construction and/or demolition for the Scope of Work attached herein.
- B. The Technical Specifications are inclusive of a variety of materials and equipment for construction. Only applicable sections apply specific to this project.

#### 1.02 EMERGENCY INCIDENT RESPONSE

All Contractors shall implicitly follow instructions by "Early Responder" personnel, including SPS site Administrators, Police, Fire, Emergency Medical Technicians, and SPS Safety/Security Officers. All alarms, drills, notifications, and directives given by any Early Responder or Administrative personnel must be responded to immediately, whether it is a real or practice situation. All Contractors shall immediately stop work, clear egress routes and evacuate to an "Area of Refuge" where directed. During school "Lock Downs," Contractors shall not be permitted to either leave or enter the facility until directed otherwise.

#### 1.03 PERSONAL IDENTIFICATION

All contractors, sub-contractors, and/or vendor personnel shall be provided with a company identification card. At a minimum, this identification card shall display the name of the company, the name of the employee represented, and photograph of the individual for whom the card has been issued. The contractor's, sub-contractors, and/or vendors employees shall prominently display such ID cards at all times while on Spokane District Property. Such identification cards shall be obtained through the School District for a nominal fee of \$5.00 per card. For further information, or to make arrangements to obtain such photo ID cards, contact Spokane School District Property Security Services at 354-7345. Badge expiration date shall be 60 days after the project completion date. Contractor shall call security services and make an appointment prior to their arrival.

#### 1.04 PRE-QUOTE AND ON-SITE IDENTIFICATION PROCEDURES

- A. All contractors who wish to visit the site before submitting a quote shall schedule an appointment with the Spokane Public Schools Project Manager identified on the cover of these specifications. Contractors shall not be allowed access to the site without a prior scheduled appointment.
- B. Prior to the start of construction, the contractor and all of his sub-contractors shall submit a list to the Owner of all individuals who will be performing work at the site through the

duration of this project.

C. All Contractors and their employs on the project site shall be required to wear at all times a District photo ID badge, as described in section 1.03 of this specification section. Access to the site is prohibited to all individuals not displaying a District badge.

#### 1.05 <u>SCOPE OF WORK</u>

- A. Spokane Public Schools "Solar Addition Linwood Elementary".
- B. Provide electrical and related work as shown on the Drawings. Provide incidental demolition, patching and painting, and electrical and mechanical work requirements.

#### 1.06 <u>SCHEDULE OF WORK</u>

- A. Optional Walk-through April 4, 2023; Linwood Elementary public office (906 W. Weile Avenue, Spokane) at 10:00 A.M.
- B. Quote due date April 11, 2023
- C. Start Construction April 25, 2023
- D. Completion August 4, 2023

#### 1.07 <u>CONTRACTS AND PERMITS</u>

- A. The General Conditions and Contract Requirements are applicable to this work.
- B. Contractor shall be responsible for obtaining and paying for all permits if required for this project. Furnish the Owner's representative a copy of the permit prior to the first request for payment.
- C. Contractor is responsible for notifying local jurisdictional authorities for inspections as required per the current adopted model building codes and ordinances.

#### 1.08 LIQUIDATED DAMAGES

- A. Date of completion for the work specified herein is an essential condition of this Contract. If the Contractor neglects, fails or refuses to complete the work within the time herein specified, the Contractor agrees as a part consideration for awarding his contract, to pay the Owner the amount of <u>\$500.00</u> per calendar day as liquidated damages for such breech of contract.
- B. The Contractor shall not be charged with a penalty or any excess cost when the delay in completion of the work is due to unforeseeable cause beyond the control and without fault or negligence of the Contractor. Included are the acts of God, acts of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with Owner, fires, floods, epidemics, quarantine restrictions, strikes or freight embargoes.

#### 1.09 <u>CODES AND STANDARDS</u>

All local, municipal and state laws, rules, and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications.

1.10 <u>WARRANTY REQUIREMENTS</u>

Manufacturer's standard warranties.

### 1.11 OWNER OCCUPANCY

- Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.
  Modification and/or interface with existing utilities to be coordinated with the Owner.
- B. Schedule the Work to accommodate these requirements. Provide an activity plan or schedule to adequately define sequence, duration and interface requirements which may affect daily operations.
- C. Use by Owner prior to project acceptance does not relieve Contractor of his responsibility to maintain all insurance and bonds required of Contractor under the contract until project is completed and accepted by Owner.

## 1.12 CONTRACTOR'S USE OF PREMISES

- A. Contractors shall have use of the immediate property for the execution of the work. Contractor will have access to water and power as required for the work. Use of these utilities shall have a minimal impact and/or interruption to the daily operations of the facility.
- B. The Contractor is granted use of the restroom facilities at the work sites; however, the Contractor will be responsible for cleaning up after themselves and their employees after use of these facilities.

## 1.13 <u>UTILITIES</u>

- A. Known existing utilities are shown in the plans at their approximate locations. The Contractor shall take care to protect such existing utility appurtenances during his operation. Should other systems not shown on the plans be encountered, the Owner shall be immediately notified. It shall be the Contractor's responsibility to provide private utility locate services anywhere on the interior of the site that is not the local purveyor's or local utility provider's responsibility.
- B. Contractor shall notify the Owner a minimum of one (1) week prior to any intended utility interruptions.
- 1.14 <u>FIELD CONDITIONS, CONSTRUCTION PROCEDURES AND COMMUNICATION</u> Requests For Information (RFI):

The Contract Documents are complementary. Before starting each portion of the work, the Contractor shall carefully study and compare the various Drawings and other Contract documents relative to that portion of the work. Contractor shall be responsible for verification of existing site conditions, installation standards and construction conditions. Field verify all necessary dimensions. Errors, Discrepancies or omissions discovered by the Contractor between existing conditions and the construction documents shall be reported promptly to the attention of the Owner and the Architect/Engineer as a Request For Information in such form as the Owner and the Architect/Engineer or work performed that is knowingly installed in a non-approved Owner standard may be rejected and shall be removed and re-constructed to the satisfaction of the Owner at the Contractor's expense. The Contractor's quoted price shall cover all materials and work necessary to provide the completed project.

#### 1.15 WORKMANSHIP

Conform to accepted trade practices, industry standards, stipulated specifications and adopted model building codes, whichever is more stringent.

#### 1.16 <u>SALVAGE</u>

The Owner may desire to salvage certain items which are to be dismantled, excavated and removed during the course of construction. Prior to removal of any existing items from the site of work, the Contractor shall ascertain from the /Architect/Engineer whether or not a particular item is to be salvaged. Items to be salvaged shall be stockpiled on the site by the Contractor in a location as directed by the Owner. All other items of equipment shall be disposed of off site by the Contractor at his own expense.

#### 1.17 **PROTECTION**

General: Appropriate first aid facilities and supplies shall be kept and maintained by the Contractor at the site of the work. Conform to OSHA and WISHA Safety and Health Standards for Construction.

- A. All dangerous equipment <u>shall be secured and made safe at the completion of each day's</u> work.
- B. The Contractor shall be responsible to protect buildings and grounds from damage.
- C. Comply with standards and code requirements for erection of structurally adequate temporary barricades. Paint with appropriate colors, graphics and warning signs to inform

personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

- D. Provide First Aid supplies. Comply with governing regulations.
- E. Where required at specific sites, provide hand-carried, portable UL-rated, 10 lb. Class "ABC" fire extinguishers.

## 1.18 <u>HOT WORK</u>

- A. Hot work includes, but is not limited to, open flames, the production of heat and/or sparks, brazing, cutting, grinding, soldering, welding, and torch applied roofing.
- B. Before initiating any hot work, the contractor shall notify the Owner and the Custodian.The Contractor shall verify and/or complete the following:
  - 1. Available sprinklers, hose streams and extinguishers are in service/operable.
  - 2. Hot work equipment is in good repair.
  - 3. Work requirements within 35 feet:
    - a. Flammable liquids, dust, lint, and oily deposits are removed.
    - b. Explosive atmosphere in area eliminated.
    - c. Floors swept clean.
    - d. Combustible floors wet down, covered with damp sand or fire-resistive sheets.
    - e. Remove other combustibles where possible. Otherwise protect with fire-resistive tarpaulins or metal shields.
    - f. All wall and floor openings covered.
    - g. Fire-resistive tarpaulins suspended beneath work.
    - h. Protect or shut down ducts and conveyors that might carry sparks to distant combustibles.
  - 4. Work on walls, ceilings or roofs:
    - a. Construction is non-combustible and without combustible covering or insulation.
    - b. Combustibles on either side of walls, ceilings or roofs are moved away.
  - 5. Work on enclosed equipment.
    - a. Enclosed equipment cleaned of all combustibles.
    - b. Containers purged of flammable liquid/vapors.
    - c. Pressurized vessels, piping and equipment removed from service, isolated and vented.
  - 6. Fire watch/Hot Work area monitoring

- a. Fire watch will be provided during and for 80 minutes after work, including any coffee and lunch breaks.
- b. Fire watch is supplied with suitable extinguishers, and where practical, a small charged hose.
- c. Fire watch is trained in use of equipment and in sounding alarm.
- d. Fire watch may be required in adjoining areas, above and below.
- e. Monitor Hot Work area for 2 hours after job is completed.
- C. Contractor shall be liable for any damages resulting from hot work.

## 1.19 ASBESTOS

If asbestos has been identified, it will be shown in supplemental documents attached within the Appendix. Contractor shall take proper precautions and adhere to required work practices and AHERA, WISHA and OSHA regulations, when drilling or cutting through materials containing asbestos. Manuals indicating asbestos containing materials reside at each site and at the Spokane Public Schools Facility Services Building. Provide incidental demolition, as required. Reference appropriate specifications attached herein if asbestos abatement is required.

DIVISION 1 GENERAL CONDITIONS SECTION 01025 SCHEDULE OF VALUES AND APPLICATIONS FOR PAYMENT Page 1

## PART I - GENERAL

#### 1.01 <u>GENERAL</u>

This Section includes procedures for the preparation and submittal of Schedule of Values and Applications for Payment in accordance with the General Conditions.

#### 1.02 <u>RELATED SECTIONS</u>

Coordinate related work specified in other parts of the Specifications, including but not limited to the following:

- A. General Conditions.
- B. Change Order Procedures, Section 01026
- B. Submittals, Section 01300.
- C. Construction Schedule, Section 01310.
- D. Project Closeout, Section 01700.

#### 1.03 PRIOR TO FIRST PROGRESS PAYMENT

- A. Submit and receive approval for the construction schedule.
- B. Submit approved "Intent to Pay Prevailing Wages Form", proof of Insurance and Performance Bonds prior to commencing the work.
- C. Submit and receive approval of Schedule of Values".

### 1.04 <u>SUBMITTAL PROCEDURES</u>

- A. Submit three (3) copies each of the Schedule of Values and Application for Payment.
- B. Submit an updated progress schedule with each Application for Payment.
- C. Submit under a Transmittal Letter.
- D. Submit (3) copies each of proof of release of liens as stipulated in the General Conditions.

#### 1.05 <u>SUBSTANTIATING DATA</u>

- A. When Owner or Architect requires substantiating information, submit data justifying dollar amounts in question.
- B. Provide one (1) copy of data with cover letter for each copy of the submittal. Show Application number and date, and line item by number and description.

#### 1.06 <u>SCHEDULE OF VALUES</u>

A. Submit typed schedule on AIA Form G703 – Application and Certificate for Payment Continuation Sheet or on Contractor's standard form or electronic media printout as

DIVISION 1 GENERAL CONDITIONS SECTION 01025 SCHEDULE OF VALUES AND APPLICATIONS FOR PAYMENT Page 2

approved by Owner.

- B. Submit Schedule of Values in duplicate within 15 days after date established in the Notice to Proceed.
- C. Format: List all major work activities indicated on the project schedule. Where appropriate, separate construction sequences, trades and phases recognized in CSI divisions. Identify site mobilization, bonds and insurance.
- D. Revise schedule to list approved Change Orders with each Application for Payment.
- E. Identify "Separately Funded Work" and amounts separately.
- F. List separate line items for General, Mechanical and Electrical equipment closeout (which includes operation and maintenance manuals) and include the dollar amount for each portion of the project.
- G. For each unit of work where payment requests will be made on account of materials or equipment purchased, fabricated, delivered but not yet installed; show "separate line items" for "order and receive" and "installation" of that unit of work.
- H. Show line items of indirect costs, and margins of actual costs, only to the extent that such items will be individually listed in payment requests. In general, establish each item in the schedule of values (and in payment requests) to be complete with its total expenses and proportionate share of general overhead and profit margin.
- I. Except as otherwise required, major cost items, which are not directly cost of actual work-inplace, such as distinct temporary facilities, may be either shown as line items in schedule of values or distributed as general overhead expense, at Contractor's option.
- J. Make sum of total scheduled costs equal to Contract Sum, do not include State sales tax.

## 1.07 <u>APPLICATIONS FOR PAYMENT</u>

- Submit three (3) copies of each application on AIA Form G702 Application and Certificate for Payment.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Payment Period: one (1) month.
- D. Include Intent to Pay Prevailing Wages Form as required by Owner.
- E. Proof of Payment as required by Owner.

SPOKANE PUBLIC SCHOOLS SPOKANE, WASHINGTON LINWOOD ELEMENTARY SOLAR ADDITION DIVISION 1 GENERAL CONDITIONS SECTION 01025 SCHEDULE OF VALUES AND APPLICATIONS FOR PAYMENT Page 3

F. Certified Payroll to governing jurisdictional authorities at their request.

#### 1.08 APPLICATION FOR FINAL PAYMENT

- A. Submit three (3) copies of the final application for payment on AIA Form G702 –
  Application and Certificate for Payment identifying total adjusted Contract Sum,
  previous payments and sum remaining due.
- B. Include Intent to Pay Prevailing Wages Form as required by Owner.
- C. Include Affidavits of Wages Paid Form as required by Owner.
- D. Submit proof of release of all liens as stipulated in the General Conditions.

DIVISION 1 GENERAL CONDITIONS SECTION 01026 CHANGE ORDER PROCEDURES Page 1

## PART I - GENERAL

### 1.01 <u>GENERAL</u>

This Section includes procedures for the preparation and submittal of Change Orders in accordance with the General Conditions.

### 1.02 RELATED SECTIONS

Coordinate related work specified in other parts of the Specifications, including but not limited to the following:

- A. General Conditions.
- B. Schedule of Values and Applications for Payment, Section 01025.
- C. Submittals, Section 01300.
- D. Construction Schedule, Section 01310.
- E. Project Closeout, Section 01700.

## 1.03 <u>SUBMITTAL PROCEDURES</u>

- A. Submit name of the individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Submit (3) copies each of change order form, AIA G701, Change Order.

## 1.04 DOCUMENTATION OF CHANGE IN CONTRACT SUM AND CONTRACT TIME

- A. Maintain detailed records of Work done on a time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
- B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
- C. On request, provide additional data to support computations:
  - 1. Quantities of products, labor, and equipment.
  - 2. Taxes, insurance and bonds.
  - 3. Overhead and Profit.
  - 4. Justification for any change in Contract Time.
  - 5. Credit for deletions from Contract, similarly documented.
- D. Support each claim for additional costs, and for work done on a time and material basis, with additional information:
  - 1. Origin and date of claim.
  - 2. Dates and times work was performed, and by whom.

DIVISION 1 GENERAL CONDITIONS SECTION 01026 CHANGE ORDER PROCEDURES Page 2

- 3. Time records and wage rates paid.
- 4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

## 1.05 <u>CHANGE PROCEDURES</u>

- A. The Owner will advise of minor changes in the Work not involving an adjustment to the Contract Sum or Contract Time as work associated with the completion of the original Contract.
- B. The Owner, Owner's representative, or Owner's consultant may issue a proposal request which may include a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit an estimate within ten (10) days.
- C. The Contractor may propose a change by submitting a request for change to the Owner, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other Contractors. Document any requested substitutions in accordance with Section 01600.

## 1.06 CONSTRUCTION CHANGE DIRECTIVE

- A. Owner may issue a document, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
- B. The document will describe changes in the Work, and will designate method of determining any change in the Contract Sum or Contract Time.
- C. Contractor shall not execute the change in Work without written approval by the Owner.

## 1.07 STIPULATED SUM CHANGE ORDER

Based on a Proposal Request and Contractor's maximum price quotation, or Contractor's request for a Change Order as approved by the Owner.

## 1.08 <u>UNIT PRICE CHANGE ORDER</u>

- A. For pre-determined unit prices and quantities, the Change Order will be executed on a fixed unit price basis.
- B. For unit costs or quantities of units of work which are not pre-determined, execute Work under a Construction Change Directive.
- C. Changes in Contract Sum or Contract Time will be computed as specified for Time and Material Change Order.

DIVISION 1 GENERAL CONDITIONS SECTION 01026 CHANGE ORDER PROCEDURES Page 3

## 1.09 <u>TIME AND MATERIAL CHANGE ORDER</u>

- A. Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- B. Owner shall determine the change in Contract Sum and Contract Time as provided in the Contract Documents.
- C. Maintain detailed records of work done on a Time and Material basis.
- D. Provide full information required for the evaluation of proposed changes, and to substantiate costs for changes in the work.

## 1.010 EXECUTION OF CHANGE ORDERS

Contractor shall issue a Change Order Proposal for Owner approval and signature prior to the commencement of any Change Order Directive.

## 1.011 CORRELATION OF DOCUMENTS

- A. Promptly revise the Schedule of Values and Applications for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- B. Promptly revise progress schedules to reflect any change in the Contract Time, revise sub-schedules to adjust time for other items of work affected by the change, and resubmit.
- C. Promptly enter changes in Project Record Documents.

## 1.012 COST ALLOWANCES

- A. A maximum allowance for overhead and profit combined, may be added to additive change orders by the Contractor and shall not exceed the following schedule:
  - 1. For the General Contractor, 15% of the cost for any materials or work performed by his own forces.
  - 2. For the General Contractor, for materials or work performed by its subcontractor, 8% of the amount due to the Subcontractor.
  - 3. No markup will be allowed for small tools, shop burden, labor burden, or freight.

DIVISION 1 GENERAL CONDITIONS SECTION 01040 PROJECT COORDINATION Page 1

## PART I - GENERAL

#### 1.01 <u>GENERAL</u>

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

- A. Coordination.
- B. Administrative and supervisory personnel.
- C. General installation provisions.
- D. Cleaning and protection.

## 1.02 <u>COORDINATION</u>

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

- A. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
- B. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
- C. Make adequate provisions to accommodate items scheduled for later installation.
- D. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
- E. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

## 1.03 ADMINISTRATIVE PROCEDURES

Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

- A. Testing and Inspections.
- B. Installation and removal of temporary facilities.
- C. Delivery and processing of submittal.

#### 1.04 POSTINGS

Staff Names: Within 15 days of Notice to Proceed, post a list of the Contractor's principal

DIVISION 1 GENERAL CONDITIONS SECTION 01040 PROJECT COORDINATION Page 2

staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

A. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

## 1.05 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturers instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation Reject items not complying with the specifications or approved submittal.
- D. Provide attachment and Connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect/ Engineer for final decision.
- F. Recheck measurements and dimensions, before starting each installation.
- G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect/ Engineer for final decision.

## 1.06 <u>CLEANING AND PROTECTION</u>

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

DIVISION 1 GENERAL CONDITIONS SECTION 01040 PROJECT COORDINATION Page 3

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

## 1.07 <u>LIMITING EXPOSURES:</u>

Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

- A. Excessively high or low temperatures.
- B. Excessively high or low humidity.
- C. Air contamination or pollution.
- D. Water or ice.
- E. Solvents.
- F. Chemicals.
- G. Light.
- H. Puncture.
- I. Abrasion.
- J. Heavy traffic.
- K. Soiling, staining and corrosion.
- L. Combustion.
- M. Electrical current.
- N. Unusual wear or other misuse.
- O. Misalignment.
- P. Excessive weathering.
- Q. Unprotected storage.
- R. Improper shipping or handling.
- S. Theft and vandalism.

DIVISION 1 GENERAL CONDITIONS SECTION 01045 CUTTING AND PATCHING Page 1

## PART I - GENERAL

## 1.01 <u>GENERAL</u>

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

## 1.02 <u>RELATED WORK</u>

Coordinate related work specified in other parts of the Specifications, including but not limited to the following:

- A. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
  - 1. Requirements of this Section apply to roof membrane, flashings, and sealants installation. Cost of providing penetrations and any subsequent patching shall be borne by the Trade requiring accommodation.

## 1.03 <u>SUBMITTALS</u>

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

- A. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
- B. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
- C. List products to be used and firms or entities that will perform Work.
- D. Indicate dates when cutting and patching is to be performed.
- E. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
- F. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure.
- G. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work found to be unsatisfactory.

## 1.04 <u>QUALITY ASSURANCE</u>

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
  - 1. Obtain approval of the cutting and patching proposal before cutting and

DIVISION 1 GENERAL CONDITIONS SECTION 01045 CUTTING AND PATCHING Page 2

patching the following structural elements.

- a. Foundation Construction
- b. Retaining walls
- c. Structural Concrete
- d. Beams, Joists and Trusses.
- e. Load Bearing walls and partitions.
- B. Requirements for Electrical Work: Refer to Division 16 for other requirements and limitations applicable to cutting and patching electrical installations.
- C. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.
  - 1. Obtain approval of cutting and patching proposal before cutting and patching the following operating elements or safety related systems.
    - a. Shoring, bracing and sheeting
    - b. Electrical and Alarm Systems
    - c. Data and Communication Systems
    - d. Plumbing Systems
    - e. Energy Management Systems (EMS)
- D. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in the Owner's opinion, reduce the building aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.
  - 1. If possible, retain the original installer or fabricator to cut and patch exposed Work, or engage another recognized, experienced and specialized firm.

## **PART II - PRODUCTS**

## 2.01 <u>GENERAL</u>

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

## **PART III - EXECUTION**

## 3.01 <u>INSPECTION</u>

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.
- B. Before proceeding, meet at the site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 3.02 **PREPARATION**

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the existing building.

## 3.03 <u>PERFORMANCE</u>

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
  - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
  - 1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering or chopping. Cut holes and slots neatly to size required with minimum disturbance to adjacent surfaces. Temporarily cover openings when not in use.
  - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Cut through concrete using a cutting machine such as a carborundum saw or diamond core drill.
  - 4. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug

## DIVISION 1 GENERAL CONDITIONS SECTION 01045 CUTTING AND PATCHING Page 4

and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
  - 1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
  - 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
  - 3. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken areas containing the patch, to adjacent abutting surfaces,; after the patched area has received primer and second coat.

## 3.04 <u>CLEANING</u>

Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty, and items of similar nature. Thoroughly clean piping, conduit, and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

## 3.05 <u>LIMITING ASBESTOS EXPOSURE:</u>

Asbestos Containing Building Materials (ACBM's) may be encountered during cutting procedures. Contact the Owner's Project Manager prior to starting work. Owner will provide a "Good Faith Survey" to ascertain and provide direction for protective procedures for abatement activities. Contractor shall be responsible for implementing these procedures for the protection of their employees, building occupants, and the general public around the Work site. Contractor will adhere to all training requirements for their employees as stated in Federal, State and local directives.
# PART 1 GENERAL

### 1.01 <u>GENERAL</u>

This section establishes the requirements necessary to ensure compliance with asbestos safety regulations while working in Spokane Public School District facilities.

## 1.02 <u>RELATED DOCUMENTS</u>

- A. Section 00700, Paragraph 5.20, of these specifications
- B. EPA 40CFR Part 763, Sub part E AHERA Regulations for Schools
- C. OSHA 29CFR 1926.1101
- D. WISHA Standard 296-65 WAC
- E. WISHA Standard 296-62-077 WAC

# 1.03 WORKER QUALIFICATIONS

- A. The contractor shall provide Department of Labor and Industries Asbestos Class III trained workers for any work required to be completed in the tunnels or crawl spaces, or for the performance of any task that will disturb asbestos containing materials within School District facilities.
- B. Class III training may be obtained from several certified asbestos training providers in the Spokane area. The Spokane Public School District can provide a partial list of certified training providers, and additional training providers can be found in the yellow pages of the local telephone book under Asbestos Consulting.
- C. The training consultant shall be certified to provide Class III Training. The Class III training shall cover how to work around asbestos containing materials, and how to perform maintenance work on and around asbestos containing building materials. Class III training does not cover full asbestos abatement. Due to the specific nature of our tunnels and crawl spaces the consultant shall provide training in the following areas:
  - 1. How to safely enter and work in the tunnels without stepping on or otherwise causing damage to the pipes that have asbestos insulation wraps.
  - 2. How to exit the tunnels and remove suits and respirators using approved decontamination procedures.
  - 3. The School District is particularly concerned that the rooms above the tunnel accesses do not become contaminated with asbestos fibers and asbestos containing soil.
  - 4. The Class III training shall cover proper techniques for drilling through asbestos containing materials on the floor, ceiling, roofs or walls for the purpose of making attachments or routing pipes or conduit.

DIVISION 1 GENERAL SECTION 01060 ASBESTOS SAFETY RQMTS Page 2

D. Representatives of the Spokane Public School District are available to coordinate with the training provider regarding course material. They will also be available to assist the contractor with designating appropriate set-up areas, answering asbestos questions, and reviewing the asbestos management plan available at each school.

# PART II - PRODUCTS

# 2.01 <u>RESPIRATORS</u>

Select respirators from those approved by the Mine Safety and Health Administration (MSHA), Department of Labor, or the National Institute of Safety and Health (NIOSH).

- A. Single-use, disposable, or quarter face masks or respirators are not allowed.
- B. Provide half-face or full-face type respirators, as required, with nose cup or other anti-fogging device.
- C. Respirators shall be equipped with HEPA type filters.

# 2.02 <u>PROTECTIVE CLOTHING</u>

Provide personnel entering tunnels or crawl spaces, or otherwise exposed to airborne concentrations of asbestos fibers with disposable, protective, whole body clothing, head coverings, gloves and foot covering.

A. A single-piece suit is preferred.

# PART III - EXECUTION

3.01 <u>PERSONNEL</u>

All contractor personnel on this project who will be entering a tunnel or crawlspace and/or to perform any task that will, or potentially could, disturb Asbestos Containing Material (ACM), shall:

- A. Be a Class III trained worker
- B. Wear personal protective clothing
- C. Wear appropriate respiratory protection

# 3.02 <u>ACCESS</u>

Entrance and egress to tunnels and crawlspaces shall be made at openings in boiler rooms, custodial rooms, or other non-public or non-student spaces.

# 3.03 <u>DISPOSAL</u>

Asbestos containing waste materials shall be legally disposed. Removal of disposal bags shall be via the least public route, or shall be done during non-school hours.

3.04 <u>APPEARANCE</u>

DIVISION 1 GENERAL SECTION 01060 ASBESTOS SAFETY RQMTS Page 3

Workers shall never be in asbestos protective clothing or wearing their respirators when they are in view of staff, students or the public.

# PART IV - SUBMITTALS

4.01 <u>CERTIFICATION</u>

Copies of the Class III training attendance records or certificates for each qualified worker shall be required as a submittal before work begins.

4.02 DISPOSAL RECEIPTS

Copies of the waste disposal receipts shall be submitted to the School District as verification of proper disposal of asbestos contaminated waste.

# PART I - GENERAL

### 1.01 <u>GENERAL</u>

This Section specifies administrative requirements for compliance with governing regulations, codes and standards.

- A. Requirements include obtaining permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes and standards.
- B. Refer to General Conditions for requirements for compliance with governing regulations.

### 1.02 **DEFINITIONS**

General: Definitions contained in this Article are not necessarily complete, but are general to the extent that they are not defined more explicitly elsewhere in the Contract Documents.

- A. Indicated refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.
- B. Directed: Terms such as "directed," "requested," "authorized," "selected,"
  "approved," "required," and "permitted" mean "directed by the Architect/ Engineer," "requested by the "Architect/ Engineer," and similar phrases. However, no implied meaning shall be interpreted to extend the Architect/ Engineer's responsibility into the Contractor's area of construction supervision.
- C. Approve: The term "approved," where used in conjunction with the Architect/ Engineer's action on the Contractor's submittal, applications, and requests, is limited to the responsibilities and duties of the Architect/ Engineer. Such approval shall not release the Contractor from responsibility to fulfill Contract Document requirements, unless otherwise provided in the Contract Documents.
- D. Regulation: The term "Regulations" includes laws, statutes, ordinances and lawful orders issued by authorities having jurisdiction, as well as rules, conventions and agreements within the construction industry that control performance of the Work, whether they are lawfully imposed by authorities having jurisdiction or not.
- E. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
- F. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting cleaning and similar

operations."

- G. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use.
- H. Installer: An installer" is an entity engaged by the Contractor, either as an employee, subcontractor or sub-subcontractor for performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - 1. The term "experienced," when used with the term "Installer" means having a minimum of 5 previous Projects similar in the and scope to this Project, and familiar with the precautions required, and has complied with requirements of the authority having jurisdiction.
- I. Project Site is the space available to the Contractor for performance of the Work, either exclusively or in conjunction with others performing other construction as part of the Project. The extent of the Project Site is shown on the Drawings, and may or may not be identical with the description of the land upon which the Project is to be built.
- J. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

### 1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

This Article is provided to help the user of these Specifications understand the format, language, implied requirements, and similar conventions. None of the explanations shall be interpreted to modify the substance of Contract requirements.

- A. Specification Format: These Specifications are organized into Divisions, Sections or Trade Headings based on the Construction Specifications Institute's 16-Division format and numbering system. This organization conforms generally to recognized construction industry practice.
- B. Specification Content: This Specification has been produced employing conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
  - 1. Language used in the Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and where the full context of the Contract Documents so indicates.
  - 2. Imperative Language is used generally in the Specifications. Requirements expressed imperatively are to be performed by the Contractor. At certain

locations in the text, for clarity, subjective language is used to describe responsibilities which must be fulfilled indirectly by the Contractor, or by others when so noted.

- C. Assignment of Specialists: The Specification requires that certain specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and the assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
  - 1. This requirement should not be interpreted to conflict with enforcement of building codes and similar regulations governing the work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
- D. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.

## 1.04 INDUSTRY STANDARDS

Applicability of Standards: Except where Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into Contract Documents. Such standards are made a part of the Contract Documents by reference. Individual Sections indicate which codes and standards the Contractor must keep available at the Project Site for reference.

- A. Publication Dates: Where compliance with an industry standard is required, comply with standard in effect as of date of Contract Documents.
- B. Conflicting Requirements: Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect/ Engineer for a decision before proceeding.
- C. Minimum Quantities or Quality Levels: In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to the Architect/ Engineer for decision before proceeding.

- D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entities' construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed for performance of a required construction activity, the Contractor shall obtain copies directly from the publication source.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations as referenced in Contract Documents are defined to mean the associated names. Names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of Contract Documents:

1.	AA	Aluminum Association 900 19th St., Suite 300; Washington, DC 20006 (202)862-5100
2.	AABC	Associated Air Balance Council 1518 K Street NW, Suite 503; Washington, DC 20005 (202)737-0202
3.	AAN	American Association of Nurserymen 1250 Eye Street NW, Suite 500; Washington DC 20005 (202)789-2900
4.	AASHTO	American Association of State Highway & Transportation Officials 444 N. Capital St., Suite 500; Washington, DC 20005 (202)624-5800
5.	ACI	American Concrete Institute P.O. Box 19150; Detroit, MI 48219 (313)532-2600
6.	AGA	American Gas Association 1515 Wilson Blvd.; Arlington, VA 22209 (703)841-8400
7.	АНА	American Hardboard Association 520 N. Hicks Rd.; Palatine IL 60067 (312)943-8800
8.	Al	Asphalt Institute Asphalt Inst. Bldg.; College Park MD 20740 (301)227-4258
9.	AISC	American Institute of Steel Construction 400 N. Michigan Ave.; 8th Flr; Chicago IL 60611 (312)670-2400

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- 10.AITCAmerican Institute of Timber Construction<br/>333 W. Hampden Ave.; Englewood Co 80110<br/>(303)761-3212
- 11. ANSI American National Standards Institute 1430 Broadway; New York, NY 10018 (212)354-3300
- 12. APA American Plywood Association P.O. Box 11700; Tacoma, WA 98411 (206)565-6600
- 13. ARMA Asphalt Roofing Manufacturers Association 6288 Montrose Road,; Rockville, MD 20852 (301)231-9050
- 14. ASC Adhesive and Sealant Council 1500 Wilson Blvd,; Suite 515; Arlington, VA 22209 (703)841-1112
- 15. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Architect/ Engineers 1791 Tulie Circle, NE; Atlanta, GA 30329 (404)636-8400
- 16. ASME American Society of Mechanical Architect/ Engineer 345 East 47th St.; New York, NY 10017 (212)705-7722
- 17. ASPEAmerican Society of Plumbing Architect/ Engineers<br/>3617 Thousand Oaks Blvd.,Suite 210; Westlake, CA 91362<br/>(805)495-7120
- ASSE American Society of Sanitary Architect/ Engineering
   P.O. Box 40362; Bay Village, OH 44140;
   (216)835-3040
- 19. ASTM American Society of Testing and Materials 1916 Race St; Philadelphia, PA 19103; (215)299-5400
- 20. AWI Architectural Woodwork Institute 2310 S. Walter Reed Dr.; Arlington, VA 22206; (703)671-9100
- 21. AWPAAmerican Wood Preservers' Association<br/>P.O. Box 5283; Springfield, VA 21666

(703)339-6660

22. AWWA American Water Works Association

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		6666 W. Quincy Ave.; Denver, CO 80235 (303)794-7711
23.	BHMA	Builders' Hardware Manufacturers Association 60 East 42nd St., Room 511; New York, NY 10165 (212)682-8142
24.	CAGI	Compressed Air and Gas Institute c/o Thomas Associates, Inc. 1230 Keith Building; Cleveland, OH 44115 (216)241-7333
25.	CISPI	Cast Iron Soil Pipe Institute 1499 Chain Bridge Rd.; Suite 203; McLean, VA 22101 (703)827-9177
26.	CRI	Carpet and Rug Institute Box 2048; Dalton, GA 30720 (404)278-3176
27.	CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road; Schaumburg, IL 60195 (312)490-1700
28.	DHI	Door and Hardware Institute 7711 Old Springhouse Rd.; McLean, VA 22102 (703)556-3990
29.	GA	Gypsum Association 1603 Orrington Ave.; Evanston, IL 60201 (312)491-1744
30.	GCC	Insulating Glass Certification Council Route 11; Industrial Park; Cortland, NY 13045 (607)753-6711
31.	NAPA	National Asphalt Pavement Association Calvert Building, Suite 620; 6811 Kenilworth Ave.; Riverdale, MD 20737
		(301)779-4880
32.	NEC	National Electrical Code (by NFPA)
33.	NKCA	National Kitchen Cabinet Association P.O. Box 6830; Falls Church, VA 22046 (703)237-7580
34.	NPA	National Particle Board Association 18928 Premier Court, Gaithersburg, MD 20879 (301)670-0604

SPOKANE PUBLIC SCHOOLS SPOKANE, WASHINGTON LINWOOD ELEMENTARY SOLAR ADDITION DIVISION 1 GENERAL CONDITIONS SECTION 01090 DEFINITIONS AND STANDARDS Page 7

- 35. NPCA National Paint and Coatings Association 1500 Rhode Island Avenue, N.W.; Washington, DC 20005 (202)462-6272 PDI Plumbing and Drainage Institute 36. (c/o Austin O. Roche, Jr.) 5342 Boulevard Pl.; Indianapolis, IN 46208 (317)251-5298 37. RFCI **Resilient Floor Covering Institute** 966 Hungerford Drive; Suite 12-B; Rockville, MD 20805 (301)340-8580 Sheet Metal & Air Conditioning Contractors National 38. SMACNA Association P.O. Box 70; Merrifield, VA 22116 (703)790-9890 39. TPI **Truss Plate Institute** 583 D'Onotrio Drive, Suite 200; Madison, WI 53719 (608)833-5900 UL Underwriters Laboratories 40. 333 Pingsten Rd..; Northbrook, IL 60062 (312)272-8800 41. CLIB West Coast Lumber Inspection Bureau P.O. Box 23145; Portland, OR 97223 (503)639-0651 42. WRI Wire Reinforcement Institute 8361 A Greensboro Drive; McLean, VA 22102 (703)790-9790 43. **WWPA** Western Wood Products Association 1500 Yeon Bldg.; Portland, OR 97204 (503)224-3930 44. W.W.P.A. Woven Wire Products Association 2515 N. Nordica Ave.; Chicago, IL 60635 (312)637-1359
- F. Federal Government Agencies: Names and titles of federal government standard or Specification producing agencies are frequently abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard or Specification producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up-to-date as of the date of the Contract Documents.

1. DOT Department of Transportation

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	400 Seventh Street NW; Washington, DC 20590 (202)426-4000
2. EPA	Environmental Protection Agency 401 M Street SW, Washington, DC 20460 (202)829-3535
3. FS	Federal Specification (General Services Administration) Specifications Unit (WFSIS); 7th and D Streets SW; Washington, DC 20406; (202)472-2205 or 472-2140

## 1.05 PERMITS. LICENSES. AND CERTIFICATES

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

# PART I - GENERAL

## 1.01 DEFINITION AND SCOPE

- A. Mobilization shall include the obtaining of all permits, insurance and bonds, moving onto the site of all material and equipment, furnishing and erecting temporary buildings and other temporary construction facilities, furnishing and erecting all temporary and permanent fencing; final clean-up and finishing of all construction-related activities to moving off site upon project completion (demobilization); all as required for the proper performance and completion of the work. Mobilization for this work shall include, but is not necessarily limited to, the following principal items:
  - 1. Obtaining all required bonds, insurance, permits and licenses.
  - 2. Submittal of all required subcontractor insurance certificates and bonds.
  - 3. Pre-construction conference and submittal of construction schedule.
  - 4. Arranging for and erection of Contractor's work and storage yard.
  - 5. Providing a field office trailer for the Contractor, including furnishings, utility services and telephone.
  - 6. Installing temporary construction power and wiring.
  - 7. Providing on-site sanitary facilities as specified
  - 8. Moving on to the site of all Contractor's material and equipment required for the first month of work.
  - 9. Having the Contractor's superintendent at the job site full time.
  - 10. Posting all OSHA/WISHA required notices and establishing of safety programs.
  - 11. Posting of all required posters, notices and wage rates (if required).
  - 12. Documentation of placing order for major equipment.
  - 13. Providing shoring and protection of existing structures, utilities, and facilities as may-be required during the course of the work.

### 1.02 PAYMENT FOR MOBILIZATION

- A. No payment for mobilization, or any part thereof, will be approved under the Contract until all mobilization items listed above have been completed as specified.
- B. Payment for Mobilization and Demobilization
  - 1. Mobilization consists of preconstruction expenses and the costs of preparatory work and operations performed by the Contractor which occur before 10% of the total original contract amount is earned from other bid

DIVISION 1 GENERAL CONDITIONS SECTION 01100 MOBILIZATION Page 2

items. Items which are not to be included in the item of Mobilization include, but are not limited to:

- a. Any portion of the work covered by the specific bid item or incidental work which is to be included in a bid item(s);
- b. Profit, interest on borrowed money, overhead, or management costs.

## PART I - GENERAL

### 1.01 <u>SUMMARY</u>

- A. Requirements for meetings, lines of communications, schedule and payments.
- 1.02 ORDER OF PRECEDENCE OF CONTRACT DOCUMENTS
  - A. In resolving conflicts resulting from conflicts, errors, ambiguities or discrepancies in any of the Contract Documents, the order of precedence shall be as follows:
    - 1. Agreement
    - 2. Specifications
    - 3. Drawings
  - B. Within the Specifications, the order of precedence is as follows:
    - 1. Addenda
    - 2. Supplemental General Conditions
    - 3. Instructions to Bidders
    - 4. Quotation and Contract Requirements
    - 5. Division 1, General Conditions
    - 6. Division 2-16, Technical Specifications
    - 7. Referenced Standard Specifications
    - C. With reference to the Drawings, the order of precedence is as follows:
      - 1. Figures govern over scaled dimensions
      - 2. Detail drawings govern over general drawings
      - 3. Change order drawings govern over contract drawings
      - 4. Contract drawings govern over standard drawings
      - 5. Contract drawings govern over shop drawings

## 1.03 PROJECT MEETINGS

A. Pre-construction meeting

Meet at Owner's office within two weeks prior to start of work. Attendees to include Owner and Contractor. Agenda shall include discussions of:

- 1. Mobilization considerations,
- 2. Administrative procedures,
- 3. Review of schedule and submittals and
- 4. Any start-up and coordination items to be addressed.

B. Weekly Progress Meetings

Meet at the work site at least once each week. Attendees to include owner and Contractor's Project Supervisor. Agenda shall include:

- 1. Review of schedule
- 2. Discussion of current work activities
- 3. Discussion of work activities for next week and
- 4. Review of technical aspects, material deliveries and coordination of activities.
- C. Pre-Installation Meetings

Meet at the site prior to the installation of all complex building systems and components requiring special scheduling and safety procedures.

- 1. Review the schedule for the coordination activities with other trades.
- 2. Discuss special installation procedures and safety considerations.
- D. Close-Out Meeting

Meet at Owner's office on or before contract completion date. Attendees to include Owner and Contractors Project Supervisor. Agenda shall include:

- 1. Status of punch list work and submittals and
- 2. Review of requirements for final close-out and payment

### 1.04 <u>SCHEDULE OF WORK</u>

- A. Schedule of work shall be in sufficient detail to show the start and completion dates for activity.
- B. The schedule shall be reviewed and updated each week.

## 1.05 WORK HOURS

- A. Working Hours
  - 1. Custodial Hours:

Elementary Schools:

Monday and Wednesday - 5:30 am to 6:30 pm

Tuesday, Thursday and Friday – 5:30 am to 10:15 pm

Middle Schools:

Monday through Friday - 5:30 am to 10:15 pm

High Schools:

Monday through Friday - 5:30 am to 11:00 pm

- 2. During the school year, all work must occur after school, generally commencing at 3:00 p.m. to 4:00 p.m. and ending approximately 7 to 8 hours thereafter. School officials will provide access to the work and lock-up at the end of each day's shift. All work must be cleaned up at the end of each shift, leaving each building in a clean, usable condition, ready for the next day of school. Custodial coverage is required when the Contractor is in the facility. Additional custodial coverage may be requested by the Contractor at a cost of \$30 to \$40 per hour (depending on the day/time and employee's rate per hour) paid by the Contractor (typically in the form of a deductive change order to the Project).
- 3. During the summer break period, conventional day-time hours may be adopted for all work. Typically, the contactor is able to work 7.5 hours on the interior of the building. The contractor may wish to arrange additional custodial coverage as discussed above. Daily clean-up is still required during this period so as not to conflict with major summer cleaning efforts by custodial staff.
- 4. During winter break and spring break, conventional day-time hours may be adopted for all work to be verified with the head custodian for that site location. Daily clean-up is still required during this period so as not to conflict with any cleaning efforts by custodial staff.
- 5. Except for the summer, winter and spring break periods and student holidays (but not 12 month school staff holidays) noted within this Section, all work shall be conducted on a "swing-shift" schedule.
- 6. Exterior work may occur during the school day and weekends as long as the work does not interfere with the educational process or impede access of students or staff to the site and facilities. Custodial coverage is not required for exterior work hours.
- B. Summer break Contractor working hours (custodial coverage to be confirmed with site's head custodian):

Monday – Friday 7:00 pm to 3:00 pm Or

Four Tens 6:00 pm to 4:00 pm

C. School District Holidays which the Contractor will not be able to work are the following:

Veteran's Day

Thanksgiving Holiday (2 days observed)

Christmas Holiday (2 days observed)

New Years Holiday (2 days observed)

Martin Luther King Junior Day

President's Day

Memorial Day

Independence Day

Labor Day

- D. Days which are student and instructor vacation days (not district employee holidays) have custodial coverage limited from 7:00 a.m. to 3:00 p.m.
- E. Contractor shall confirm all schedules and working hours with the Principal and Head Custodian. Contractor shall be responsible for coordinating with the school's principal and custodian of special events (i.e. carnival event, open house, etc.) which may impact the Contractor's ability to perform project work. In some cases it may not be possible for the Contractor to work that evening.
- F. Requests for extended work hours shall be made 48 hours in advance to the Project Manager. Custodial staff will be notified and must be on site prior to any extended work hours. The Contractor shall be responsible for covering Custodial Rates for extended work hours (typically in the form of a deductive change order to the Project). Rates shall be per the Custodial Contracts with the School District.

## 1.06 LINES OF COMMUNICATION

- A. A direct line of daily communication shall be maintained between the Owner's representative and the Contractor's Project Supervisor.
- B. Each work site shall have a person-in-charge at anytime work is being performed.

## 1.07 PROGRESS PAYMENTS

Five percent of the current billing amount shall be withheld from each pay request for retainage.

A. <u>Initial Progress Payment</u>

Owner's approval of the initial pay request shall be based on completion or receipt of the following:

- 1. Owner's receipt of:
  - a. Certificate of Insurance
  - b. Performance Bond
  - c. Statement of Intent to Pay Prevailing Wages approved by the Department of Labor and Industries and
- 2. Satisfactory processing of submittals required by Section 01300, Paragraph 1.03.

- 3. Attendance of Pre-Construction meeting,
- 4. Satisfactory completion of portion of work for which billing is submitted.
- B. Subsequent progress payments shall be approved by the Owner for portions of work completed up to 90% of contract price contingent upon:
  - 1. Attendance of Weekly Progress Meetings,
  - 2. Adherence to Approved Schedule of Work and
  - 3. Satisfactory compliance with the project specifications.
- C. Final progress payment shall be approved by the Owner upon completion of:
  - 1. Satisfactory completion of the scope of work including punch list items.
  - 2. Execution of Change Orders if required.
- D. Payment of retainage shall be in accordance with Division 0, Quotation and Contract Requirements.

#### PART I - GENERAL

#### 1.01 <u>GENERAL</u>

- A. Wherever submittals are required from the Contractor by the Contract Documents all such submittals shall be submitted to the Architect/ Engineer in accordance with the requirements of this section.
- B. Each submittal shall be transmitted on Contractor's standard letterhead form. This includes but is not limited to Administrative submittals, Contractor submittals, Project Close-out submittals, Applications for Payment, Construction Management processes and Requests for Information and all such transmitted documents. Transmittal shall include, Project Name, Purchase Order Number, and Date.
- C. If alternate major equipment items require any modification or deviation from the Plans, the Contractor agrees to prepare and submit detailed drawings to the Architect/ Engineer showing all modifications in structures, piping, electrical, mechanical or other work required to adapt the Plans to the alternate equipment. The Contractor further understands that the Architect/ Engineer will review said detailed drawings of modifications and either approve them or indicate thereon changes necessary to comply with the project requirements Detailed drawings which are not approved will be revised and then resubmitted to the Architect/ Engineer. Any deduct and add amounts are "installed" prices and take into consideration and include any cost of the design or construction changes that may be required as a result of using the alternate equipment. See also Section 01600, Materials and Equipment, 1.06 Substitutions.

#### 1.02 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittal with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittal and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittal for related elements of the Work so processing will not be delayed by the need to review submittal concurrently for coordination.
  - 3. Coordinate and consolidate Submittals to include complete assemblies and systems.

Partial or incomplete Submittals will not be reviewed until complete Submittal is received.

- B. Deviations on Submittals: Identify deviations from Contract Documents, conforming to industry standards or standard shop practices by drawing cloud or other identify in marking around deviation and noting change. Identify Product or system limitations which may be detrimental to successful performance of completed Work.
- D. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittal, including time for re-submittal. Allow (10) days for review.
- E. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Sequentially number the transmittal forms. Re-submittals shall have the original number with an alphabetical suffix. Identify each copy of submittal with number.
  - 1. Include the following information on the label for processing and recording action taken.

Project name.

Date.

Name and address of Contractor.

Name and address of subcontractor or supplier.

Pertinent Drawing sheet, detail number and specification Section number.

- 2. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, all dimensions and field verified dimensions, shop drawing dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the Work and the Contract Documents.
  - Compliance with specified characteristics is the Contractor's responsibility. Approval of submittals does not release the Contractor from the requirements of a proper installation, compliance with applicable codes or coordination of the work.
- 3. Provide space for Contractor and Architect/Engineer review stamps.
- F. Distribution: Following response to initial submittal, print and distribute copies to the Architect/ Engineer, subcontractors, and other concerned parties required to comply with

submittal dates indicated. Post copies in the field office.

G. When revisions are made, distribute to the same parties and post in the same locations.Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

#### 1.03 ADMINISTRATIVE SUBMITTAL

Refer to General Conditions and other Contract Documents for requirements for administrative submittal. Such submittal shall include, but are not limited to:

- A. Permits.
- B. Applications for payment.
- C. Performance and payment bonds.
- D. Insurance certificates.
- E. Inspection and test reports are included in Section 01400 Quality Control.

#### 1.04 CONTRACTOR'S SUBMITTALS

Submittals to be in accordance with the following, but not limited to:

- A. General Conditions.
- B. Construction Schedule.
- C. Weekly Progress Reports.
- D. Contractor's Price Breakdown "Schedule Of Values".
- E. Outline of construction sequence of the work, as specified, and as construction requirements become more evident. Relate outline to construction schedule and contractor price breakdown. Submit document for review prior to commencing work at the site.

#### 1.05 <u>SUBMITTALS/SHOP DRAWINGS</u>

A. Wherever called for in these Specifications or on the Drawings, or where required by the Architect/ Engineer, the Contractor shall furnish to the Architect/ Engineer for review, three (3) copies of each submittal. The term "submittal" as used herein shall be understood to include detail design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, samples and similar items. Where required, each submittal shall contain a photocopy of the governing technical section. Any deviation from the governing technical section shall be noted and referenced to the appropriate paragraph of the section. Unless otherwise required, said submittals shall be submitted to the Architect/ Engineer at a time sufficiently early to allow

review of same by the Architect/ Engineer and to accommodate the rate of construction progress required under the Contract.

- B. All shop drawings or other submittals shall be accompanied by the Contractor's standard submittal transmittal form as approved by the Architect/ Engineer. Any submittal not accompanied by such a form, or where all applicable items on the form are not completed, will be returned for re-submittal. The Contractor may authorize a material or equipment supplier to contact the Architect/ Engineer directly with regard to questions pertaining to submittals, however, ultimate responsibility for the accuracy and completeness of the information contained in the submittal shall remain with the Contractor.
- C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the Architect/ Engineer.
- D. Except as may otherwise be provided herein, the Architect/ Engineer will return prints of each submittal to the Contractor with his comments noted thereon, within fifteen (15) working days following their receipt by the Architect/ Engineer. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Architect/ Engineer by the second submission of a submittal item The Owner reserves the right to withhold monies due the Contractor to cover additional costs of the Architect/ Engineer's review beyond the second submission.
- E. If two (2) copies of a submittal are returned to the Contractor marked "NO EXCEPTIONS TAKEN," formal revision and re-submission of said submittal will not be required. Owner will retain (1) copy.
- F. If two (2) copies of a submittal are returned to the Contractor marked "MAKE CORRECTIONS NOTED, "formal revision and resubmission of said submittal will not be required. However, all corrections must be made or noted prior to fabrication. Owner will retain (1) copy.
- G. If one (1) copy of the submittal is returned to the Contractor marked "REVISE AND

RESUBMIT," the Contractor shall revise said submittal and shall resubmit three (3) copies of said revised submittal to the Architect/ Engineer.

- H. If one (1) copy of the submittal is returned to the Contractor marked "REJECTED," the Contractor shall revise said submittal and shall resubmit three (3) copies of said revised submittal to the Architect/ Engineer.
- I. If one (1) copy of the submittal is returned to the Contractor marked "SUBMIT SPECIFIED ITEM," the Contractor shall make another complete submittal of three (3) copies of the item required by the Specifications.
- J. Fabrication of an item shall not be commenced before the Architect/ Engineer has reviewed the pertinent submittals and returned copies to the Contractor marked either "NO EXCEPTIONS TAKEN," or "MAKE CORRECTIONS NOTED," unless allowed otherwise by the Architect/ Engineer. Revisions indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Drawings and Specifications and shall not be taken as the basis of claims for extra work.
- K. All Contractor submittals shall be carefully reviewed by an authorized representative of the Contractor prior to submission to the Architect/ Engineer. Each submittal shall be dated, signed and certified by the Contractor as being correct and in strict conformance with the Contract Drawings and the Specifications, unless approved otherwise by the Architect/ Engineer. Any variation from the specifications, if any, and a written explanation of the need for a change shall be noted on the submittal. Any non-certified submittals may be returned to the Contractor without action taken by the Architect/ Engineer, and any delays caused thereby shall be the total responsibility of the Contractor.
- L. The Architect/ Engineer's review of Contractor submittals shall not relieve the Contractor of the responsibility for the correctness of details and dimensions. The Contractor shall assume all responsibility and risk for any misfits due to any errors in Contractor-submitted submittals. Any fabrications or other work performed in advance of the receipt of approved submittals shall be entirely at the Contractor's risk and expense. The Contractor shall be responsible for the dimensions and the design of adequate connections and details.
- M. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8 <sup>1</sup>/<sub>2</sub>" x11" but no larger than 24" x 36".

#### 1.06 CONTRACTOR'S SCHEDULES

A. Contractor's construction schedule shall be prepared and submitted to the Architect/Engineer in accordance with the provisions of Section 01310.

#### 1.07 SUBMITTAL OF PROPOSED EQUIVALENT PRODUCTS

A. All materials, processes or equipment which are to be listed and provided shall comply with the General Conditions.

#### 1.08 <u>SAMPLES</u>

- A. Unless otherwise specified, whenever in the Specifications samples are required, the Contractor shall submit not less than one (1) sample of each such item or material to the Architect/ Engineer for approval at no additional cost to the Owner.
- B Samples, as required herein, shall be submitted for approval a minimum of fifteen (15) working days prior to ordering such material for delivery to the job site, and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the work.
- C. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Manufacturer's names for identification and submittal to the Architect/ Engineer for approval. Upon receiving approval of the Architect/ Engineer, one (1) set of the samples will be stamped and dated by the Architect/ Engineer and returned to the Contractor, one (1) set will be retained by the Architect/ Engineer, and one (1) set of samples shall remain at the job site until completion of the work.
- D. Unless otherwise specified, all colors and textures of specified items will be selected by the Owner from the Manufacturer's standard colors and standard product lines.

#### 1.09 SPECIAL JOB-SITE SUBMITTALS

- A. Hazardous Chemical Inventory:
  - In order to comply with the State of Washington's Hazard Communication Standard (Chapter 296-62-054 through 05427 WAC), the Owner requires the contractor to provide a complete inventory of all potentially hazardous chemicals which the Contractor (including sub-contractors) will bring into or produce at the work site. This inventory shall be submitted to the Owner and Architect/Engineer no later than three days prior to the chemicals arrival to the site. Specific information for each

chemical, in the form of Material Safety Data Sheets (MSDS), and the personal protective equipment required for working with the materials (respirators, special clothing, etc.) shall be included in the submittal.

- 2. The Contractor shall revise this information as necessary (i.e. when new chemicals are brought onto or produced at the worksite), with updates forwarded to the Owner and Architect/Engineer. A complete and accurate copy of this information shall be immediately available at the Contractor's worksite office for reference by Owner representatives and the Contractor's employees during the Contractor's working hours.
- 3. Submit MSDS information for all chemicals or hazardous materials. All chemicals and hazardous materials shall meet NIOSH Permissible Exposure Levels (P.E.L.) and OSHA Time Weighted Average (T.W.A.). All MSDS information shall be submitted in bound three ring binders and tabulated by specification section. A copy of all MSDS information shall be kept on the job site.

### 1.10 TECHNICAL MANUALS

- A. The Contractor shall furnish to the Architect/ Engineer three (3) identical sets of technical manuals when required. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, 3-ring. looseleaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches Manuals shall be furnished to the Architect/ Engineer within thirty (30) days of delivery of each item of equipment to the construction site, unless required otherwise by the Architect/ Engineer.
- B The technical manuals shall include the following for each item of mechanical and electrical equipment:
  - 1. Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.
  - 2. Lubrication schedules, including a list of acceptable lubricants from at least three (3) different major manufacturers whose products are locally available.
  - 3. Preventive maintenance procedures and schedules.
  - 4. Parts lists, by generic title and identification number, complete with exploded views of each assembly, including the weights of individual components weighing over

one hundred (100) pounds.

- 5. Disassembly and reassembly instructions.
- 6. Name and location of nearest supplier and spare pans warehouse.
- 7. Recommended troubleshooting and startup procedures.
- 8. Reproducible prints of the as-built diagrams, schematics, and installation drawings required under the electrical and instrumentation portions of these Specifications.

#### 1.11 SPARE PARTS LISTS

A. The Contractor shall furnish to the Architect/ Engineer three (3) identical sets of spare parts information for all mechanical, electrical and instrumentation equipment when required. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare pans which each Manufacturer recommends be maintained by the Owner in inventory at the plant site. Each Manufacturer or supplier shall indicate the name, address and telephone number of its nearest outlet of spare pans lists to the equipment numbers designated in the Specifications or on the Drawings. The spare parts lists shall be bound in standard size, 3-ring, looseleaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

#### 1.12 <u>RECORD DRAWINGS</u>

- A. The Contractor shall keep and maintain, at the job site, one (1) record set of Specifications, Addenda, Change Orders, modifications, full-size Contract Drawings and Shop Drawings. On these he shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated, or which were not indicated on the Contract Drawings. Said Record Drawings shall be supplemented by any detailed sketches as necessary or directed to indicate, fully, the work as actually constructed. These master Record Drawings of the Contractor's representation of as-built conditions, including all revisions made necessary by addenda, change orders, and the like, shall be maintained up-to-date during the progress of the work.
- B. In the case of those drawings which depict the detail requirement for equipment to be

assembled and wired in the factory, such as motor control centers and the like, the Record Drawings shall be updated by indicating those portions which are superseded by final Shop Drawings, and by including appropriate reference information describing the Shop Drawings by Manufacturer, drawing and revision numbers.

- C. Record Drawings shall be accessible to the Architect/ Engineer at all times during the construction period and shall be delivered to the Architect/ Engineer upon completion of the work.
- D. Requests for partial payments will not be approved if the Record Drawings are not kept current, and not until the completed Record Drawings, showing all variations between the work as actually constructed and as originally shown on the Contract Drawings or other Contract Documents, have been inspected by the Architect/ Engineer.
- E. Final payment will not be approved until the Contractor-prepared Record Drawings have been delivered to the Architect/ Engineer. Said up-to-date Record Drawings may be in the form of a set of prints with carefully plotted information overlaid in pencil.
- F. Upon completion of the work and prior to final acceptance, the Record Drawings shall be turned over to the Architect/Engineer for transmittal to the Owner. See specification Section 01700, "Project Closeout" for submittal requirements.

### 1.13 SUPERINTENDENT'S RESUME

A. If requested by the Architect/ Engineer and/or Owner, and prior to execution of the Agreement, the Contractor shall submit to the Architect/ Engineer the experience resume of the person who will be designated Construction Superintendent While this person shall serve at the pleasure of the Contractor, he shall be replaced on this project at the option of the Owner(s) upon five (5) days written notice.

### 1.14 PERMITS. LICENSES. AND CERTIFICATES

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

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#### END OF SECTION 01300

## PART I - GENERAL

### 1.01 SCOPE OF WORK

A. This section specifies reports and schedules when required by the Owner's Representative for planning and monitoring the progress of the work.

### 1.02 SUBMITTAL PROCEDURES

- A. Preliminary Schedule: Within ten (10) calendar days after receiving the Notice of Award, the Contractor shall furnish to the Architect/Engineer a preliminary schedule for the work showing his general plan for orderly completion of the work and showing in detail his planned mobilization of materials and equipment, sequence of early operations, and timing of procurement of materials and equipment. The Contractor shall assist the Architect/Engineer in reviewing and evaluating such schedule.
- B. Detailed Schedule: Within fifteen (15) calendar days after receiving the Notice to Proceed, the Contractor shall furnish to the Architect/Engineer a detailed schedule for orderly completion of the work showing his planned sequences of operations and the dates for commencement and completion of all important features of the work.
  - 1. The schedule shall be comprehensive, covering both activities at the site of the work and off-site activities such as design, procurement and fabrication. The schedule shall show the time allowed for testing and other required procedures prior to the work being put into operation. The schedule shall be orderly and realistic, and shall be revised as necessary to meet this requirement. The Contractor shall promptly advise the Architect/Engineer of any occurrence requiring substantial revision of the schedule and shall furnish a revised schedule within ten (10) calendar days after receipt.
  - 2. The detailed schedule and each revision thereof shall be subject to approval by the Architect/Engineer for conformity with the requirements of this section. The Contractor shall assist the Architect/Engineer in reviewing and evaluating each schedule furnished. Disapproved schedules will be returned to the Contractor, shall be revised by him to correct the defects noted, and shall be re-submitted to the Architect/Engineer within ten (10) calendar days after receipt.
- C. The Architect/Engineer may require the Contractor to modify any portions of the work schedule that become infeasible because of "activities behind schedule" or for any other valid reason. An activity that cannot be completed by its original latest completion date shall be deemed to be behind schedule.
- D. The Contractor shall submit three (3) copies of each schedule required.

## 1.03 <u>SCHEDULE MONITORING</u>

A. Not later than the fifth day of each calendar month, the Contractor shall provide a

copy of the construction schedule with notes thereon indicating the percentage of completion of each subdivision of the work on the last day of the previous month and the deviations from the schedule. Contract time extensions shall be incorporated into updated schedules, reflecting their effect at the time they occur.

## 1.04 <u>CHANGE ORDERS</u>

A. Upon approval of a change order, the approved change shall be reflected in the next submittal by the Contractor.

## 1.05 SPECIFIC ACTIVITY REQUIREMENTS

- A. General Categories: The construction schedule shall, as a minimum, be divided into the following general categories or similar items as approved by the Architect/Engineer:
  - 1. Mobilization
  - 2. Demolition
  - 3. Electrical Work
  - 4. Clean-up and Demobilization
- C. Construction Schedule: The construction schedule shall include for removing equipment or structures from operation.

DIVISION 1 GENERAL CONDITIONS SECTION 01400 QUALITY CONTROL Page 1

# PART I - GENERAL

## 1.01 SITE INVESTIGATION AND CONTROL

- A. The Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the work due to his failure to comply with this requirement.
- B. The Contractor shall inspect related and appurtenant work and shall report in writing to the Architect/ Engineer any conditions which will prevent proper completion of the work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair replacement caused by unsuitable conditions shall be performed by the Contractor at his expense.

## 1.02 **INSPECTION OF THE WORK**

- A. The work shall be conducted under the general observation of the Architect/ Engineer and shall be subject to inspection by representatives of the Architect/ Engineer acting on behalf of the Owner to insure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop or field inspection, as required. The Architect/ Engineer shall be permitted access to all parts of the work, including plants where materials and equipment are manufactured or fabricated. The Contractor shall at all times provide access to the work by representatives of any government agencies.
- B. The presence of the Architect/ Engineer or any inspector(s), however, shall not relieve the Contractor of the responsibility for the proper execution of the work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the Architect/ Engineer or any inspector(s).
- C. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no materials or articles shall be used in the work until they have been inspected and accepted by the Architect/ Engineer or his authorized representative. No work shall be backfilled, buried, cast in concrete, hidden or otherwise covered until it has been inspected by the Architect/ Engineer or his authorized representative. Any work so covered in the absence of inspection shall be subject to uncovering. Where un-inspected work cannot be uncovered, such as in concrete cast over reinforcing steel, all such work shall be subject to demolition, removal and reconstruction under proper inspection, and no additional payment or time for completion will be allowed therefore.

## 1.03 <u>TIME OF INSPECTION AND TESTS</u>

A. Samples and test specimens required under these Specifications shall be furnished and prepared for testing in ample time for the completion of the necessary tests and analyses before said articles or materials are to be used. The Contractor shall DIVISION 1 GENERAL CONDITIONS SECTION 01400 QUALITY CONTROL Page 2

furnish and prepare all required test specimens at his own expense. Except for compaction testing, performance of all required tests will be borne by the Contractor at no cost to the Owner.

B. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide or otherwise cover any work under the Contract, he shall notify the Architect/ Engineer not less than 24 hours in advance to request inspection before beginning any such work of covering. Failure of the Contractor to notify the Architect/ Engineer at least 24 in advance of any such inspections shall be reasonable cause for the Architect/ Engineer to order a sufficient delay in the Contractor's schedule to allow time for such inspections and any remedial or corrective work required; and all costs of such delays, including its effect upon other portions of the work, shall be borne by the Contractor.

## 1.04 SAMPLING AND TESTING

- A. When not otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered; however, the Owner reserves the right to use any generally-accepted system of inspection which, in the opinion of the Architect/ Engineer, will insure the Owner that the quality of the workmanship is in full accord with the Specifications.
- B. Any waiver of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a Performance Bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any technical or qualitative requirements of the Specifications.
- C. Notwithstanding the existence of such waiver, the Architect/ Engineer shall reserve the right to make independent investigations and test as specified in Paragraph 1.04 D, following; and upon failure of any portion of the work to meet any of the qualitative requirements of the Specifications, shall be reasonable cause for the Architect/ Engineer to require the removal or correction and reconstruction of any such work.
- D. In addition to any other inspection or quality assurance provisions that may be specified, the Architect/ Engineer shall have the right to independently select, test and analyze, at the expense of the Owner, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials so tested or analyzed; provided that wherever any portion of the work is discovered, as a result of such independent testing or investigation by the Architect/ Engineer, which fails to meet the requirements of the Specifications, all costs of such independent

## DIVISION 1 GENERAL CONDITIONS SECTION 01400 QUALITY CONTROL Page 3

inspection and investigation, and all costs of removal, correction, and reconstruction or repair of any such work shall be borne by the Contractor.

## 1.05 <u>RIGHT OF REJECTION</u>

- A. The Architect/ Engineer, acting for the Owner, shall have the right, at all times and places to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of these Specification, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the work at the site. If the Architect/ Engineer or inspector, through an oversight or otherwise, has accepted materials or work which are defective or which are contrary to the Specifications, such as material, no matter in what stage or condition of manufacture, delivery or erection, may be rejected by the Architect/ Engineer for the Owner.
- B. The Contractor shall promptly remove rejected articles or materials form the site of the work after notification of rejection.
- C. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the Contractor.

DIVISION 1 GENERAL CONDITIONS SECTION 01500 TEMPORARY FACILITIES Page 1

# PART I - GENERAL

## 1.01 CONTRACTOR'S PARTS AND EQUIPMENT

- A. General: It shall be the contractor's responsibility to provide parts and equipment that is adequate for the performance of the work under this Contract with in the time specified, at the Contractor's expense. All parts and equipment shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required work, and shall be subject to inspection and approval by the Architect/ Engineer at any time within the duration of the Contract. All work hereunder shall conform to the applicable requirements of the WISHA and OSHA Standards for Construction.
- B. Separate Contracts: Whenever portions of the work hereunder are let under separate contracts, all of the provisions of this section shall apply to each such prime contractor, including requirements for separate field offices and communications facilities.
- C. Construction Lighting: All work conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper work and to afford adequate facilities for inspection and safe working conditions.
- D. Construction Wiring: All wiring for temporary electric light and power shall be installed and maintained in first-class manner, and shall be securely fastened in place. All electrical facilities shall conform to the requirements of the WISHA and OSHA Safety and Health Standards for Construction.
- E. Separation of Circuits: Unless otherwise permitted by the Architect/ Engineer, circuits separate from lighting circuits shall be used for all power purposes.
- F. Fire Protection: The construction and all other parts of the work shall be connected with the Contractor's water supply system and shall be adequately protected against damage by fire hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the work, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The Contractor's fire protection program shall conform to the requirements of the WISHA and OSHA Standards for Construction.
- G. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.
- H. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated units on foundations adequate for normal loading.

- I. Temporary Toilet Units: Provide self-contained single occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material. Toilets shall conform to the requirements of the WISHA and OSHA Standards For Construction.
- J. First Aid supplies: Comply with governing regulations.
- K. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "ABC" fire extinguishers for temporary offices.

## 1.02 <u>UTILITIES</u>

- A. General
  - 1. Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
  - 2. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
  - 3. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
- B. Water Supply: Water for construction and testing purposes will be supplied to the Contractor at no cost from the existing potable water systems as necessary during the course of the work to the extent it is available from the existing water supply at the site. The Contractor shall install a backflow preventor at the connection to the existing system, if required. The Contractor shall not waste water.
- C. Removal of Water Connections: Before final acceptance of the work on the project, all temporary connections and piping installed by the Contractor shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the Architect/ Engineer and Owner.
- D. Power: The Contractor shall purchase from the local utility all necessary power required for his operation under this Contract, and shall provide and maintain all temporary power lines required to perform the work in a safe and satisfactory manner.
- E. Approval of Electrical Connections: All temporary connections for electricity shall be subject to approval of the Architect/ Engineer and Owner, and shall be removed in like manner at the Contractor's expense prior to final acceptance of the work.
- F. Telephone Services: The Contractor shall provide and maintain at all times during the progress of the work, at his own expense, not less than one (1) telephone in good working order, at his own field construction office. Each such

DIVISION 1 GENERAL CONDITIONS SECTION 01500 TEMPORARY FACILITIES Page 3

telephone shall be connected to an established exchange for toll service and with all other telephones utilized by the Contractor.

G. Telephone Use: The Contractor shall permit the Architect/ Engineer, the Owner, or their authorized representatives or employees free and unlimited use of said telephone facilities for all calls that do not involve published toll charges. Calls originated by the Architect/ Engineer, the Owner, their authorized representatives or employees which involve toll or message unit charges shall be billed to the Owner by the Contractor at the rates charged him by the telephone company.

## 1.03 <u>SAFETY</u>

General: Appropriate first aid facilities and supplies shall be kept and maintained by the Contractor at the site of the work. All persons within the construction area shall be required to wear protective helmets. In addition, all employees of the Contractor and his subcontractors shall be provided with, and required to use, personal protective and life saving equipment as set forth in the WISHA and OSHA Safety and Health Standards for Construction.

### 1.04 INSTALLATION GENERAL

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.
- C. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.
- D. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.
- E. At each telephone, post a list of important and emergency telephone numbers.
- F. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.
- G. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- H. Provide temporary heat required by construction activities, for curing or drying of completed installations or protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a
DIVISION 1 GENERAL CONDITIONS SECTION 01500 TEMPORARY FACILITIES Page 4

harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

- I. Provide insulated, weather tight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small meetings.
- J. Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.
- K. Provide containerized tap-dispenser bottled-water type drinking water units.
- L. Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.

# 1.05 BARRICADES WARNING SIGNS AND LIGHT

Comply with standards and code requirements for erection of structurally adequate temporary barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

# 1.06 SUPERVISION

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

# 1.07 MAINTENANCE

Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

# 1.08 TERMINATION AND REMOVAL

- A. Unless the Architect/ Engineer requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion.
- B. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
- C. Materials and facilities that constitute temporary facilities are property of the contractor. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction periods.
- D. Replace significantly worn parts and parts that have been subject to unusual operating conditions. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

# PART I - GENERAL

# 1.01 EXPLOSIVES AND BLASTING

The use of explosives shall not be allowed.

# 1.02 DUST ABATEMENT

The Contractor shall furnish all labor, equipment and means required and shall carry out effective measures wherever and as often as necessary to prevent his operation from producing dust. The Contractor shall be responsible for any damage resulting from any dust originating from his operations. The dust abatement measures shall be continued until the Contractor is relieved of further responsibility by the Architect/ Engineer.

# 1.03 <u>RUBBISH CONTROL</u>

During the progress of the work, the Contractor shall keep the site of the work and other areas used by him in a neat clean condition, and free from any accumulation of rubbish. The Contractor shall dispose of all rubbish and waste materials of any nature occurring at the work site, and shall establish regular intervals of collection and disposal of such materials and waste. He shall also keep his haul roads free from dirt, rubbish and unnecessary obstructions resulting from his operations. Equipment and material storage shall be confined to areas approved by the Owner. Disposal of all rubbish and surplus materials shall be off the site of construction, at the Contractor's expense, all in accordance with all applicable safety laws, and to the particular requirements of the WISHA and OSHA Safety and Health Standards for Construction.

# 1.04 <u>SANITATION</u>

The Contractor shall establish a regular collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor, or organic material wastes from any other source related to the Contractor's operations, shall be disposed of away from the site in a manner satisfactory to the Architect/ Engineer and in accordance with all laws and regulations pertaining thereto. Disposal of all such wastes shall be at the Contractor's expense. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80 degrees F (27 degrees C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner

# 1.05 <u>CHEMICALS</u>

A. All chemicals used during project construction or furnished for project operation, whether disinfectant, polymer, reactant or of other classifications, shall show approval of the U.S. Environmental Protection Agency and maintain Safety Data Sheets (SDS) for all materials contained on site and turned over to Owner. Use of all such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer. Use of all such chemicals and disposal DIVISION 1 GENERAL CONDITIONS SECTION 01560 ENVIRONMENTAL CONTROLS Page 2

of residues shall be in strict accordance with the printed instructions of the manufacturer.

B. See Specification Section 01300, Submittals for procedures for the use of chemicals or hazardous materials at the job site.

DIVISION 1 MATERIAL AND EQUIPMENT SECTION 01600 Page 1

#### PART I - GENERAL

#### 1.01 <u>SECTION INCLUDES</u>

- A. Products
- B. Transportation and handling
- C. Storage and protection
- D. Product options
- E. Substitutions

# 1.02 <u>RELATED SECTIONS</u>

- A. Instructions to respondent: Product options and substitution procedures.
- B. Section 01400 Quality Control: Product quality monitoring.

# 1.03 <u>PRODUCTS</u>

- A. Products: Means new material 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. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.

# 1.04 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurements, or damage.

# 1.05 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage and protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

#### DIVISION 1 MATERIAL AND EQUIPMENT SECTION 01600 Page 2

F. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

# 1.06 **PRODUCT OPTIONS**

- A. Products specified by reference standards or by description only; Any product meeting those standards or description.
- B. Products specified by naming one or more manufacturers with a provision for substitutions; submit a request for substitution for any manufacturer not named.

# 1.07 <u>SUBSTITUTIONS</u>

- A. Instructions to respondent: specify time restrictions for submitting requests for substitutions during the quoted period to requirements specified in this section.
- B. Substitutions after the quote, including during construction, may be <u>considered</u>.
  - When a product becomes unavailable through no fault of the Contractor, Or
  - 2. When the delivery of the specified product will adversely impact the construction schedule even if ordered with all possible haste.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. A request constitutes a representation that the respondent:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to Owner.
  - 4. Waives claim for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Owner for review or redesign services associated with retrieval by authorities.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittal, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Substitution submittal procedure:
  - 1. Submit 3 copies of request for substitution for consideration on the substitution request

form included at the end of this section. Limit each request to one proposed substitution.

- 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
- 3. The Owner will notify Contractor of decision to accept or reject request by returning one copy of the request form, if a self-addressed stamped envelope was submitted with the substitution request.
- 4. All requests for substitutions must be in owner's office five (5) working days before quote opening.

#### SPOKANE PUBLIC SCHOOLS SPOKANE, WASHINGTON LINWOOD ELEMENTARY SOLAR ADDITION

#### DIVISION 1 MATERIAL AND EQUIPMENT SECTION 01600 Page 1

#### SUBSTITUTION REQUEST FORM

ТО:				
PROJECT:				
SPECIFICATION ITEM:				
~				
Section	Page	Paragraph	Description	

Substitution approval is an acceptance of only the manufacturer and product for general conformance with the design concept reflected in the Contract Documents. The A/E has made no attempt to verify specific performance data, or to check the details of the proposed substitution as to special features, capacities, physical dimensions or code and/or regulatory compliance, all of which remain the responsibility of the person/entity submitting the proposed substitution.

#### The undersigned requests consideration of the following:

#### PROPOSED SUBSTITUTION:

Attached data includes product description, specifications, drawings, photographs, performance and test data, adequate for evaluation of the request; applicable portions of the data are clearly identified.

Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

#### The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

- 1. The proposed substitution does not affect dimensions shown on the Drawings.
- 2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitutions.
- 3. The proposed substitution will have no adverse affect on other trades, the construction schedule, or specified warranty requirements.
- 4. Maintenance and service parts will be **locally** available for the proposed substitution.

# The undersigned further certifies that the function, appearance, and quality of the proposed substitution are *equivalent or superior* to the specified item.

The undersigned agrees, that, if this page is reproduced, the terms and conditions for substitutions found in the Bidding Documents apply to this request.

Submitted by:

Name (Printed)	-
	For use by the A/E:
Signature	
Firm Nama	Accepted Accepted as noted
Film Name	□ Not Accepted □ Received too late
Address	
City, State, Zip	By
Date	Date
Telephone	Remarks

DIVISION 1 GENERAL CONDITIONS SECTION 01700 PROJECT CLOSEOUT Page 1

# PART I - GENERAL

#### 1.01 <u>GENERAL</u>

This Section specifies administrative and procedural requirements for Project Closeout.

A. See General Conditions for project Closeout requirements.

#### 1.02 PRELIMINARY PROCEDURES

Before requesting inspection for certification of Substantial completion, complete the following (list exceptions in the request):

- 1. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
- 2. Release from all parties who are entitled to claims against the subject project, property or improvement pursuant to the provisions of law.
- 3. Advise Owner of pending insurance changeover requirements.
- 4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- 5. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
- 6. Submit record drawings, maintenance manuals, and similar final record information.
- 7. Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.
- 8. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- 9. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

#### 1.03 INSPECTION PROCEDURES

See General Conditions and Division 1 for final inspection requirements.

# 1.04 FINAL INSPECTION - ACCEPTANCE

See General Conditions for inspection procedures.

#### 1.05 <u>SETTLEMENT</u>

- A. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
- B. Submit an updated final statement, accounting for final additional changes to the Contract

DIVISION 1 GENERAL CONDITIONS SECTION 01700 PROJECT CLOSEOUT Page 2

Sum.

C. Submit a certified copy of the Architect/ Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect/ Engineer.

#### 1.06 RECORD DOCUMENT SUBMITTAL

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Owner's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

Prepare and submit the original and two (2) copies of record drawings at settlement.
 MAINTENANCE MANUALS (Operation and Maintenance Manuals "O&M's")

Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual binders. Mark appropriate identification on front of each binder. Submit two (3) copies of maintenance manuals for the Owner. Submit (3) copies of maintenance manuals for each school site in project.

# 1.08 FINAL CLEANING

1.07

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

- A. Complete the following cleaning operations before requesting inspection for Final Certificate.
  - 1. Remove labels that are not permanent labels.
  - Clean transparent materials, including mirrors and glass in doors and windows.
    Remove glazing compound and other substances that are noticeable vision obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
  - 3. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to

their original reflective condition. Leave concrete floors broom clean.

- 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
- 5. Clean the site, including landscape development areas, of rubbish, litter and foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

# 1.09 <u>REMOVAL OF PROTECTION</u>

Remove temporary protection and facilities installed for protection of the Work during construction.

# 1.10 <u>COMPLIANCE</u>

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

A. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

# 1.11 MAINTENANCE AND GUARANTEE

- A. The Contractor shall comply with the guarantee requirements contained in the General Conditions with regard to repairs or replacements.
- B. Replacement of Work, where it has settled below the required finish elevations, work that has fallen out of plumb, work that has lost adhesion or fasteners, work that has become discolored, deflected or disfigured shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the Contractor which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the Contractor shall have obtained a statement in writing from the affected private owner or public agency releasing the Owner from further responsibility in connection with such repair or resurfacing.
- C. The Contractor shall make all repairs and replacements promptly upon receipt of written order from the Owner. If the Contractor fails to make such repairs or replacement promptly, the Owner reserves the right to do the work, and the Contractor and his surety shall be liable to the Owner for the cost thereof.

DIVISION 1 GENERAL CONDITIONS SECTION 01700 PROJECT CLOSEOUT Page 4

D. The Contractor shall warrant all work for a period of one (1) year or as specified in all appropriate specification sections and the General Conditions of the Contract Documents.

# 1.12 <u>BOND</u>

A. If required, the Contractor shall provide a Bond to guarantee performance of the provisions contained in Paragraph 1.11 above and the General Conditions, Section 00600, "Bonds and Certificates.

DIVISION 1 GENERAL CONDITIONS SECTION 01740 WARRANTIES AND BONDS Page 1

# PART I - GENERAL

# 1.01 <u>GENERAL</u>

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.
- B. Refer to the General Conditions for terms of the Contractor's special warranty of workmanship and materials.
- C. General closeout requirements are included in Section 01700 "Project Closeout."

# 1.02 DISCLAIMERS AND LIMITATIONS

Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

# 1.03 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or re-building, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Submit written warranties to the Owner prior to the date of Settlement.

# ELECTRICAL CONTRACT SPECIFICATIONS DIVISIONS 26



03/17/2023

The Engineer's seal and signature affixed hereon is all inclusive for the full content of this portion of the document

#### PART 1 GENERAL

#### 1.1 CONDITIONS AND REQUIREMENTS

- A. Refer to instructions to bidders, general conditions, supplementary general conditions, and Division 1 of these specifications that govern work under Division 26. Refer to other sections of these specifications for additional related requirements.
- 1.2 SCOPE OF WORK
  - A. The work covered by the Electrical Section (Division 26) of the specifications shall include:
    - 1. Furnishing all materials and supplying all labor, equipment and services to install the electrical systems as shown on the accompanying drawings and specified herein.
    - 2. Testing and adjusting of the completed electrical systems in the manner described herein.

#### 1.3 CODES, PERMITS AND FEES

- A. Electrical work shall be in complete accordance with the latest revised edition of the following:
  - 1. National Electrical Code
  - 2. International Building Code
  - 3. International Mechanical Code
  - 4. International Fire Code
  - 5. Americans with Disabilities Act
  - 6. Electrical Safety Orders of the State Department of Labor and Industries
  - 7. Regulations of the State Fire Marshal
  - 8. Regulations of the State Board of Fire Underwriters
  - 9. Requirements of Washington State Industrial Safety and Health Administration (WISHA)
  - 10. Washington Administrative Code
  - 11. Applicable sections of other State and local codes
- B. In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Owner's Representative in writing of such differences.
- C. The Contractor, at their expense, shall obtain permits and inspections required for the electrical work on this project. Inspection certificates shall be included in the Operation and Maintenance Manuals. Deliver copies thereof to the Architect prior to final acceptance of the work.
- D. Contractor shall pay all costs levied by utility companies and/or governing agencies associated with electrical service, telephone service, and cable TV service connections and include these costs within their bid. This shall include but not limited to tap fees, service mains, meter and vault charges, etc.
- E. Comply with serving utility regulations.

#### 1.4 INTENT AND INTERPRETATIONS

- A. It is the intent of these specifications and the accompanying drawings to result in a complete electrical installation in complete accordance with all applicable codes and ordinances.
- B. The drawings and specifications are intended to supplement each other and any details contained in one and not the other shall be included as if contained in both. Items not specifically mentioned in the specifications or noted on the drawings, but which are necessary to properly complete the installation of the indicated systems or to render the systems operational, shall be provided, unless specifically excluded.
- C. In the event that any discrepancies of any kind exist, or that required items or details have been omitted, the Contractor shall notify the Architect in writing of such discrepancy or omission at least five (5) days prior to bid date. Failure to do so shall be construed as the willingness of the Contractor to supply all necessary materials and labor required for the proper completion of this work.

#### 1.5 **DEFINITIONS**

- A. The term "The Contractor", when used in Division 26 of the specifications, shall be construed to mean the Contractor for the electrical work.
- B. The term "Electrical Systems Installer", where used in Division 26 of the specifications, refers to the firm, licensed by the State to perform electrical installation, which is responsible for immediate supervision of electrical work on the project.
- C. The word "provide", where used in this specification and on the accompanying drawings, shall mean furnish and install.

#### 1.6 DRAWINGS

- A. The Electrical Drawings shall serve as the working drawings for the electrical work, but the Architectural Drawings shall take precedence over the Electrical Drawings if any dimensional discrepancies exist. The Electrical Systems Installer shall review the plans for the work of the other trades and shall adjust their work to conform to all conditions indicated thereon.
- B. Work covered under Division 26 has been indicated on the drawings in locations that should allow installation without interfering with the work of other trades; however, exact finish locations have not been indicated. Therefore, locations of all work and equipment shall be verified to avoid interferences, preserve headroom, provide access for maintenance and keep openings and passageways clear. Changes shall be made in locations of equipment and materials as required to accomplish these purposes without additional claims or charges by the Contractor.
- C. The locations of existing concealed lines and connection points have been indicated as closely as possible from available information. The Contractor shall assume that such connection points are within a 10 foot radius of the indicated location. Where connection points are not within this radius, the Contractor shall contact the Architect for a decision before proceeding or may proceed at their own expense.
- D. At the beginning of the work, the Contractor shall set aside one complete set of the drawings which shall be maintained as a complete Record Drawings set. The Record Drawings set shall

include one set of drawings for the facility conduit plan prepared by this Contractor as described in paragraph 2.4 below. Notations shall be done in a neat and legible manner as specified in Division 1 and in accordance with the Architect's instructions.

- 1. The record drawings shall be updated daily by the foreman to show every change from the original drawings and the exact locations, sizes and kinds of equipment. This set of drawings shall not be used for any other purpose and shall be maintained at the job site and available for review at any time.
- 2. Record drawings shall indicate actual size of electrical equipment routing of major raceway systems and location of control devices.
- 3. The actual location and elevation of all buried lines, boxes, monuments, stub-outs and other provisions for future connection shall be shown on the record drawings and shall be referenced to the building lines or approved bench marks.
- 4. Upon completion of the job, the Contractor shall deliver the record drawings marked-up to the Architect.
- E. By the act of submitting a bid, the Contractor shall be deemed to have:
  - 1. Examined the site and familiarize themselves with the conditions affecting the work. No additional allowance shall be granted because of lack of knowledge of such conditions.
  - 2. Verify all measurements at the building and acquaint themselves with the existing conditions before submitting their bid proposal.
  - 3. Examined all architectural, structural, mechanical and other applicable drawings.
  - 4. Become familiar with the electrical drawings and specifications.
  - 5. Developed an understanding of the electrical system requirements.
  - 6. Discussed the project with the Electrical System Installer and determine that he can successfully execute the electrical work.
  - 7. Accepted such conditions and included allowances for them in their bid.

#### 1.7 ELECTRICAL COST BREAKDOWN

- A. Refer to Division 01.
- B. The Contractor shall furnish to the Owner's Representative a breakdown of the electrical construction cost within thirty (30) days of notice to proceed. The breakdown shall be in general conformance with the following:
  - 1. Bonds, Permits, Fees
  - 2. Cartage, Rentals, Shack
  - 3. Supervision
  - 4. Demolition
  - 5. Utility Service Provisions
  - 6. Utility Service Labor
  - 7. Feeder Conduit and Wire
  - 8. Feeder Labor
  - 9. Branch Circuit Conduit and Wire
  - 10. Branch Circuit Labor
  - 11. Devices and Plates
  - 12. Trim Labor
  - 13. Switchboard(s)
  - 14. Switchgear Labor
  - 15. Disconnects and Miscellaneous Materials
  - 16. Equipment Connection Labor

- 17. Miscellaneous Systems
- 18. Miscellaneous Systems Labor

#### 1.8 TEMPORARY ELECTRICAL SERVICES

A. There is no requirement for temporary power on this project.

#### 1.9 PAYMENT REQUESTS

- A. Refer to Division 01.
- B. Payment requests for materials and equipment will not be reviewed or approved until shop drawings have been received and approved.

#### 1.10 GUARANTEE

A. The electrical equipment and installation shall be guaranteed for a period of one (1) year from date of acceptance unless an individual item or specification is otherwise noted as longer. The Contractor shall make good at their own expense all defects in their work, and/or equipment furnished by them, which shall develop at any time during the one year guarantee period and shall stand any expense of cutting and patching and repairing made necessary by their corrections of unsatisfactory work or equipment operation.

#### 1.11 ALTERNATES

A. See Division 01 for a list of alternates to bid for this project. Contractor shall include cost of their bid for complete working electrical system as described in the alternates and shown on the drawings.

#### PART 2 PRODUCTS

#### 2.1 MATERIALS AND EQUIPMENT

- A. Materials used under this Contract, unless specifically noted otherwise shall be delivered to the site new, in their original unbroken packages and shall be of the best quality of their respective kind and shall conform to the latest Standard Specifications of the American Society for Testing Materials, National Electrical Manufacturers' Association, National Board of Fire Underwriters or other appropriate agency. Standard items shall bear the stamp indicating listing by Underwriter's Laboratories, Inc. when such listing is available. Custom-designed items shall be fabricated of UL approved materials.
- B. Throughout these specifications various materials, equipment, apparatus, etc., are specified by manufacturer, brand name, type or catalog number. Such designations are to establish standards of desired quality and construction and shall be the basis of the bid.
- C. Substitutions will be allowed only as herein provided. No substitutions will be permitted without the Architect's written acceptance. Refer to Division 01 of these specifications for additional requirements.
  - 1. All prior acceptance submittals shall be accompanied by a transmittal letter indicating date, project name, product description/type, and deviations from contract documents if any.

- 2. Present complete photometric data as listed by an independent testing laboratory for all proposed luminaire substitutions. See additional requirements in Section 26 50 00.
- 3. Subject to the Architect's discretions certain items may be considered for substitution only after samples have been submitted for review.
- D. Contractors wishing to bid on equipment other than that listed shall obtain prior acceptance of same. Unless prior acceptance (By Addendum) is issued to all bidders, the Contractor will be held to furnish all items exactly as scheduled and/or specified.
- E. Unauthorized product substitution will be removed from the job site and replaced with the specified item at the Contractor's expense.

#### 2.2 EQUIPMENT/MATERIAL SUBSTITUTIONS

- A. Throughout these specifications and drawings, various materials, equipment, apparatus, etc., are specified or scheduled by manufacturer, brand name, type or catalog number. Such designation is to establish standards of desired quality and construction and shall be the basis of design and the bid.
- B. Substitutions will not be permitted without written approval
- C. Where two or more manufacturer designations are listed in these specifications, choice will be optional with the Contractor except that where more than one manufacturer is listed, and only one manufacturer's catalog number is specified or only one manufacturer scheduled on the drawings (basis of design) that standard of quality, dimensional characteristics, capacities, and construction shall be maintained by materials or equipment supplied by the other manufacturer(s).
- D. If the Division 26 Contractor uses manufacturers other than the basis of design, the Contractor shall be responsible for:
  - 1. Insuring the substituted item will fit the available space while allowing proper maintenance access.
  - 2. Any changes required by other Contractors caused by the substituted equipment.
- E. In the event other than specified equipment is used and will not fit job site conditions, this Contractor assumes responsibility for replacement with items indicated as the basis of design.
- F. See Division 01 for product prior approval requirements.

#### 2.3 OWNER FURNISHED EQUIPMENT AND MATERIALS

A. The Contractor shall accept and become responsible for all Owner furnished equipment and materials. Inspect all equipment and materials to determine suitability for installation. Immediately notify the Owner of any defects or deficiencies. Failure to so notify the Owner shall mean that the Contractor warrants that all equipment and materials are of the proper quantity, design and are free from all defects. Properly store all equipment and materials.

#### 2.4 SUBMITTALS FOR REVIEW

- A. Shop Drawings
  - 1. Refer to Division 01.

- 2. Shop drawings, catalog information and material schedules shall be submitted for approval on all materials and equipment prior to ordering. This applies to all specified material and equipment in Division 26.
- 3. Provide specific wiring diagrams for all equipment requiring electrical or control wiring. Upon approval, copies of these diagrams shall be forwarded to pertinent contractors.
- 4. Prior to construction, a facility conduit plan shall be submitted for review showing the routing of all conduits and the mounting of the conduits, (e.g. below grade, concealed, surface mounted, etc.), the locations of all junction boxes, and the devices or equipment the conduits serve and where the conduits are terminated. Shop drawing submittal shall be the same size as the contract documents and shall show the floorplan scaled at 1/8 inch = 1 foot.
- 5. Shop drawing shall be generated using a computer aided drafting program; as-built drawings and .DWG or .DXF files of the facility conduit plan shall be delivered to the Architect. CAD floorplans of the contract documents will be provided by the Owner's representative on a thumb-drive or transmitted electronically to the Electrical Contractor in .DWG format only after completion of an "Consent for the Release of Electronic Files" (forwarded by the Owner's representative on request).
- B. Electronic submittals in lieu of hardcopies are preferred and subject to all of the following conditions. Electronic submittals which do not comply with all of these conditions will be rejected.
  - 1. Electronic submittals shall be submitted in the current version of Adobe Portable Document Format (PDF)
  - 2. Submittals shall be original PDF's of the document and shall not be created using scanned copies of paper documents.
  - 3. PDF documents shall be searchable.
  - 4. Optical character recognition (OCR) shall be run prior to transmission to ensure all text appears as text and not an image.
  - 5. Electronic submittals shall be separated by specification section and identified as such. Submittals which combine multiple sections into a single document will be rejected.
  - 6. Electronic submittals shall include a table of contents and each applicable section shall be bookmarked for easy access.
  - 7. Electronic submittals shall be clearly marked in RED using boxes and arrows and other appropriate markings to indicate specific product information, option selections, accessories, etc.
  - 8. Only information relevant to this project shall be included with the submittals. Irrelevant or extraneous product information shall be identified and removed from documents prior to submitting.
- C. Furnish complete shop drawing/catalog data for equipment and materials to be used in the work for review. Allow sufficient time for developing shop drawings, processing and review time so that the installation will not be delayed.
- D. Shop drawings shall be reviewed, approved and stamped by Contractor prior to submitting to Owner's Representative for approval. Submittals without such approval will be returned without review.
- E. Submit data in accordance with Division 1 and in accordance with this section. Data shall be black and white, on 8½×11 inch or 11×17 inch, single, one-sided sheets suitable for copying. Diagrams and drawings larger than 8½×11 inch shall be accordion folded to fit in a three ring

binder. Drawings and catalog data must be clean, neat copies. FAX material or other poor quality copies will not be acceptable.

- F. Submittals shall be bound in a black 3-ring binder with the project name on the cover. Provide index tabs for each specification section in same order and using same name as appears in the Specifications.
- G. Where choices of options and accessories are available or specified, provide written description of what is to be furnished. If necessary, list page numbers where submitted items are described.
- H. Underline applicable data.
- I. If material or equipment is not as specified or submittal is not complete, it will be rejected. Only complete submittal including all applicable specification sections will be reviewed.
- J. Catalog data or shop drawings for equipment that are noted as being reviewed shall not supersede Contract Documents.
- K. Review comments shall not relieve Contractor from responsibility for deviations from Contract Documents unless attention has been called to such deviations in writing at time of submission, nor shall they relieve this Contractor from responsibility for errors in items submitted.
- L. Check work described by catalog data with Contract Documents for deviations and errors.
- M. Submit four (4) copies of each shop drawing. The Engineer will retain one stamped copy, one will be provided to the Architect and a two stamped and reviewed copies will be returned to the Contractor. The Contractor shall be responsible for distribution of required number of reviewed copies to parties other than the Owner's Representative(s).

#### PART 3 EXECUTION

#### 3.1 GENERAL

- A. Workmanship shall be of first quality throughout and shall be in complete accordance with the applicable codes.
- B. Locations and heights of all wall and ceiling mounted devices to be confirmed with Owner in field prior to installation of raceways and boxes.
- C. Surface mounted boxes or surface mounted raceways is not permitted in finished spaces or at building exterior. This includes CMU block walls where present. Contractor shall coordinate installation of pathways and device boxes with other trades during construction of CMU block walls.

#### 3.2 SCHEDULING

A. This Contractor is advised that the work on this project is phased to suit the requirements of the Owner. During construction, it may be necessary to make temporary connections or installations to accommodate the phased nature of the work. Some work may need to be installed and then reinstalled in order to satisfy the operational requirements of the Owner.

Power changeover for existing loads shall be made in the smallest possible increments with branch circuit by branch circuit re-connection required wherever possible.

- B. The controlling issue governing the work described under Division 26 shall be: DE-ENERGIZING OF ANY FEEDER, SWITCHBOARD, PANEL, BRANCH CIRCUIT OR OTHER EXISTING ELECTRICAL DEVICE OR ITEM SHALL BE AFFECTED ONLY AFTER NOTIFICATION AND SCHEDULING WITH THE OWNER'S PROJECT COORDINATOR.
- C. The Contractor shall prepare written proposed schedules for all systems, feeders, panels and branch circuits to be de-energized and submit same to the Owner's Project Coordinator fourteen (14) days in advance of the first schedule item for acceptance. Schedules shall include at least the following:
  - 1. Specific load to be de-energized
  - 2. Proposed date and time to be de-energized and re-energized
  - 3. Backup plan should an emergency occur during the outage period (for critical loads)
- D. Schedules proposed by the Contractor are subject to adjustment by the Owner.
- E. The Contractor is advised that the above notification and scheduling requirement may necessitate rescheduling, partial completion and re-connection, overtime work at night or on weekends or delay of the work. Contractor costs incurred due to the above shall be included in the original bid price and shall not be the cause for additional claims or charges to the Owner.
- F. Remove any abandoned cable/wire related to project work.
- G. Work on the project shall be performed to suit the requirements of the Owner in regard to the school facility's educational process.
- H. De-energizing of any feeder, switchboard, panel, branch circuit or other existing electrical device or item shall be affected only after notification and scheduling with the owner's project coordinator.
- I. The above notification and scheduling requirement may necessitate rescheduling, partial completion and reconnection, overtime work at night or on weekends or delay of the work.
- J. Cutting of concrete or other building materials shall be avoided where possible.
- K. Holes through concrete or masonry shall be made only with a core drill unless pre-approved by Owner.
- L. No penetrations into concrete beams with internal pre-stressed cable design or concrete floor slabs with pre-stressed cabling will be allowed without prior written analysis by a structural engineer.
- M. All penetrations through building roofing shall be flashed by a qualified roofing contractor normally in the business of commercial roofing. Flashing shall be in accordance with NRCA standard practices.
- N. Prevent spillage during hauling operations. In case of spills (including trenching materials)

- O. Clean streets, walkways, courtyards, etc. by means of proper sweepers or other approved methods.
- P. School dumpsters shall not be used by the Contractor.

#### 3.3 COORDINATION, INSERTS AND OPENINGS

- A. This installation requires extensive interfacing. It is the responsibility of the Contractor to clarify any questions or discrepancies with the Architect and to ascertain and verify installation conditions about which he is unsure prior to commencing work. Further, during the entire construction period, coordinate, verify and confirm that related work by other trades is done in a manner that will not complicate or compound the electrical systems work.
- B. Locations of devices, outlets, fixtures, equipment, etc. as shown on the drawings are approximate unless dimensioned. Exact locations of such items shall be determined by the Architect's representative or secured from special details and drawings. The Contractor shall insure that no switches or other electric control devices are mounted such that they are trapped behind opened doors or otherwise rendered inaccessible.
- C. Obtain rough-in and connection dimensions as required for power, control and grounding connections to equipment items that require electrical connection.
- D. Verify the physical dimensions of each item of electrical equipment to fit the available space and promptly notify the Architect/Engineer prior to roughing-in, if conflicts appear. Coordination of equipment to the available space and to the access routes through the construction shall be the Contractor's responsibility.
- E. Provide inserts for hangers, brackets, clamps, etc. as required to support boxes, raceways, cables, fixtures, equipment, etc. Coordinate location and routing to avoid interference with work of other trades. Method of insert placement shall suit the type of construction into which the inserts are to be installed.
- F. Furnish and install sleeves and block-outs required for openings in the structure needed to install the electrical work. The responsibility for proper placement of sleeves and block-outs shall be with the Contractor.
- G. Openings for electrical work shall be carefully caulked or grouted as required. Spare conduits shall be tightly capped.
- H. All roof and exterior wall penetrations shall be flashed and counter-flashed watertight. Caulking shall be equal to General Electric silicone construction sealants.

# 3.4 CUTTING AND PATCHING

- A. Cutting of concrete or other building materials shall be avoided where possible. The Contractor shall have a workman present at the pouring of concrete and at the building of any masonry that contains electrical work.
- B. All cutting and patching of new and existing construction required for the installation of systems and equipment specified in Division 26 shall be the responsibility of the Division 26 Contractor. All cutting shall be accomplished with masonry saws, drills or similar equipment to provide neat uniform openings.

- C. Patch and repair walls, floors, ceilings, and roof with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials. All patching shall meet the approval of the Owner's Representative.
- D. All cutting and patching made necessary to repair defective equipment, defective workmanship or by neglect of this Contractor to properly anticipate their requirements shall be included in Division 26.
- E. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses or other structural members without the Owner Representative's written approval.
- F. Cutting, patching, repairing, and replacing pavement, sidewalks, roads, and curbs to permit installation of work specified or indicated under this Division is responsibility of Division 26.

#### 3.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. See Section Division 01 for additional requirements.
- B. Follow manufacturer's directions in delivery, storage, protection, and installation of equipment and materials.
- C. Promptly notify Owner's Representative in writing of conflicts between requirements of Contract Documents and manufacturer's directions and obtain written instructions from Owner's Representative before proceeding with work. Contractor shall bear expenses arising from correcting deficiencies of work that do not comply with manufacturer's directions or such written instructions from Owner's Representative.
- D. Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in a dry, heated space.
- E. Notify Owner of equipment delivery dates, twenty-four (24) hours in advance of delivery.
- F. The Contractor shall be responsible for protection of equipment furnished in this Division from vandalism and weather during all phases of construction. Damaged equipment shall be restored to like new condition or replaced at the Contractor's expense.
- G. Any factory painted equipment scratched or marred during shipment or construction shall be restored to original "new" condition. This includes complete repainting if necessary to provide exact paint match.

#### 3.6 EXCAVATION AND BACKFILL

- A. The Contractor shall include in their bid the complete excavation and backfill cost required to install the electrical work as specified under Division 26 of this specification and that of the utilities affecting the electrical work. Contractor shall provide all necessary excavation, shoring and backfilling required for the proper installation of their work, whether inside building and premises, or outside as may be necessary.
- B. Locate existing underground utilities in excavation areas. If utilities are indicated to remain, support and protect services during excavation operations.

- C. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.
- D. Dewater: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
  - 1. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.
  - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- E. No underground lines shall be covered until the installation has been viewed by inspectors having jurisdiction and the Engineer. Trenches near or under footings or utility tunnels shall be cut only after approval of the Architect/ Engineer. Backfilling of such trenches shall be in accordance with Architect/Engineer's directions.
- F. Grading which will in any manner affect the bearing capacity of the soil foundation upon which will be placed floor slabs, walls, columns, footings, pipe beds, and external backfill under paved areas shall be performed in accordance with the requirements in Division 02 and the following specifications:
  - 1. Compaction testing shall conform to ASTM 1557 modified proctor.
  - 2. Compact to:
    - a. 95 % density for fills under all interior and exterior concrete slabs, in all streets, and where lines are buried 10 feet or more.
    - b. 90 % density elsewhere.
- G. Approved site material not containing rocks in excess of 4 inch diameter may be used for compacted backfill in amounts available. Additional approved backfill materials shall be furnished by the Contractor. No cinders shall be used for backfill material.
- H. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- I. Compact carefully against foundation, basement and retaining walls so as not to create excessive pressure on walls. Backfilling shall be compacted in 8 inch maximum lifts.
- J. Excess earth shall be removed from the site and disposed of by the Contractor at their expense.
- K. Prevent spillage during hauling operations. In case of spills, clean streets by means of proper sweepers or other approved methods.
- L. Protect adjoining properties, existing sidewalks and other improvements that remain. If damaged, repair or replace as directed by the Architect.
- M. Proper approvals shall be obtained in accordance with applicable City, County and/or State regulations.
- N. All safety regulations must be observed.

O. Where subsidence occurs at electrical installation excavations during the period twelve (12) months after project completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

# 3.7 PROTECTION AND CLEANING

- A. The Contractor shall provide adequate means for protection and shall fully protect all material and equipment against damage from any causes during the progress of the work and until approval by the Architect.
- B. All material and equipment, both when in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred or splattered with plaster or paint, and all electrical conductors, buses and connections, electronic components and moving parts shall be kept clean and dry.
- C. All damaged material or equipment, including face plates of panels and switchboard sections, shall be replaced or refinished by the manufacturer at no additional expense to the Owner.
- D. During the progress of the work, the Contractor shall clean up after their workers and shall leave the premises and all portions of the building in which he is working free from their debris.
- E. Provide and maintain suitable barriers, protective devices, lights and warning signs where required for protection of the public and employees about the building and site.

#### 3.8 PAINTING

- A. No painting is included in Division 26 except as specifically called for.
- B. Where exposed electrical raceways and equipment are to be painted, schedule work to insure that such electrical items are installed prior to painting or that items installed afterward are painted later to match the original finishes.
- C. Protect latches on panelboard covers, wiring devices, device faceplates, clocks, and other electrical devices against accidental painting.
- D. Protect nameplates and labels on electrical equipment from being obscured by paint.

#### 3.9 VISITING THE PROJECT SITE

- A. Examine premises and understand the conditions that may affect performance of work of this Division before submitting proposals for this work.
- B. No subsequent allowance for time or money will be considered for any consequence related to failure to examine existing site conditions.

#### 3.10 TESTS

A. See individual specification sections for Testing Requirements.

#### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Operation and Maintenance Manual
- B. Operation and Maintenance Training/Startup
- C. Spare Parts/Maintenance Materials
- D. Warranties
- E. Final Cleaning
- F. Record Drawings
- G. Punch List Procedures
- H. Maintenance Services

#### 1.2 RELATED SECTIONS

- A. Refer to Division 01 Contract Closeout
- B. Section 26 01 01 Basic Electrical Requirements
- 1.3 OPERATION AND MAINTENANCE MANUAL
  - A. Bind Operation and Maintenance Manual for Electrical Systems in a black three-post, hardbacked binder with the job title, date, Engineer, Architect and Contractor names.
    - 1. Provide a master index at the beginning of Manual showing items included. Use plastic index tabs for each section of the Manual.
    - 2. First section shall consist of name, address, and phone number of Architect, Mechanical and Electrical Engineers, General Contractor, and Electrical Contractors.
    - 3. Provide a separate section for each section of the specifications. Provide index for each section listing equipment included.
  - B. Operation and Maintenance Manual may also be submitted in electronic format with the same requirements as those listed above but with bookmarking in leu of the plastic index tabs for each section of the Manual.
  - C. Product literature, catalog cuts, etc. shall be clean copies. FAX or other poor quality prints will not be acceptable.
  - D. Submit one (1) copy of Operation and Maintenance Manual to Owner's Representative for review. After this review and final approval of the manuals, prepare two (2) copies of approved manuals for use during the instruction period. Following instruction period, turn over both copies to the Owner.
  - E. In general, the following shall be included in the Operation and Maintenance Manual for each electrical equipment item:

- 1. List of electrical equipment used indicating name, model, serial number, and name plate data of each item together with number and name associated with each system item as indicated on the drawings.
- 2. Manufacturer's maintenance instructions: Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
- 3. Step-by-step procedure to follow in putting each piece of electrical equipment into operation
- 4. Wiring diagram for particular equipment item
- 5. Refer to individual specification sections for additional information required to be incorporated into the Operation and Maintenance Manual.
- F. Include the following additional items in the O&M Manual:
  - 1. Summary list of spare equipment parts furnished under this contract
  - 2. Test Records of feeders, transformers, circuit breakers, telephone/data wiring, etc.
  - 3. Signed checklist of Instruction Period
  - 4. Copies of specific product Warranties.
  - 5. Copies of Startup Reports for:
    - a. Engine/Generators
      - b. Motor Starters
  - 6. Electrical identification schedules
  - 7. Copies of manual describing specific maintenance services that will be furnished

#### 1.4 OPERATION AND MAINTENANCE TRAINING/STARTUP

- A. Upon completion of the work, the Contractor shall assemble the Electrical Systems Installer and any subcontractors together with factory representatives for system start-up and demonstration. These people shall assist in start-up and check out each system and remain at the site until the total electrical system operation is acceptable and understood by the Owner's designated maintenance and/or operation personnel. The Electrical System Installer or a subcontractor or factory representative designated by them shall also give personal instructions on operation and maintenance of the electrical equipment to the Owner's maintenance and/or operation personnel.
- B. Provide a videotape of the training sessions conducted and furnish copies of the tape to the Owner and Engineer. A professional shall tape training sessions to provide a quality video that the Owner can use to train future employees or refresh their operating personnel in the system operation and maintenance. Use VHS format.
- C. To prove acceptance of operation and instruction by the Owner's representative, the Contractor shall prepare a written statement of approval detailing it for their signature. The statement shall read as follows:

"I, the Contractor, together with the Electrical Systems Installer and the associated factory representatives, have started each system and the total electrical system, and have demonstrated their normal operation to the Owner's representative and have instructed them in the operation and maintenance thereof."

Owner's Representative

Contractor

Electrical System	Demonstrated By/Witnessed By	Instruction Time Allotment	Date
Division 26 – Photovoltaic Arrays	/	7.0 hrs.	
Demonstrate Operation and Instruct Owner in Maintenance of General Electrical System	/	1.0 hrs.	
Written Guarantee Received	/		
O&M Manuals Received	/		
As-Built Drawings Received	/		

#### 1.5 SPARE PARTS/MAINTENANCE MATERIALS

- A. Provide summarized list of spare parts that are to be furnished. Incorporate into O&M Manual.
- B. Refer to individual specification sections for spare parts to be furnished under this contract.
- C. Turn spare parts and materials over to Owner.

#### 1.6 WARRANTIES/GUARANTEES

- A. The Contractor shall guarantee all work to be free from defects in material and workmanship for a period of one (1) year. See General Conditions for beginning of guarantee period. The Contractor shall make good at their own expense all defects in their work and/or equipment furnished by them, which shall develop at any time during the one (1) year guarantee period and shall stand any expense of cutting and patching and repairing made necessary to correct unsatisfactory work or equipment operation.
- B. Exceptions incandescent lamps shall be guaranteed for a period of one month.
- C. Manufacturer's warrantee certificates shall be included in the Operation & Maintenance Manuals for equipment that is warranted by the manufacturer for a period greater than one year.

#### 1.7 CLEAN-UP

- A. Clean up all equipment, materials, cartons and other debris that is a direct result of the installation of equipment under this contract.
- B. Clean exposed conduits, equipment, and fixtures. Repair damaged finishes and leave everything in working order.
- C. Remove stickers from fixtures and electrical equipment.

#### 1.8 RECORD DRAWINGS

A. Record differences, between electrical work as installed and as shown in Contract Documents, on a set of prints of electrical drawings to be furnished by Owner's Representative. Return these prints to Owner's Representative at completion of Project. Notations made on drawings shall be neat and legible. These drawings shall not be used for any other purposes.

B. Refer to individual specification sections for additional requirements.

#### 1.9 PUNCH LIST PROCEDURES

- A. The Contractor shall notify the Owner's Representative in writing when the project is ready for punch lists. After punch lists are complete, written notice must be forwarded to the Owner's Representative requesting final checkout. Any additional trips by the Engineer to the site for punch list verification that become necessary due to items on previous punch lists that have not been completed at the time of the final checkout will be billed to the Contractor at normal rate plus travel expenses.
- B. At the time of punch list and final project checkout, the project foreman shall accompany the Engineer and remove coverplates, panel covers and other access panels to allow complete review of the entire electrical systems.

# 1.10 MAINTENANCE SERVICES

A. Provide separate manual describing specific maintenance services to be provided as required under specific specification sections.

#### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Building wire and cable
- B. Service entrance cable
- C. Wiring connectors and connections
- 1.2 RELATED SECTIONS
  - A. Section 26 05 53 Electrical Identification

#### 1.3 REFERENCES

- A. NECA Standard of Installation (National Electrical Contractors Association)
- B. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association)
- C. NFPA 70 National Electrical Code

# 1.4 SUBMITTALS FOR REVIEW

A. Product Data: Submit information covering every type of wire or cable to be provided on the project.

#### 1.5 PROJECT CONDITIONS

- A. Verify that field measurements are as indicated.
- B. Conductor sizes are based on copper, unless noted otherwise.
- C. Wire and cable routing indicated is approximate unless dimensioned.

#### 1.6 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

#### PART 2 PRODUCTS

#### 2.1 BUILDING WIRE

- A. Manufacturers: Conductors shall be as manufactured by:
  - 1. American Insulated
  - 2. Cerro
  - 3. Encore
  - 4. Essex
  - 5. Houston
  - 6. Southwire

- B. Wire and cable shall be copper single conductor type with 600 volt insulation, unless otherwise indicated.
- C. Copper conductors shall be soft drawn, minimum 98 % conductivity.
- D. Aluminum conductors are <u>only</u> permitted as follows:
  - 1. For building service conductors from the transformer secondary to the building main service disconnect. Refer to the drawings for additional information.
  - 2. For building feeders in conduit rated 100 Amps and larger. Refer to the drawings for additional information.
- E. Grounding conductors shall be copper in all cases, no exceptions.
- F. #10 & #12 wire shall be solid with type THHN insulation. Larger wire shall be stranded with type THW or THWN insulation.
  - 1. Exception: Provide stranded wire (#12 and larger) for connections from outdoor condensing unit to associated indoor unit.
- G. Outer jackets of conductors shall be color coded as follows:
  - 1. 120/208 volt circuits.
    - a. Phase A-Black
    - b. Phase B-Red
    - c. Phase C-Blue
    - d. Neutral-White
  - 2. 277/480 volt circuits
    - a. Phase A-Brown
    - b. Phase B-Orange
    - c. Phase C-Yellow
    - d. Neutral-Gray
  - 3. Insulated ground wires-Green.
  - 4. Lighting Controls & Occupancy Sensors: Orange.
  - 5. Security Systems: Yellow.
  - 6. Intercom: Gray.
  - 7. On large conductors, for which color coded jackets are not available, install bands of adhesive non-fading colored tape or slip-on bands of colored plastic tubing over the cables and wires at their terminations and in the vaults, wireways, junction boxes and outlet boxes. In vaults and wireways, install the color coding at each end of the wireway and at approximately 3 foot intervals within the vault or wireway.
  - 8. Materials used for identification shall be colorfast and shall withstand cleaning. Colors used shall be the same as specified for outer jackets.
- H. The use of MC-type or AC-type cable in not permitted.

#### PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Verify that interior of building has been protected from weather.
  - B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

# 3.2 INSTALLATION IN RACEWAYS

- A. Wire and cable shall be run in metal raceways, except where plastic conduit has been specifically approved. Pull all conductors into raceway at same time.
- B. Branch circuit runs are shown schematically. Except where exact routing is indicated, branch circuit home runs may be grouped and the actual routing of branch circuit conduits may be determined at the site and properly entered on the As-built drawings.
- C. Use solid conductor for feeders and branch circuits 12 AWG and smaller.
- D. Use stranded conductors for control circuits.
- E. Use conductor not smaller than 12 AWG for power and lighting circuits.
- F. Use conductor not smaller than 14 AWG for signal and control circuits, except as indicated.
- G. Use 10 AWG conductors for the entire length of the branch circuit for 20 ampere, 120 volt branch circuits longer than 100 feet.
- H. Use 10 AWG conductors for the entire length of the branch circuit for 20 ampere, 277 volt branch circuits longer than 200 feet.
- I. Use 10 AWG conductors for all exterior lighting circuits.
- J. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- K. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- L. Where more than three current carrying conductors are installed in a single raceway, the minimum wire size shall be increased to provide allowable load current of 100 % of the overcurrent device in accordance with National Electrical Code, Table 310-15(b)(2)(a).
- M. All splices shall be made in properly sized junction/pull boxes. Splices within homeruns is not permitted.
- N. Service entrance and feeder conductors shall be installed without splices.
- O. Except where sizes are indicated on the drawings, the following schedule shall be adhered to:

Circuit Overcurrent	Conductor
Device Rating	Sizes
20 amperes or less	#12
25 or 30 amperes	#10
35 or 40 amperes	#8
45 or 50 amperes	#6
60 or 70 amperes	#4
80 or 90 amperes	#2
100 or 110 amperes	#1
125 or 150 amperes	#1/0

- P. Where ambient temperatures are within 50 °F of the maximum allowable operating temperatures of the insulation of a conductor, provide conductors with insulation of higher temperature rating suitable for the temperature to be encountered.
- Q. Identify and color code all wire and cable as specified above. Identify each conductor with its circuit number or other designation indicated.
- R. Provide dedicated neutrals for all branch circuits.

#### 3.3 WIRING CONNECTIONS AND TERMINATIONS

- A. The use of molded connectors with metal thread-on core is restricted to splices in wire #10 and smaller. Splices made in conductors larger than #10 shall be made with Compression type connectors, smoothed out with insulating putty, and thoroughly taped with Scotch #33 or approved equal electrical tape.
- B. Clean conductor surfaces before installing lugs and connectors.
- C. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- D. Re-tighten all bolt type connections twenty-four (24) to forty-eight (48) hours after installation and before taping. All bolt type connections to bus-bars shall employ spring loaded Belleville washers.
- E. All cables shall extend between outlets with complete electrical continuity and without any shorts or grounds. Cables shall be uninterrupted and un-spliced.
- F. Cables shall be routed so as to maintain a separation of at least 2 feet from all heat sources and from ballasts, transformers, dimmers and all other sources of electromagnetic interference. Avoid cables in areas where they may be damaged as a result of normal use of the area.
- G. Cable run in ceiling cavities shall not lie upon the ceiling or be supported from ceiling suspension wires or from conduits or pipes, but shall be suspended from the building structural elements using cable ties.
- H. Care shall be exercised during installation not to damage the cable insulation. Damaged cables shall be removed and replaced.
- I. Stranded conductors shall not be connected directly to wiring devices. Where such connections are to be made, insulated solid copper wire "tails" shall be spliced to the stranded conductors in the outlet box.
- J. Molded connectors with metal thread-on core shall be used for splicing #12 and #10 wire.
- K. For #8 and larger conductors, splicing of the copper conductors (both power and ground conductors) shall be made only with tool applied compression (swaged) fittings, listed for the use and insulated with shrink type insulation. Provide new pull box at interception point for termination of wiring. All splices shall be made within the pull box.
- L. Stranded cable shall be connected to lugs using mechanical connectors and shall be wrapped with electrical tape to a thickness equal to the wire insulation connecting block.

#### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

A. Electrical connections to equipment

#### 1.2 RELATED SECTIONS

- A. Section 26 05 19 Building Wire and Cable
- B. Section 26 05 30 Conduit
- C. Section 26 05 32 Boxes

#### 1.3 REFERENCES

- A. NEMA WD 1 General Purpose Wiring Devices
- B. NEMA WD 6 Wiring Devices Dimensional Requirements
- C. NFPA 70 National Electrical Code

#### 1.4 SUBMITTALS FOR REVIEW

A. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

#### 1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

#### 1.6 COORDINATION

- A. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- B. Determine connection locations and requirements.
- C. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- D. Sequence electrical connections to coordinate with start-up of equipment.

# PART 2 PRODUCTS

- 2.1 CORDS AND CAPS
  - A. Manufacturers: Leviton, Bryant, Hubbell, Pass & Seymour, and Arrow-Hart.
  - B. Attachment Plug Construction: Conform to NEMA WD 1.

- C. Configuration: NEMA WD 6, UL 498, heavy duty nylon construction with external cord clamp and dead-front construction, with rating and NEMA configuration molded on the device. Match receptacle configuration at outlet provided for equipment.
- D. Cord Construction: NFPA 70, Type SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- E. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

#### PART 3 EXECUTION

#### 3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

#### 3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquid-tight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide cord and cap where field-supplied attachment plug is required.
- E. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- G. Install terminal block jumpers to complete equipment wiring requirements.
- H. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- I. Provide final connection of all equipment items as scheduled. Coordinate work with the equipment supplier/installer.
- J. Obtain dimensioned shop drawings from the equipment suppliers prior to rough-in of branch circuits.
- K. Where equipment requires a cord connection, install a new cord and cap if the one furnished does not match the receptacle provided.
- L. Circuit breaker, feeder and fuse sizes shall be coordinated with the nameplate data on the equipment actually furnished.
# PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Grounding electrodes and conductors
- B. Equipment grounding conductors
- C. Bonding

### 1.2 REFERENCES

- A. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association)
- B. NFPA 70 National Electrical Code

### **1.3 PERFORMANCE REQUIREMENTS**

- A. Grounding System Resistance: 25 ohms
- 1.4 SUBMITTALS FOR REVIEW
  - A. Submit under provisions of Section 26 01 01.
  - B. Product Data: Provide data for grounding electrodes and connections, installation details, etc.

# 1.5 PROJECT FINALIZATION

- A. Submit under provisions of Section 26 01 02.
- B. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- C. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with the manufacturer

### 1.6 OPERATION AND MAINTENANCE DATA

- A. Division 01 Contract Closeout, Operation and Maintenance Data, Warranties: Procedures for submittals
- B. Project Record Documents: Record actual locations of components and grounding electrodes.
- C. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

## 1.7 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Product: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

# PART 2 PRODUCTS

# 2.1 CONNECTORS

A. Materials: Fasteners, splices and connectors shall be specifically selected for the materials to be joined.

# 2.2 WIRE

- A. Material: Stranded copper
- B. System grounding electrode conductors and bonding conductors shall be stranded single conductors, with 600 volt insulation, sized to meet NFPA 70 requirements, as manufactured by General Cable, Rome, Southwire or Triangle.
- C. Bonding conductors, except rebar bonding conductors at ground terminals, shall be cabled assemblies of 14 strands of 17 AWG copper wire assembled in a braided smooth twist resulting in <sup>1</sup>/<sub>4</sub> inch diameter cable of 28,500 circular mil cross-sections with a net weight of 92 pounds per 1000 linear feet.

# PART 3 EXECUTION

### 3.1 GENERAL

A. Grounding conductors shall be copper in all cases - no exceptions.

### 3.2 DISTRIBUTION GROUNDING

- A. Provide grounding electrodes and grounding electrode conductors for separately-derived electrical systems, including dry-type transformers. Ground the neutral of each separately-derived electrical system. Bond the grounding electrodes for each separately-derived system to the premises grounding electrode system.
- B. Refer to Electrical & Communications drawings for additional requirements.
- C. Where a conduit enters the enclosure of a switchboard, motor control center or transformer from below, provide an insulated-throat grounding bushing on the conduit and a bonding jumper connecting it to the ground bus and metal frame of the equipment.
- D. Where a conduit enters a painted sheet metal enclosure, the paint shall be cleaned from the area around the locknut to allow metal-to-metal contact or a grounding locknut shall be used.
- E. Provide a redundant equipment grounding conductor together with each feeder run in addition to the conduit system grounding path.
- F. Provide a redundant equipment grounding conductor, in addition to the conduit system ground path and in addition to the phase and neutral conductors shown on the plans, in each branch circuit conduit which supplies receptacles, lights or fixed electrical equipment.
- G. Provide a copper equipment grounding terminal bar in all panelboards, new or existing, where equipment grounding conductors terminate, bonded to a grounding bushing on the conduit feeding the panelboard.

- H. Provide separate grounding conductors at motor connections, transformer connections, and where flexible or non-metallic conduit is used.
- I. Connect the ground terminal on each receptacle to the metallic raceway system with a bonding jumper, except in the case of surge-suppression or isolated-ground type receptacles. The ground terminal of surge-suppression or isolated-ground type receptacles shall be connected to an insulated equipment grounding conductor run with the branch circuit conductors, but isolated from the conduit system except at the panelboard, where it shall be connected to the panelboard ground bus. Maintain continuity of the ground to every outlet in the system.
- J. Where ground conductors are subject to damage or are installed outside of the building or underground, protect the grounding conductor with schedule 40 PVC conduit.

# 3.3 TESTING

- A. After installation, the grounding electrode systems shall be tested for system conductivity and ground terminal resistance-to-earth.
- B. The test report shall be included in the Operation and Maintenance Manual.

END OF SECTION 260526

# PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Metal conduit
- B. PVC coated metal conduit
- C. Flexible metal conduit
- D. Liquid tight flexible metal conduit
- E. Electrical metallic tubing
- F. Rigid plastic conduit
- G. Fittings and conduit bodies

# 1.2 RELATED SECTIONS

- A. Section 26 05 26 Grounding and Bonding
- B. Section 26 05 32 Boxes
- C. Section 26 05 53 Electrical Identification
- D. Section 26 27 27 Supporting Devices

# 1.3 REFERENCES

- A. ANSI C80.1 Rigid Steel Conduit, Zinc Coated
- B. ANSI C80.3 Electrical Metallic Tubing, Zinc Coated
- C. ANSI/NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
- D. ANSI/NFPA 70 National Electrical Code
- E. NECA "Standard of Installation"
- F. NEMA RN 1 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit
- G. NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing

### 1.4 DESIGN REQUIREMENTS

A. Conduit Size: ANSI/NFPA 70

# 1.5 SUBMITTALS

- A. Product Data: Provide data for metallic conduit, flexible metal conduit, liquid tight flexible metal conduit, metallic tubing, nonmetallic conduit, flexible nonmetallic conduit, fittings, conduit bodies, and fire sealants.
- B. Prior to construction, a facility conduit plan shall be submitted for review showing the proposed routing of all conduits 2" and larger. Shop drawing submittal shall be the same size as the contract documents and shall show the floorplan scaled at 1/8 inch = 1 foot. Shop drawing shall be generated using a computer aided drafting program; as-built drawings and .DWG or .DXF files of the facility conduit plan shall be delivered to the Architect. CAD floorplans of the contract documents will be provided by the Owner's representative to the electrical Contractor in .DWG or format only after completion of a "Consent for the Release of Electronic Files" (forwarded by the Owner's representative on request).

# 1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01.
- B. Accurately record actual routing of conduits 2" and larger.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle Products to site under provisions of Section 26 01 01.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

### 1.8 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete the wiring system.

# PART 2 PRODUCTS

- 2.1 METAL CONDUIT
  - A. Manufacturers: Allied Tube and Conduit, LTV, Triangle PWC, Western Tube and Conduit, or equal
  - B. Rigid Steel Conduit: ANSI C80.1
  - C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; Threaded galvanized or cadmium plated steel fittings. Bushings shall have nylon insulated throats

# 2.2 PVC COATED METAL CONDUIT

- A. Manufacturers: Rob Roy Industries, or equal
- B. Description: NEMA RN 1; rigid steel conduit with external PVC coating, 20 mil thick
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; Threaded galvanized or cadmium plated steel fittings. Bushings shall have nylon-insulated throats. All steel fittings shall have an external PVC coating to match conduit.

# 2.3 FLEXIBLE METAL CONDUIT

- A. Manufacturers: AFC, Anamet, Triangle PWC, or equal
- B. Description: Interlocked, galvanized steel construction
- C. Fittings: ANSI/NEMA FB 1: Specifically designed for the purpose
- 2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT
  - A. Manufacturers: AFC, Anamet, Electriflex, Alflex, or equal
  - B. Description: Interlocked, galvanized steel construction with PVC jacket.
  - C. Fittings: ANSI/NEMA FB 1: Specifically designed for the purpose

### 2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers: Allied Tube and Conduit, LTV, Triangle PWC, or equal
- B. Description: ANSI C80.3; galvanized tubing
- C. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression type with nylon insulated throats on connectors for larger than 1-1/2". Steel set screw with nylon insulated throats for 1-1/2" and smaller.
- 2.6 RIGID PLASTIC CONDUIT
  - A. Manufacturers: Carlon, PW Pipe, Triangle PWC, or equal
  - B. Description: NEMA TC 2; Schedule 40 PVC, Heavy Wall.
  - C. Fittings and Conduit Bodies: NEMA TC 3

# 2.7 CONDUIT WITH INNERDUCTS

- A. Manufacturers: Carlon, Optic-Gard/PE, No 13109, or approved equal
- B. Description: NEMA TC 2
- C. Fittings and Conduit Bodies: NEMA TC 3

# PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Primary service and secondary service entrance conduit types shall be any combination of the following:
  - 1. Rigid metal conduit for exposed or concealed runs.
  - 2. Rigid nonmetallic conduit with a separate ground wire for underground, or underslab on grade, runs.
- B. Feeder conduit types shall be as follows:
  - 1. Rigid metal conduit for exposed runs.
  - 2. Electrical metallic tubing with separate ground wire in non-masonry/concrete walls or above ceilings, except for runs in hazardous locations.
  - 3. Rigid nonmetallic conduit with a separate ground wire for underground or under slab on grade runs, except runs in hazardous locations. Provide rigid steel for 90 degree sweeps.
- C. Branch circuit conduit types shall be as follows:
  - 1. Minimum size conduit to be <sup>3</sup>/<sub>4</sub>". The use of <sup>1</sup>/<sub>2</sub>" conduit will be permitted only for a single circuit of 2#12+#12G.
  - 2. Rigid metal conduit for exposed runs up to 4 feet 6 inches above the finished floor in sheltered spaces, for all exposed runs subject to the weather or for runs in hazardous locations.
  - 3. Electrical metallic tubing in non-masonry/concrete walls or above ceilings, and for exposed runs more than 4 feet 6 inches above the finished floor in sheltered spaces, except runs in hazardous locations.
  - 4. Liquid-tight flexible steel conduit for connections to transformers, motors and other equipment in damp and wet areas or where exposed to the weather.
  - 5. Flexible steel conduit for connections to transformers, motors, lighting and other equipment in dry, sheltered areas. Limited to 6 feet in length maximum from serving junction box to connection point with a maximum of (2) changes of direction of 90 degree or less. Install conduit neatly trained and, where possible, parallel or perpendicular with structural elements.
  - 6. Rigid nonmetallic conduit with a separate ground wire for underground or under slab on grade runs. Provide rigid steel for 90 degree sweeps.
- D. Conduits shall be sized in accordance with the applicable codes except where larger conduits are called for on drawings. Sizes shown on the drawings are based on the use of rigid metal conduit and copper conductors with THW insulation unless noted otherwise.
- E. Do not install conduit in poured concrete or masonry walls or slabs without the Architect's approval.
- F. All conduit penetrations of structural elements or conduits run within masonry walls or slabs shall be approved by the Architect in advance of installation.
- G. Conduits run in masonry shall be placed at least 1 inch from the surface. Care shall be taken to avoid placing conduits where they will be subjected to excessive heat.
- H. Conduit ends shall be capped using standard capped bushings or steel "pennies" and bushings to prevent entrance of foreign materials during construction.

- I. Rigid conduit shall be reamed after threads are cut. Joints shall be cut square and shall butt solidly into couplings. Running threads will not be permitted. Cut ends of EMT shall also be reamed.
- J. Bends in rigid conduit and EMT runs larger than 1¼ inch shall be of factory-made elbows unless otherwise specifically approved. Bends in 1¼ inch and 1 inch runs shall be made in an approved bending machine (or factory made). Hickey bends will not be permitted in conduits larger than <sup>3</sup>/<sub>4</sub> inch. Bends shall not show flattening.
- K. The radius of the inner edge curve of any field bend shall not be less than indicated in the following table:

Conduit Size	Inside Radius
(inches)	(inches)
1/2	4
3⁄4	5
1	6
1¼	8
11⁄2	10
2	12
21/2	15
3	18
31/2	21
4	24

- L. Where conduit runs are 100 feet or longer or contain the equivalent of four (4) 90 degrees bends, pull/junction boxes shall be provided. Pull box locations shall be indicated on the asbuilt drawings.
- M. Provide a #12 AWG copper pull wire or a polyethylene pull rope rated at 250 pounds (minimum) tensile strength in each conduit left empty for future use.
- N. Conduits containing innerducts shall consist of a four inch PVC Schedule 40 outer conduit (underground) or RGS (above ground or indoors), with three 1<sup>1</sup>/<sub>4</sub> inch ribbed polyethylene innerducts. Install all innerducts at once without crushing or kinking.
- O. Ground and bond conduit under provisions of Section 26 05 26.
- P. Identify conduit under provisions of Section 26 05 53.
- Q. Branch circuit runs are shown schematically. Except where exact routing is indicated, branch circuit home runs may be grouped and the actual routing of branch circuit conduits may be determined at the site and properly entered on the As-built drawings.
- R. Provide (4) 1" spare conduits with pull string from each panelboard section up into nearest accessible ceiling for future.

### 3.2 RACEWAY INSTALLATION - SPECIAL UNDERGROUND REQUIREMENTS

A. Underground conduits installed outside the building perimeter shall be minimum <sup>3</sup>/<sub>4</sub> inch trade size and shall have a minimum cover of 24 inches. Underground service conduits shall be encased in a minimum 3 inch concrete envelope (all around).

- B. Primary and service entrance conduits shall be buried deeper than 24 inches if required by the power company.
- C. Where PVC conduit is installed beneath concrete slabs on grade, it shall be buried a minimum of 6 inches below top of sub-surface beneath floor slab. Minimum size of PVC used shall be <sup>3</sup>/<sub>4</sub> inch.
- D. Transitions from underslab/grade rigid nonmetallic conduit to above slab/grade conduits shall be made with rigid metallic sweeps. Rigid nonmetallic conduit shall not be installed above slab/grade.
- E. Rigid steel conduit shall be used at penetrations through basement exterior walls encase conduits in a minimum 3 inch concrete envelope (all around) for the first 2 feet on the exterior side of the wall.
- F. Where conduits penetrate a building wall or roof, the section of conduit within the wall or roof shall be sealed inside and around the conduit. Sealant shall be UL approved for the application.
- G. Make joints liquid and gastight. Ends of all underground conduits shall be sealed after conductors have been installed to prevent breathing and condensation.
- H. All conduits stubbed out for future use underground shall be extended 5 feet clear beyond buildings, foundations, concrete walks, paving, other utilities and the like. Keep such stubouts at least 10 feet clear of future buildings or other permanent installations. Install a 4×4×12 inch (deep) concrete monument with an embedded brass plate at all conduit ends for future location. The brass plate shall indicate the origin of the conduit whose end it marks.
- I. All metallic conduits installed underground shall be painted with two coats of asphaltic compound or wrapped with one half-lapped layer of Hunt's Wrap Process No. 3. Alternate installation: provide PVC coated metallic conduits.
- J. Slope underground conduits to handholes or vaults at three inches per 100 feet. Where impractical, provide a duct drain in the low point of the conduit. The finished grade elevation at the top of underground pull boxes shall be lower than the elevation of the finished floor at the point of stub-up within the building.
- K. Do not cut, notch or drill foundations, footings, retaining walls or other structural elements without the Architect's advance approval in each case.
- L. Flush floor couplings shall consist of a standard galvanized steel coupling with a brass pipe plug installed flush with the floor. The brass plug shall be fitted with a female square or hex depression.
- M. Provide rigid steel conduit with concrete encasement for conduits below all roadways.

# 3.3 RACEWAY INSTALLATION - SPECIAL REQUIREMENTS FOR DIVISION 28 WORK

- A. Where "conduit", "raceway", and/or "conduit system" is referred to in this specification it shall be interpreted as follows:
  - 1. Standard weight galvanized rigid steel conduit underground; less than 36 inches above the floor in concrete or masonry walls; and where exposed.

- 2. Electrical metallic tubing above ceilings and higher than 36 inches above the floor in frame walls.
- B. Cable tray shall be used where indicated on the drawings.
  NOTE: ONLY METALLIC CONDUIT SHALL BE USED FOR THE DIVISION 28
  RACEWAY SYSTEM. PVC CONDUIT WILL NOT BE ALLOWED.
- C. Minimum size of conduit shall be  $\frac{3}{4}$  inch.
- D. Reference the Division 28 drawings for special backbox requirements. Provide all necessary backboxes for the installation of Division 28 equipment. Coordinate all backbox requirements with the Division 28 Contractor prior to installation.
- E. The raceway systems, wire and cable required to support the low voltage systems shall be installed in accordance with the following general installation requirements:
  - 1. Provide a nylon pull-line in each unused conduit. The pull-line shall have a tensile strength of 200 pounds for conduit sizes up to 1 inch, 400 pounds for conduit sizes up to 2 inch and 600 pounds for larger sizes.
  - 2. All conduits shall be clearly identified at both ends as to their destination. Where more than one conduit serves the same location, each conduit should be identified with a unique number.
  - 3. Open ends of conduits shall be plugged to prevent the entrance of moisture or foreign material. If moisture or foreign material is found at the time the cables are being installed, promptly and thoroughly clean the conduit before installation of cables.
  - 4. All conduits shall be securely fastened in place and free from burrs, defects, or obstructions that could interfere with installation of cables.
  - 5. All conduit that terminates at a connection backboard (unless otherwise specified on the drawings) shall terminate at the designated backboard either 12 inches above the floor or 12 inches below the ceiling or at the wireway indicated.
  - 6. All conduit shall be reamed. Where the conduit enters pull boxes, cabinets, wireways, or outlets, the conduit shall be secured by locknut(s) and provided with an insulated bushing on the conduit end.
  - 7. All unused conduits shall be marked as noted above and provided with metal blank end discs and a bushing.
  - 8. All underground control and communication conduits shall have a minimum earth cover of 18 inches, except where subjected to vehicular traffic (to include road right-of-way) the minimum cover shall be 30 inches. Control and communications conduit may be buried in the same trench as power, if separated by a minimum of 3 inches of concrete or 12 inches of dirt.
  - All metallic conduits installed underground shall be painted with two (2) coats of asphaltic compound or wrapped with one half-lapped layer of Hunt's Wrap Process No.
    Alternate installation: Provide PVC coated metallic conduits.
  - 10. All communications outlets shall be installed at the same height above the finish floor as the electrical outlets, unless otherwise specified on the drawings.
  - 11. All outlet boxes shall be the proper dimension to receive the system device to be installed. Provide plaster rings as required. Use of Tiger Box rings is not approved.
  - 12. Installation of these conduit, raceway, wiring and grounding systems requires extensive interfacing. Coordinate at all times during the planning and installation of this work to assure that the resulting installation is acceptable to the other subcontractors, the General Contractor and the Owner.

F. Assure that backboxes in concrete and block walls are installed properly. This includes the proper depth relationship between the lip of the backbox and the finished surface of the wall, verification that the plane of the front of the backbox is parallel with the plane of the finished wall and confirmation that the sides of the backbox are vertical.

# 3.4 RACEWAY INSTALLATION - SPECIAL ABOVE-GROUND REQUIREMENTS

- A. Conduits shall be concealed in the building construction except in electrical rooms, mechanical rooms and where exposed runs are indicated. Exposed conduits shall be run parallel to walls and ceilings and at the ceiling wherever possible.
- B. Conduits, whether exposed or concealed, shall be securely supported and fastened at intervals of nominally every 10 feet and within 36 inches of each outlet, ell, fitting, panel, etc. Suspended conduits shall be supported by metal rings or by trapeze hangers of Unistrut or Kindorf channel and threaded steel rods. Multiple runs of conduit on ceilings and walls shall be mounted on Unistrut or Kindorf channel. Perforated plumber's tape shall not be used. Single runs of exposed conduit shall be supported with steel pipe straps. Conduit shall not be supported from ducts, plumbing or other piping or from other conduits but only from building structural elements. Reference additional conduit support requirements under provisions of Section 26 27 27.
- C. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints, or wherever conduit may be affected by dissimilar movements of the supporting structure.
- D. Where conduit is exposed to the weather or in wet locations, make joints liquid and gastight. Ends of all such conduits shall be sealed after conductors.
- E. Keep conduit at least 6 inches from hot water or steam pipes and at least 18 inches from the covering on flues and the like.
- F. Do not cut, notch or drill structural framing members for the installation of conduit without the Architect's advance approval in each case.
- G. Rigid steel conduit shall be used at roof penetrations. Where conduits pass through the roof, provide channel supports below the roof spanning the structural elements of the roof and braced to the building structure in at least two (2) directions at right angles to one another. The conduit penetrating the roof shall be secured to the supports at two (2) points below the roof as required to render the portion above the roof rigid.
- H. Where flexible metal conduit is used for equipment connections or other special (approved) situations provide a continuous copper ground conductor sized in accordance with the applicable codes. Liquidtight flexible metal conduit shall be used for all equipment connections in damp and wet areas. Flexible conduit used for connections to vibrating equipment shall be approximately 3 feet long and contain one (1) 90 degree bend.
- I. Conduit and surface mounted raceway shall be installed in neat symmetrical lines parallel and/or perpendicular to the ceiling, floors and walls of the building construction.
- J. Install conduits so that there is a minimum of 12 inches of clearance between bottom of conduit and top of removable ceiling tiles.

- K. Rigid non-metallic conduit shall be used in above grade floor slabs and within CMU masonry block walls.
- L. Where raceways traverse across flat roofs, conduit shall be supported every 8 feet on center with Cooper B-Line Dura-Blok supports or approved equal.
- M Exposed conduit or raceways in finished spaces will not be permitted.
- N. Conduits installed within 1-1/2" of the bottom of roof decking shall be rigid galvanized steel.
- О. Where exposed conduits are installed at open ceilings in finished spaces, the conduits shall be installed a linear manner which follows the lines of the structure. Conduits shall be concealed above structural members where possible. Conduits crossings below structural steel members shall be avoided and shall be approved by the Architect prior to conduit roughin.

#### **RACEWAY INSTALLATION - SPECIAL TELECOMMUNICATIONS SYSTEMS** 3.5 REQUIREMENTS

Telecommunications conduits shall be installed in accordance with the requirements of A. ANSI/EIA/TIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces, and the Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual. Note that some of these requirements are more stringent than the National Electrical Code. Conduits shall be concealed in the requirements of the National Electrical Code.

		Canadulit		Number of Cobles	
	(unless otherwise indicated on the drawings):				
B.	In g	eneral, the race	way size shal	l be determined in accordance with	the following table

Conduit	Wiremold	Number of Cables		
Trade Size	Size	Cable O.D. of	Cable O.D. of	
(incnes)		5.6 mm	6.1 mm	
1/2	—	0	0	
3/4	V700	4	3	
1	V2000	7	6	
1¼	V2000	12	10	
11/2	V2400	16	15	
2	V2400	22	20	

- C. There shall be no more than two (2) 90 degree bends between pull points in telecommunications conduit, without derating of the conduit capacity. For each additional 90 degree bend the conduit capacity shall be derated by 15 %, or the conduit shall be increased to the next highest trade size. Offsets shall be considered as equivalent to a 90 degree bend. Provide additional pull boxes as required to meet this requirement.
- Inside radius of conduit bends shall be at least six (6) times the internal diameter of the D. conduit for sizes up to 2 inch trade size; ten (10) times the internal diameter of the conduit for sizes larger than 2 inch trade size. Where bending machine shoes are not available with the required bending radius for a one-shot field bend, factory bent, large radius 90 degree elbows shall be provided. Conduits of all sizes for use as optical fiber raceways shall have a minimum inside bend radius of ten (10) times the internal diameter of the conduit.

- E. Conduits which are terminated at ladder-type cable trays shall be supported from structure within a maximum distance of 24 inches from the tray. Conduits terminated at cable trays shall bonded to the tray in accordance with Section 26 05 26 Grounding and Bonding.
- F. Conduits entering the telecommunications closet or equipment room through the floor shall be terminated 4 inches above finished floor. Conduits entering the telecommunications closet or equipment room from above shall be terminated 4 inches below the finished ceiling, but in no case shall the conduits terminate greater than 12 inches above the ladder racking or distribution frame.
- G. Conduits and cut-out openings between floors shall be sealed with firestopping material which is removable and reusable, to accommodate adds, moves, and changes in the cabling system.
- H. Layout of conduits shall give consideration to nearby sources of electromagnetic energy such as electrical power wiring, large electric motors and generators, induction heaters, variable frequency drives, etc. Maintain the greatest separation practicable between telecommunication raceways and sources of electromagnetic interference (EMI). A minimum of 5 inches of separation shall be maintained between telecommunication raceways and fluorescent lighting ballasts.
- I. Maintain minimum separation from = 480 V power wiring in accordance with the following table:

Condition	Minimum Separation Distance(inches)		
Condition	< 2 kVA	2-5 kVA	> 5 kVA
Unshielded power lines or electrical equipment in proximity to open non- metal telecommunications proximity to open non-metal telecommunications pathways	5	12	24
Unshielded power lines or electrical equipment in proximity to a grounded metal telecommunications conduit pathway	21/2	6	12
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal telecommunications conduit pathway	_	3	6

# 3.6 SLEEVES

- A. Provide sleeves of sufficient size to permit ready installation of each conduit which passes through concrete walls or suspended slabs. Sleeves in concrete beams, joists, columns or footing walls may be installed only where permitted by the Architect.
- B. For conduit that passes through suspended concrete slabs, place sleeves with the top one inch above finished slab and the bottom flush with underside of slab. In all other cases, place sleeves with the ends flush with the concrete surfaces. Space sleeves at least three diameters apart on center or more if required by the Architect.

- C. Where conduits pass through fire resistive walls, ceilings or floors, sleeves shall be packed with fire resistive compound equal to 3M Fire Barrier.
- D. Penetrations through fire rated floors, ceilings and walls shall be sealed using an approved fire barrier sealant. Fire barrier sealants shall be a UL Rated material classified for use in through-penetration fire stop systems, and shall have ICBO, BOCAI, and SBCCI (NRB 243) approved rating per ASTM-814 (UL 1479). The sealant shall be equal to 3M CP-25 caulk, FS 195 strips and CS 195 sheet forms or an approved equal. Acceptable manufacturers are STI, 3M, Pensil, Hilti, Dow, Fyre Putty, Hevi-Duty and Nelson.
  - 1. Where sleeves penetrate existing fire resistive concrete walls or floors, the annular space around the sleeve shall be filled with fire resistive intumescent compound equal to STI "Spec Seal" firestop sealant as manufactured by Specified Technologies, Inc., Somerville, New Jersey. If the annular space exceeds <sup>3</sup>/<sub>4</sub> inch, it shall be filled instead with fire resistive grout equal to STI "Spec Seal" firestop mortar.
  - 2. Where sleeves penetrate fire resistive sheetrock walls or ceilings or where they penetrate fire resistive suspended ceilings, the annular space around the sleeve shall be filled with fire resistive intumescent compound equal to STI "Spec Seal" firestop sealant.
  - 3. Where sleeves pass through fire resistive walls, ceilings or floors, sleeves shall be packed with fire resistive intumescent compound equal to STI "Spec Seal" firestop putty.
  - 4. A manufacturer's supplied installation detail shall be submitted for each type of assembly with the UL approval and limitations indicated.

# 3.7 SEALING OF PENETRATIONS THROUGH BELOW-GRADE EXTERIOR WALLS

- A. Openings for conduit penetrations through basement exterior concrete walls shall be core drilled and sealed around the conduit using modular mechanical type of sealing closures.
- B. The inside diameter of each wall opening shall be sized as recommended by the manufacturer to allow the proper annular space around the conduit to assure a watertight seal when the sealing closure is installed. Contractor shall determine the required inside diameter of each wall opening before ordering materials or core drilling walls.
- C. Install sealing closures in accordance with the manufacturer's instructions.

# 3.8 FLASHING OF ROOF CONDUIT PENETRATIONS

- A. Electrical conduits passing through the roof shall be flashed using approved flashing assemblies, in accordance with manufacturer's instructions for the roof system.
- B. The neck of the flashing and the conduit shall be sealed with waterproofing compound as recommended by the manufacturer of the flashing assembly. The protected counterflashing shall be secured to the conduit with vandal-proof set screws. The upper annular space between the conduit and the counterflashing shall also be sealed with the recommended waterproofing compound.
- C. Install flashing assemblies in accordance with manufacturer's instructions.

# 3.9 EXPANSION FITTINGS

A. Provide expansion fittings for all rigidly fastened conduits spanning a building expansion joint, and for all runs 1-1/2" or larger exceeding 150 feet in length. Fittings shall be hot-

dipped galvanized malleable iron with a packing ring to exclude water, a pressure ring, and a separate external copper bonding jumper.

END OF SECTION 260530

# PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes
- B. Pull and junction boxes

### 1.2 RELATED SECTIONS

- A. Section 26 05 30 Conduit
- B. Section 26 27 16 Cabinets and Enclosures
- C. Section 26 27 26 Wiring Devices

### 1.3 REFERENCES

- A. NECA Standard of Installation
- B. NEMA FB 1 Fittings and Supports for Conduit and Cable Assemblies
- C. NEMA OS 1 Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports
- D. NEMA OS 2 Non-metallic Outlet Boxes, Device Boxes, Covers and Box Supports
- E. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
- F. NFPA 70 National Electrical Code

### 1.4 SUBMITTALS

- A. Product Data: Provide data for wall and ceiling outlet boxes, floor boxes, pull, and junction boxes.
- B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

### 1.5 REGULATORY REQUIREMENTS

A. Provide Products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

### PART 2 PRODUCTS

### 2.1 OUTLET BOXES

- A. Manufacturers: Appleton, Crouse Hinds, Killark, O Z Gedney, Raco/Bell, Steel City, or equal.
- B. Boxes shall accommodate the devices to be installed and shall be sized as required by the applicable codes for number and size of conduits and conductors entering and leaving. Round

or octagon boxes will not be permitted unless specifically called for. Boxes shall have galvanized finish.

- C. Boxes shall be of code gauge steel and provided with plaster, tile or other appropriate device rings.
- D. Outlet boxes and device boxes mounted in non-masonry walls shall be minimum 4 inches square by 2-1/8" inches deep exclusive of rings and shall be provided with covers or device rings as specified. Boxes for data/telephone outlets shall be minimum 4 11/16 inches square by 2 1/8 inches deep exclusive of rings.
- E. Outlet boxes, telephone/data boxes, and device boxes mounted in masonry walls shall be double gang masonry boxes with a minimum depth of  $2\frac{1}{2}$  inches for 4 inch masonry walls and  $3\frac{1}{2}$  inches for 6 inch or 8 inch masonry walls (exclusive of rings).
- F. Multi-gang boxes shall be one-piece. Do not use built-up boxes.
- G. Weatherproof boxes shall be non-rusting cast metal with threaded hubs. Boxes shall have screw mounted, gasketed covers. Plugs shall be installed in all unused holes.
- H. Boxes installed in masonry walls shall have tile covers.

### 2.2 PULL AND JUNCTION BOXES

- A. Manufacturers: Circle AW, Hoffman, Rittal, or equal
- B. Special oversized outlet boxes and junction boxes shall be code gauge steel and of the knockout type. Boxes shall have screw mounted covers for surface or flush mounting. Boxes shall be sized in accordance with applicable codes. Special outlet boxes shall accommodate the equipment served. Provide hinged covers where indicated in the drawings.
- C. In damp or wet locations sheet metal pull boxes shall be hot dipped galvanized after fabrication then finish painted with two coats of rust-resistant paint. Use covers with neoprene gaskets affixed with stainless steel screws. Seal around conduit entries with silicone based sealant.

### PART 3 EXECUTION

### 3.1 EXAMINATION

A. Verify exact locations of floor boxes and outlets prior to rough-in.

### 3.2 GENERAL INSTALLATION

- A. Install boxes in accordance with NECA "Standard of Installation."
- B. Install in locations as shown on drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- C. Electrical boxes are shown on drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose.
- D. Install boxes to preserve fire resistance rating of partitions and other elements.

- E. Boxes shall be supported independently of the conduit system. Do not fasten boxes to ceiling support wires.
- F. Where boxes occur in pre-cast concrete construction, the Contractor shall coordinate said installation with the Contractor building the precast construction to produce shop drawings showing all box locations. Provisions shall be made for conduit entry from top or bottom of wall panels. All conduit and boxes shall be installed concealed and flush respectively. These requirements shall be met whether the precast work is done at the site or a location remote from the site.
- G. All boxes shall be plumb. Supports shall be noncombustible and corrosion resistant. In suspended ceilings, bar hangers shall be used to support the boxes from the ceiling channels. Refer to architectural drawings for exact heights of outlets not specified herein or indicated on the drawings. Unused knockouts in boxes shall be left sealed.
- H. Do not mount control or disconnecting devices more than 6 feet 6 inches above finish floor.
- I. Do not locate cabinets, outlets or other apertures larger than 16 square inches in rated fire walls.
- J. Prior to installation, the Owner reserves the right to relocate any outlet or device within 6 feet of the location indicated on the plans at no additional cost.
- K. Where rigid conduit enters a box, fitting or device through a knockout, double locknuts and an insulated metallic bushing shall be used. EMT shall terminate at knockouts with an insulated throat fitting and one locknut. Connectors shall be made up tight to insure electrical continuity of the raceway system.
- L. Provide all necessary supports and backing for all enclosures and equipment.
- M. Attach boxes, outlets, straps, cabinets and equipment to wood with wood or lag screws, to metal with machine screws or bolts, and to concrete with expansion anchors or self-drilling metal anchors and machine screws or bolts. Use size and number of attachments as required to support equipment weight with a safety factor of four (4) minimum.
- N. Provide access doors where boxes are not exposed or located within an accessible ceiling.

# 3.3 OUTLET BOX INSTALLATION

- A. Each lighting outlet, switch, receptacle and other miscellaneous device shall be provided with a suitable box.
- B. Align adjacent wall mounted outlet boxes for receptacles, data/telephone outlets, and similar devices.
- C. Use flush mounting outlet box in finished areas.
- D. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- E. Outlet boxes installed in masonry walls shall be set deep enough to allow a masonry facing over the plaster ring to frame the opening. Center outlet in a course of masonry. Masonry

boxes shall be mounted as follows: From floor to height of 6 feet, mount so that bottom of box rests on block joint. Above 6 feet, mount so that top of box rests on block joint.

- F. Do not install flush mounting box back-to-back in walls; provide minimum or 6 inches separation. Provide minimum or 24 inches separation in fire-rated assemblies and acoustic rated walls.
- G. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- H. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- I. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- J. Use adjustable steel channel fasteners for hung ceiling outlet box.
- K. Use cast outlet box in exterior locations, where exposed to the weather and wet locations.
- L. Where two or more of the same type devices occur adjacent to each other, they shall be in a gang type box with a gang type cover. Where different type devices occur adjacent to each other, space outlet boxes so that finish plates will be spaced 1 inch apart. Where receptacles or switches are shown side by side but at different heights, they shall be centered one above the other unless noted otherwise.
- M. Refer to section 26 27 26 Wiring Devices for device mounting heights. Coordinate outlet locations and provide box extensions or other equipment as required where outlets occur in cabinet backs.
- N. Outlets in acoustical ceilings are to be in the center of the acoustical tile or in the center of a joint in the acoustical tile.
- O. Align all outlets horizontally or vertically for a uniform and neat appearance.

# 3.4 PULL AND JUNCTION BOX INSTALLATION

- A. Pull boxes and junction boxes shall be provided as indicated on the drawings and/or as required.
- B. Boxes larger than 200 cubic inches or 18 inches in any dimension shall use a hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.
- C. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- D. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.

# 3.5 ACCESS PANEL INSTALLATION

A. Access panels to be Schlage-keyed in exposed locations.

### 3.6 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused box openings.

# END OF SECTION 260532

# PART 1 GENERAL

# 1.1 SECTION INCLUDES

- A. Nameplates
- B. Wire and Cable Markers
- C. Underground Conduit Markers
- D. Pull and Junction Box Identification
- E. Device Plate Identification

### 1.2 RELATED SECTIONS

A. Section 26 27 26 - Wiring Devices

# PART 2 PRODUCTS

### 2.1 GENERAL

- A. Prohibited Materials: Dymo style labels or equivalent shall not be utilized.
- B. Install nameplates on all main and distribution switchboards, panelboards, disconnect switches, and miscellaneous systems junction boxes and cabinets installed under this contract.
- C. Install bakelite nameplates at each protective device in switchboard and distribution centers, showing circuit service.
- D. Install circuit directory cards in all panelboards. Cards shall be typed or computer printed for neatness.
- E. All wiring in all outlet and junction boxes shall be properly identified as to circuit number. Type of marker shall be made with Brady ID PAL printer/labeler with <sup>3</sup>/<sub>4</sub>" labels; locate label on inside of device box.

# 2.2 NAMEPLATES

- A. Nameplates shall be laminated phenolic plastic, white front and back with black core, with lettering etched through the outer covering, except where other colors are a code requirement (e.g., service entrance main disconnects). Engraved letters shall be 3/8 inch high. Nameplates shall be securely fastened to the equipment with No. 4 Phillips, round-head, cadmium-plated, steel self-tapping screws or nickel-plated brass bolts.
- B. Manufacturers: W. H. Brady Co, Seton, Tyton.
- C. Markers shall be cloth tape, split sleeve, or tubing type.

# 2.3 LABELS

A. Labels shall be Nylon stick-on labels equal to 3M. Label shall be white with black lettering for concealed locations and clear with black lettering for exposed locations.

# PART 3 EXECUTION

### 3.1 PREPARATION

A. Degrease and clean surfaces to receive identification materials.

# 3.2 NAMEPLATE INSTALLATION

- A. The following items shall be equipped with nameplates:
  - 1. Motor starters, motor control switches, pushbutton stations, control panels and time switches.
  - 2. Disconnect switches, panelboards, switchboards, and separate overcurrent devices mounted in switchboards. Indicate voltage and phase.
  - 3. Service entrance main disconnects. Indicate other service entrance locations, if any.
  - 4. Circuit breakers, contactors and relays in separate enclosures.
  - 5. Switches or dimmers controlling luminaires not located within sight of the controlling device.
  - 6. Special electrical system components, terminal cabinets, equipment cabinets and equipment racks.
  - 7. Wall switches controlling equipment.
  - 8. Special receptacles.
- B. Panelboard nameplates shall be located on inside of door above circuit breakers, unless panelboard is located in a Utility space, then install nameplate on outside above door.

# 3.3 LABEL INSTALLATION

- A. The following items shall be equipped with nylon stick-on labels:
  - 1. Receptacles
  - 2. Lighting switches
- B. Locate label on back of device cover plate. Label shall indicate branch circuit information.

### 3.4 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboards, gutters, pull boxes, and at load connection.
- B. Identify with branch circuit or feeder number for power and lighting circuits.
- C. Identify with control wire number as indicated on equipment manufacturer's shop drawings.

### 3.5 PULL BOX AND JUNCTION BOX IDENTIFICATION

A. Each pull and junction box shall be neatly identified with permanent black marker or stick on labels on the outside of the box (where the box is concealed) and on the inside of the box (in exposed locations). Identify each pull and junction box with a system description as follows:

- 1. Lighting Ltg.
- 2. Receptacles Rec.
- 3. Equipment AHU-1 or MZU-1.
- 4. Computer Com.
- 5. Telephone Tel.
- 6. Fire Alarm FA (Box shall be painted Red in color)

END OF SECTION 260553

# PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Main service switchboard
- B. Secondary distribution switchboards
- C. Additions to existing switchboards
- 1.2 RELATED SECTIONS
  - A. Section 26 27 12 Utility Service Entrance: Utility metering equipment

### 1.3 REFERENCES

- A. ANSI C12.1 Electricity Metering
- B. ANSI C39.1 Electrical Analog Indicating Instruments
- C. ANSI C57.13 Instrument Transformers
- D. NEMA PB 2 Deadfront Distribution Switchboards
- E. NEMA PB 2.1 Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less
- F. NEMA PB 2.2 Application Guide for Ground Fault Protective Devices for Equipment
- G. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (National Electrical Testing Association).
- H. UL 50 Electrical Cabinets and Boxes
- I. UL 98 Enclosed and Dead Front Switches
- J. UL 198G Fuses for Supplementary Overcurrent Protection
- K. UL 489 Molded Case Circuit Breakers
- L. UL 512 Fuseholders
- M. UL 869 Electrical Service Equipment
- N. UL 891 Dead Front Switchboards
- O. UL 977 Fused Power Circuit Devices
- P. UL 1053 Ground-Fault Sensing and Relaying Equipment

# 1.4 SUBMITTALS FOR REVIEW

- A. Product Data: Submit information covering every type of switchboard to be provided on the project, as follows: component list; descriptive bulletins; voltage; overcurrent frame size and trip ratings; overcurrent device interrupting capacity ratings; conductor terminal sizes; switchboard instrumentation; ground fault protection; switchboard accessories; and time-current curves of all overcurrent devices.
- B. Shop Drawings: For each switchboard, show the following. voltage and phase; main bus ampacity; section bus ampacity for each section; integrated short circuit ampere rating; front and side views of enclosure, with overall dimensions; conduit entrance locations and requirements; switchboard instrument details; overcurrent device arrangement; location, size and number of bus bars, including phase, neutral and ground buses; shipping splits; one-line diagram, showing device connections; details of provisions for bus bar extension; and equipment anchorage details.

### 1.5 PROJECT FINALIZATION

- A. Submit under provisions of Section 26 01 02.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and start-up of product.
- C. Maintenance Data: Furnish the following information: replacement parts listing, including source; recommended maintenance procedures and intervals; wiring diagrams; copy of NEMA Standards Publication PB2.1; and copy of NEMA Standards Publication PB2.2.
- D. Test Reports: indicate results of factory production tests; and indicate field test and inspection procedures and test results.
- E. Seismic Certification
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with the manufacturer.

# 1.6 QUALITY ASSURANCE

- A. Products: Switchboards shall be designed and manufactured in accordance with the latest revision of NEMA PB2. Current transformers and potential transformers shall comply with ANSI C57.13; Ammeters and voltmeters with ANSI C39.1; and watt-hour meters with ANSI C12.1.
- B. Installation: Switchboard installation shall conform to the latest revisions of NEMA PB2.1 and NEMA PB2.2, as applicable.
- C. Testing: Overcurrent protective devices in the main service switchboard shall be tested in accordance with the National Electrical Testing Association (NETA) including provisions in the latest revision of NETA ATA, as applicable.

# 1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Products: Switchboards and devices therein shall be UL listed and classified as suitable for purpose indicated.

# 1.8 WARRANTY

- A. Submit under provisions of Section 26 01 02.
- B. Products furnished under this section shall be guaranteed against defective parts or workmanship for a period of one year after the date of substantial completion. The guarantee shall cover full parts and labor.

# 1.9 EXTRA PRODUCTS

- A. Provide one (1) set of manufacturer's instructions and maintenance data affixed within the incoming or main section of each switchboard.
- B. Furnish ten (10) keys of each type.

# PART 2 PRODUCTS

# 2.1 GENERAL DESCRIPTION

- A. Manufacturers: Eaton Electrical, General Electric, and Square D.
- B. Construction: Each switchboard shall consist of the required number of vertical sections bolted together to form a rigid, free-standing, totally enclosed assembly. The sides and rear shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Enclosures shall be equipped with adequate means for ventilation within the enclosure.
- C. All sections of each switchboard shall be rear-aligned. Devices shall be front-removable. Bus connections and conductor terminations shall be front-accessible, enabling the switchboard to be mounted against a wall.
- D. The assembly shall be provided with adequate lifting means.
- E. Switchboards used as service-entrance equipment shall be UL listed and labeled as suitable for such use.
- F. Enclosures: Switchboard enclosures shall be NEMA Type 1 general purpose enclosures, unless otherwise indicated. Enclosures shall be made from heavy gauge galvanized steel.
- G. Finish: External surfaces shall be finished with one coat of zinc chromate and one coat of gray baked enamel. Coat internal surfaces with minimum one (1) coat corrosion-resisting paint, or plate with cadmium or zinc.
- H. Busing: Switchboard buses shall be solid and full-capacity rated, with all hardware in place for present and indicated future devices.
- I. Bus bars shall be copper. Bus sizing shall limit temperature rise at rated current on any current-carrying port to a maximum of 65 degrees C over an ambient of 40 degrees C.
- J. Provide a full-capacity neutral bus for each switchboard indicated with neutral.

- K. A copper ground bus shall be provided in each switchboard. The ground bus shall be firmly secured to each vertical section structure and shall extend the entire length of the switchboard. Ground bus shall be sized as indicated on the drawings, but not less than 1/3 the size of the switchboard main bus. Minimum ground bus size shall be 1/4×2 inches.
- L. All hardware used on bus bars shall be high tensile strength and zinc plated. All bus joints shall be provided with conical spring-type Belleville washers.
- M. Bus bars shall include provisions for extension to future switchboard sections.
- N. Devices: Main and distribution section overcurrent protective devices shall be as indicated on the drawings.
- O. Adjustments shall be accessible without removing covers, unless such removal does not require use of tools.
- P. The trip rating of each unit shall be clearly indicated and visible or identified on a permanently affixed nameplate.
- Q. Devices shall be mounted in switchboards such that the operating handles are no more than 78 inches above the floor when in their highest position, taking into account the height of the housekeeping pad under the switchboard.
- R. Switchboards located outdoors shall not contain circuit breakers with electronic trip units.
- S. All devices 1200 amperes and larger shall be equipped with an approved Arc Energy reduction feature in accordance with the NEC.
- T. Future Provisions: Fully equip spaces for future devices with busing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.

### 2.2 MAIN SERVICE SWITCHBOARD

- A. Metering: Switchboard shall include Owner metering located in a separate enclosure and provided with (1) telecommunications outlet.
- B. Main and Tie Devices: Each device shall be electronic trip, molded-case, service-rated circuit breaker, with LSI, size as indicated on the drawings. Devices shall be individually mounted and compartmented.
- C. Distribution Devices: Each device shall be a quick-make, quick-break molded-case thermal magnetic circuit breaker or fusible switch assembly as indicated on the drawings. Devices shall be group mounted, unless otherwise indicated on the drawings.

### 2.3 SECONDARY DISTRIBUTION SWITCHBOARDS

- A. Main Lugs: Suitable lugs shall be provided for connection of the incoming feeder.
- B. Main Devices: Each device shall be electronic trip, molded-case, service-rated circuit breaker as indicated on the drawings. Devices shall be individually mounted and compartmented.

C. Distribution Devices: Each device shall be a quick-make, quick-break molded-case thermal magnetic circuit breaker or fusible switch assembly as indicated on the drawings. Devices shall be group mounted, unless otherwise indicated on the drawings.

### 2.4 SHORT CIRCUIT RATINGS

- A. Each switchboard shall be labeled with a UL integrated equipment short circuit rating. All overcurrent protective devices shall have the interrupting capacity rating as indicated without relying upon series-connected ratings.
- B. Switchboards shall have short circuit ratings as shown on the drawings, but not less than 65,000 amperes RMS symmetrical at rated voltage.
- C. Series rated equipment is not permitted. All equipment shall be fully rated.

# 2.5 UTILITY METERING

A. Description: Coordinate with local utility to provide pathway and communication from utility meter location on site to the building EMS system. Utility meter shall have two-pulse output to allow for Owner monitoring.

### 2.6 SWITCHBOARD METERING

- A. Manufacturer: The meter shall be SQUARE D PM-8240. Equals allowed with prior approval. Provide with following options:
  - 1. Integrated display.
  - 2. Optical interface and software for downloading of data.
  - 3. Remote I/O link equipped with smart Communications card.
  - 4. Form C output contacts.
- B. Each switchboard shall be provided with a digital power meter. Meter to be mounted in enclosure separate from switchboard and provided with (1) telecommunications outlet. Provide required current and potential transformers, wiring, pathway and accessories for complete metering system.
- C. Additional metering shall be provided at locations were indicated in the drawings.
- Metering parameters and accuracy shall include: D. Phase voltage ±0.5% Phase current ±0.3% Line Voltages ±0.5% Current (Ampere) Peak Demand ±0.3% Power (kW) Peak Demand ±0.5% Apparent Power (kVA) Peak Demand ±0.5% Reactive Power (KVAR) Peak Demand ±0.5% Energy (kWh) ±0.5% Apparent Energy (kVAh) ±0.5% Reactive Energy (kVARh) ±0.5% Power Factor ±1.0% Frequency ±1.0%
- E. Field programming, start-up and function testing of each installed meter shall be provided by an authorized representative.

# 2.7 MOLDED-CASE CIRCUIT BREAKERS

- A. Circuit breakers serving as switchboard main or tie devices and circuit breakers serving as NEC 700 or 702 system main shall be electronic trip equipped with a tripping system consisting of:
  - 1. Three (3) current sensors, a trip unit, and a flux-transfer shunt trip. The trip unit shall provide adjustable time-current protection functions. Interchangeable rating plugs shall establish the continuous trip ratings of each circuit breaker. The trip unit shall include adjustments for:
    - a. Long-time pick-up and delay
    - b. Short-time pick-up and delay
    - c. Instantaneous Settings
- B. Ground-fault pick-up and delay (switchboards with line-to ground voltage above 150 volts only).
- C. Switchboard feeder and branch overcurrent protective devices indicated as circuit breakers shall be thermal magnetic, molded-case type, which will provide inverse time overload protection and instantaneous short circuit protection. Ground fault protection shall be provided where indicated.
- D. Each circuit breaker shall be operated by a single toggle-type handle and shall have a quickmake, quick-break, over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy, with arc extinction chutes. Multiple-pole circuit breakers shall be common trip.
- E. Where indicated, circuit breakers shall be current-limiting type. Such circuit breakers shall have automatically resetting current limiting elements in each pole, coordinated with the thermal and instantaneous trip elements. Let-through current and energy level shall be less than permitted for same size Class RK-5 fuse.
- F. Circuit breakers located in non-air conditioned spaces or outside the building shall be ambient compensated type.
- G. Circuit breakers for air conditioning equipment shall be UL labeled "HACR".

# 2.8 FUSIBLE SWITCH ASSEMBLIES

- A. Feeder protective devices indicated as fusible switches shall be quick-make, quick-break, load-interrupted enclosed knife switches with externally operable handles. Provide interlock with defeat mechanism to prevent opening front cover with switch in ON position. Handle shall be lockable in OFF position.
- B. Fuse clips shall be designed to accommodate Class J or Class L current-limiting fuses only.

# 2.9 GROUND FAULT PROTECTION

- A. Ground fault protection shall be provided at the main service switchboard where the service voltage is greater than 150 volts to ground. The ground fault protection system shall be modified zero sequence sensing type, and shall comply with the following requirements:
  - 1. System shall require no external power to trip circuit breakers.

- 2. System shall be suitable for use on grounded systems, whether the system neutral is carried through the system or not.
- 3. Pickup current setting and time delay shall be field adjustable.
- 4. System shall include a means of testing the ground fault system, complying with on-site testing requirements.
- 5. System shall include local visual ground fault trip indication.
- 6. System shall include I2t curve-shaping option.
- 7. System shall include zone-selective interlocking communication capabilities compatible with other ground fault protection on upstream and downstream devices, equipped with ground fault protection. Compatibility shall include thermal magnetic circuit breakers equipped with ground fault sensing, electronic trip circuit breakers with integral ground fault sensing, and external ground fault sensing systems.
- 8. System shall not affect interrupting rating of the companion devices.
- 9. Each device shall be equipped with a current sensor, ground fault relay and a ground fault trip mechanism. Ground fault protection integral with the overcurrent protective devices is acceptable, provided it complies with requirements specified herein.
- 10. Current sensors shall be of sufficient size to encircle all phase and neutral conductors.
- 11. Ground fault relays shall be solid state with adjustable pickup current and delay settings. Adjustment dial shall be calibrated to permit field adjustment.
- 12. Ground fault trip mechanisms shall be stored-energy devices designed to open the respective protective devices when tripped by the ground fault protection system and shall be capable of operating satisfactorily at 55 % of rated voltage.
- 13. Provide a test winding and external test push button to simulate the flow of ground fault current through the current sensor in order to test the operation of the protection system including the sensor pickup, relay, and circuit protective device operation.
- 14. Provide monitor panel with lamp to indicate relay operation, TEST and RESET control switches.

# 2.10 WIRING AND TERMINATIONS

- A. Suitable terminals shall be provided for all line and load terminations, sized for conductors as indicated on the drawings.
- B. Lugs shall be provided for connection of all neutral conductors in incoming and outgoing feeders and circuits.
- C. Lugs shall be provided for connection of all grounding conductors, including grounding electrode conductors, equipment grounding conductors, and bonding conductors.
- D. Control wiring, fuse blocks and terminal blocks within the switchboard shall be provided as necessary. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, and switches, shall be suitably marked for identification corresponding to appropriate designations on manufacturer's wiring diagrams.
- E. Control wire within the switchboard shall be Type SIS, bundled and secured with nylon ties. Control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. Provide wire markers at each end of all control wiring.
- F. Switchboard instrument current transformer secondary leads shall first be connected to conveniently accessible short circuit terminal blocks before connecting to any other device. Accuracy shall be consistent with connected metering. Provide primary and secondary fuses.

# 2.11 ACCESSORIES

- A. Device Accessories: Provide kirk-key interlocks, shunt-trip units and auxiliary switches as indicated on the drawings.
- B. Auxiliary Contacts: Field convertible contacts, in addition to seal-in contact and pilot light contacts.
- C. Indicators: Light-emitting diode (LED) lamps, liquid-crystal display (LCD) read-outs or dial gauges.
- D. Relays: 120 volt, unless otherwise indicated.
- E. Control Power Transformers: 120 volt secondary, sized for control burden plus 50 %, 100 VA minimum. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.

### PART 3 EXECUTION

### 3.1 PREPARATION

- A. Field Measurement: Verify that field measurements are as indicated, and that equipment will fit in the available space while maintaining required working space clearances and space for future switchboard sections.
- B. Provide a 4 inch high concrete housekeeping pad for each switchboard, extending approximately 2 inch beyond the equipment enclosure on both sides and in front, except as otherwise indicated on the drawings, and extend 1 inch beyond back or enclosure. Floor sills shall be set level in concrete per switchboard manufacturer's recommendations.
- C. Verify that surfaces are suitable for switchboard installation. Insure that surfaces are level and free from irregularities.

# 3.2 FACTORY TESTING

- A. The following factory production tests shall be performed on each switchboard:
  - 1. The switchboard shall be completely assembled, wired and adjusted at the factory.
  - 2. After assembly, the complete switchboard shall be tested for operation under simulated service conditions to assure the accuracy of the wiring and the functioning of all equipment.
  - 3. The main circuits shall be subjected to a dielectric test of 2200 volts for one (1) minute between live parts and ground and between opposite polarities.
  - 4. The wiring and control circuits shall be subjected to a dielectric test of 1500 volts for one (1) minute between live parts and ground.
- B. The manufacturer shall furnish three (3) certified copies of the factory production test report, which shall be included in the O & M manuals.
- C. Verify that surfaces are suitable for switchboard installation. Insure that surfaces are level and free from irregularities.

# 3.3 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products in conformance with manufacturer's recommended practices.
- B. Deliver switchboards in 60 inch maximum width shipping splits for ease of handling. Each shall be individually wrapped for protection and mounted on shipping skids.
- C. Inspect and report concealed damage to carrier within their required time period. Damaged equipment shall be replaced or repaired prior to installation.
- D. Store in a clean, dry environment. Maintain factory wrapping. If required, to protect units from dirt, water, construction debris and traffic, provide an additional heavy canvas or heavy plastic cover. If applicable, provide heating within enclosure to prevent condensation.
- E. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

### 3.4 INSTALLATION

- A. Install switchboards in accordance with manufacturer's instructions.
- B. Install switchboards plumb. Anchor switchboards to floor.
- C. Tighten accessible bus connections and mechanical fasteners after placing switchboard. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's instructions.
- D. Where devices are to be added to existing equipment, mount devices in existing space, together with required mounting hardware. Provide blank covers to fill remaining vacated space.
- E. Neatly arrange and support conductors using nylon ties or wraps, in accordance with the equipment manufacturer's recommendations, so as to conform to the bracing requirements for the ampere interrupting capacity rating indicated for the equipment.
- F. Connect the unfused leg of each control power transformer to ground.
- G. Install fuses.
- H. Install metering provisions and program for required measurement and recording. Coordinate programming with Owner's EMS maintenance staff.

# 3.5 ADJUSTMENT AND TESTING

- A. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench per manufacturer's instructions.
- B. Inspect complete installation for physical damage, proper alignment, anchorage and grounding.

- C. Measure insulation resistance of each bus section phase to phase and phase to ground for one (1) minute each, at test voltage of 1000 volts DC. Minimum acceptable value for insulation resistance is 1 megohm. Refer to manufacturer's instructions for specific test procedures.
- D. Adjust all operating mechanisms for free mechanical movement.
- E. After installation of switchboards, but prior to energization, pretest all components. Check operability of all controls, adjust circuit breaker settings, and check interlocks.
- F. Test and set the overcurrent protection devices in accordance with the National Electrical Testing Association (NETA). Test to include the main service switchboard together with the associated ground fault protection equipment. Provide a written report indicating final trip settings and adjustments together with tests results. The report shall be included in the Operation and Maintenance Manuals.
- G. Test instruments shall have an accuracy of ±0.5 % for voltmeters, ±2 % for ammeters, and ±2 % for ohmmeters. All instruments shall be accurately calibrated by an approved testing laboratory before use.
- H. Overload trip test shall be conducted at 300 % of full load amperage. Time to trip shall be within manufacturer's acceptable range, or circuit breaker shall be replaced.
- I. Instantaneous magnetic trip test shall be conducted using pulse method.
- J. Ground fault test shall be conducted using high-current injection test method. Test equipment shall be capable of delivering up to 1000 amperes or more at 2.5 volts.
- K. Disconnect and reconnect equipment as required to perform the above tests.
- L. The above testing procedures shall be performed on all new overcurrent protection devices 200 Amps and above. The above testing procedures shall be performed on all existing overcurrent protection devices sized 400 Amps and above.
- M. Upon completion of the above adjustment and testing, the Contractor shall energize the system and demonstrate proper operation of all equipment in the presence of the Owner's representative. Notify Owner's representative at least one (1) week in advance of the dates when the demonstration will be undertaken. Demonstration shall include:
- N. Apparatus arranged for manual operation shall be operated under power and then returned to their normal position.
- O. Operate all control equipment and verify that it operates properly. Tests of control equipment shall include at least two operating cycles.
- P. Any deficiencies discovered as a result of the above tests shall be rectified and the work affected by such deficiencies shall be completely retested at the Contractor's expense.
- Q. Instruments, gauges, testing equipment, protective devices and safety equipment for all testing shall be provided by the Contractor. Energy for the tests will be furnished by the Owner.
- R. Perform functional testing of power and energy meter data reporting as part of the Energy Management System commissioning procedures.

# 3.6 TRAINING

- A. The Contractor shall provide two (2) hours minimum of training for maintenance personnel in the maintenance and operation of the equipment.
- B. A training plan shall be submitted in advance for approval, outlining the topics to be covered, the publications to be used, and the training schedule.
- C. The training shall be conducted by personnel thoroughly familiar with the equipment and its features. The training shall include instruction and over-the-shoulder hands-on training. As a minimum, the training shall cover:
  - 1. Recommended maintenance procedures and intervals
  - 2. Operation of major components within the assembly
  - 3. Operation of all control equipment to demonstrate that it operates in accordance with the requirements of this section
  - 4. Demonstration of programming and control options for all programmable equipment
  - 5. Reading and resetting of switchboard instruments
- D. A trained manufacturer's representative shall conduct the training.
- E. After completion of the training, the manufacturer's representative shall reprogram any programmable equipment as directed by the Owner.

END OF SECTION 262413

# PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Distribution panelboards
- B. Branch circuit panelboards
- C. Additions to existing panelboards

### 1.2 RELATED SECTIONS

- A. Section 26 05 26 Grounding and Bonding
- B. Section 26 05 53 Electrical Identification
- C. Section 26 28 13 Fuses

### 1.3 REFERENCES

- A. NEMA PB 1 Panelboards
- B. NEMA PB 1.1 Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
- C. UL 50 Cabinets and Boxes
- D. UL 67 Panelboards
- E. UL 98 Enclosed and Dead-front Switches
- F. UL 489 Molded-Case Circuit Breakers and Circuit Breaker Enclosures
- G. UL 512 Fuseholders
- H. UL 943 Ground-Fault Circuit Interrupters
- I. UL 977 Fused Power Circuit Devices

# 1.4 SUBMITTALS FOR REVIEW

- A. Product Data: Submit information covering every type of panelboard to be provided on the project, as follows: component list; descriptive bulletins; voltage; overcurrent device interrupting capacity ratings; conductor terminal sizes; and accessories.
- B. Shop Drawings: For each panelboard, show the following: voltage and phase; main bus ampacity; integrated short circuit ampere rating; outline and support points, with dimensions; wiring gutter dimensions; overcurrent device arrangement; overcurrent device trip ratings; location of neutral and ground buses; and wiring gutter dimensions.

### 1.5 PROJECT FINALIZATION

A. Submit under provisions of Section 26 01 02.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Maintenance Data: Furnish the following information: replacement parts listing, including source; recommended maintenance procedures and intervals; and a copy of NEMA Standards Publications PB1.1.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with the manufacturer.

## 1.6 RECORD DOCUMENTS

- A. Record final location of each panelboard.
- B. Record actual circuiting arrangements.
- 1.7 QUALITY ASSURANCE
  - A. Products: Panelboards shall be designed and manufactured in accordance with the latest revision of NEMA PB1.
  - B. Installation: Panelboard installation shall conform to the latest revision of NEMA PB1.1, as applicable.
- 1.8 REGULATORY REQUIREMENTS
  - A. Products: Panelboards and devices therein shall be UL listed and classified as suitable for the purpose indicated.
- 1.9 WARRANTY
  - A. Submit under provisions of Section 26 01 02.
  - B. Products furnished under this section shall be guaranteed against defective parts or workmanship for a period of one year after the date of substantial completion. The guarantee shall cover full parts and labor.

## 1.10 EXTRA PRODUCTS

- A. Furnish ten (10) panelboard keys of each type.
- PART 2 PRODUCTS
- 2.1 GENERAL DESCRIPTION
  - A. Manufacturers: Eaton Electrical, General Electric, and Square D.
  - B. Types: Panelboards shall be dead-front design. Panelboards shall be circuit breaker type, except where fused switch assemblies are specifically indicated.

- C. Interiors: Panelboard interiors shall be completely factory assembled with bolt-on devices. They shall be designed such that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors.
  - 1. Main bus bars shall be copper, sized to limit temperature rise on any current carrying part to a maximum of 150 °F above an ambient of 104 °F outside the enclosure.
  - 2. Full-size insulated neutral bars shall be included for panelboards indicated with neutral. Bus bar taps for panels with single-pole branches shall be arranged for sequence phasing of the branch circuit devices. Neutral busing shall have suitable lugs for the incoming feeder and each outgoing feeder or branch circuit requiring a neutral connection.
  - 3. A copper ground bus capable of being isolated shall be included in each panelboard. The ground bus shall be bonded to panelboard enclosure, except where isolated ground bus is indicated. Ground busing shall have suitable lugs for the equipment grounding conductors associated with the incoming feeder and each outgoing feeder or branch circuit, and for any bonding conductors.
- D. Finish: In finished areas, finish all panels with one (1) coat of zinc chromate and one coat of primer sealer. In all other locations, finish panels with one (1) coat of zinc chromate and one coat of gray baked enamel.
- E. Door locks shall be flush cylinder type. All panelboard locks shall be keyed alike.
- F. Enclosures: Panelboard enclosures shall be NEMA Type 1 general purpose enclosures. Enclosures shall be made from galvanized steel. Provide adequate gutter space for wire bending and termination. Where feeder conductors supplying the mains of a panel board are carried through its enclosure to supply other electrical equipment, the enclosure shall be sized to include the additional required wiring space. At least four (4) interior mounting studs with adjustable nuts shall be provided.
  - 1. Panelboards shall be true door-in-door type enclosures.
  - 2. Panelboards shall be surface-mounted or flush-mounted as indicated. Surface trims shall be same height and width as box. Flush trims shall overlap the box by <sup>3</sup>/<sub>4</sub> inch on all sides.
  - 3. When panelboards are located adjacent to each other, cabinets and doors shall be of the same size.
  - 4. Where barriered top, side or bottom compartments are indicated, each compartment shall have its own hinged, lockable door. Maintain at least 2 inches of solid trim between doors. Contactors or relays mounted in panelboard compartments shall have vibration isolators.
  - 5. Where skirts are indicated, provide removable sheet-metal skirts to the floor and to the ceiling to conceal conduits.
- G. Service Equipment: Panelboards used as service-entrance equipment shall be UL listed and labeled as suitable for such use.

# 2.2 DISTRIBUTION PANELBOARDS

- A. Enclosures: Enclosures for distribution panelboards shall be at least 11 inches deep, and 36 inches wide.
  - 1. Distribution panelboard trims shall cover all live parts. Switching device handles shall be accessible.
- B. Bolt-On Alternative: In lieu of bolt-on circuit breakers, circuit breakers equipped with line terminal jaws, equal to Square D I-Line type, are acceptable, provided that in the event of a

short circuit condition, the increased magnetic flux causes the jaws to grip the bus more firmly. Circuit breaker jaws shall be protected by an impact resistant molded shroud. Circuit breakers of this type shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners.

# 2.3 BRANCH CIRCUIT PANELBOARDS

- A. Enclosures: Enclosures for lighting and appliance branch circuit panelboards shall be at least 5.5 inches deep and 20 inches wide.
  - 1. Trims for branch circuit panelboards shall be supplied with a hinged door over all circuit breaker handles.
  - 2. Surface mounted panelboards shall be provided with hinged trims such that devices, lugs, and gutters may be exposed without completely removing trim.
  - 3. Flush mounted panelboards shall have easily removable trims.
  - 4. Doors shall be flush with panelboard trim and shall not uncover any live parts. Doors shall have a flush cylinder lock and catch assembly. Doors over 48 inches in height shall have auxiliary fasteners.
  - 5. All panelboard locks shall be keyed alike.
- B. Panel Index: A directory card with a clear plastic cover shall be supplied and mounted on the inside of each door.

# 2.4 SHORT CIRCUIT RATINGS

- A. Each panelboard shall be labeled with a UL integrated equipment short circuit rating. All overcurrent protective devices shall have the interrupting capacity rating as indicated without relying upon series-connected ratings.
- B. Panelboards applied at 240 volts or less shall have short circuit ratings as indicated on the drawings and/or associated schedules, but not less than 10,000 amperes RMS symmetrical at 240 volts.
- C. Panelboards applied at 480 volts shall have short circuit ratings as indicated on the drawings and/or associated schedules, but not less than 14,000 amperes RMS symmetrical at 480 volts.
- D. Series rating is not permitted.

# 2.5 CIRCUIT BREAKERS

- A. Circuit breakers shall be molded-cast type, with inverse time and instantaneous tripping characteristics.
- B. Each circuit breaker shall be operated by a single toggle-type handle and shall have a quickmake, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding with arc extinction chutes. Multiple-pole circuit breakers shall be common trip.
- C. Where indicated, circuit breakers shall be current-limiting type. Such circuit breakers shall have automatically resetting current limiting elements in each pole, coordinated with the thermal and instantaneous trip elements. Let-through current and energy level shall be less than permitted for same size Class RK5 fuse.

- D. The trip rating of each circuit breaker shall be imprinted in the handle.
- E. Ground fault interrupting circuit breakers shall have "Test" button and pigtail for neutral connection.
- F. Circuit breakers located in non-air conditioned spaces or outside the building shall be ambient compensated type.
- G. Circuit breakers used for switching lighting circuits shall be UL labeled "SWD".
- H. Circuit breakers used for air conditioning equipment shall be UL labeled "HACR".
- I. Circuit breakers shall have mechanical screw type removable connector lugs, AL/CU rated.
- J. Circuit Breaker Accessories: Provide shunt-trip units and auxiliary switches as indicated on the drawings or panel schedules.

## 2.6 METERING

- A. Provide energy metering at panelboards where indicated in the drawings. Energy meters shall be Square D PowerLogic EME Series or approved equal. Meter to be mounted in enclosure separate from panelboard and provided with (1) telecommunications outlet. Provide with EMCB option for Communication. Provide with EMBOND option for bonding.
- B. Provide quantity of CT's per meter as required for metering of loads indicated in the drawings.
- C. Provide Belden #9841 interface cable in conduit from panelboard power meter to building 480V main service power meter. Daisy chain interface cable between multiple panelboard power meters per manufacturer's instructions.

#### 2.7 FUSIBLE SWITCH ASSEMBLIES

- A. Fusible switches shall be quick-make, quick-break, load interrupter enclosed knife switches with externally operable handles. Provide interlock with defeat mechanism to prevent opening front cover with switch in ON position. Handle shall be lockable in OFF position.
- B. Fusible switches shall be equipped with rejection-type fuse clips designed to accommodate Class R current-limiting fuses only, except as otherwise indicated.

## PART 3 EXECUTION

#### 3.1 PREPARATION

A. Field Measurement: Verify that field measurements are as indicated and that equipment will fit in the available space while maintaining required working space clearances.

#### 3.2 DELIVERY, STORAGE AND HANDLING

- A. Inspect and report concealed damage to carrier within their required time period. Damaged equipment shall be replaced or repaired prior to installation.
- B. Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.

C. Store in a clean, dry environment. Maintain factory packaging. If required to protect equipment from dirt, water, construction debris and traffic, provide an additional heavy canvas or heavy plastic cover.

## 3.3 INSTALLATION

- A. Install panelboards in accordance with manufacturer's instructions.
- B. Install panelboards plumb. Recessed panelboards shall be installed flush with wall surface. Anchor panelboards to structure.
- C. Mount panelboards with top of trim 78 inches above the floor. Install panelboards taller than 78 inches with bottom no more than 4 inches above the floor. In no case shall the handle of any device be mounted more than 78 inches above the floor when in its highest position.
- D. Installation of panelboards that are flush mounted in walls shall be coordinated with other trades as required to maintain the integrity of fire-resistive walls. Where the wall is required to be fire-rated, the wall opening shall be lined with a 5/8 inch fire-rated gypsum board and all gaps shall be filled with fire-resistive intumescent sealant.
- E. Provide facilities for connection of future loads. Spare conduits shall be stubbed into the nearest accessible ceiling space or to another accessible location out of each recessed panelboard. Minimum spare conduits: Four (4) empty; identify each as SPARE.
- F. Circuit breakers shall be arranged to reflect the size and order shown on the panel schedules.
- G. Provide filler plates for unused spaces in panelboards.
- H. Neatly arrange and lace conductors in panelboards, gutters and terminal cabinets by means of nylon twine or wraps.
- I. Provide a typewritten circuit directory for each branch circuit panelboard. Directory cards shall be completely filled out with all circuits adequately marked. Spares shall be marked "Spare" in pencil. Directory cards shall indicate load served and room number for each circuit. The permanent room numbers, assigned by the Owner, shall be used on the directory cards. The Contractor shall verify the loads served by each existing circuit. Revise directories to reflect any circuiting changes.
- J. Provide typed or neatly handwritten circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- K. Provide (4) 1" spare conduits with pull string from each panelboard section up into nearest accessible ceiling for future.

## 3.4 ADJUSTMENT AND TESTING

- A. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's instructions.
- B. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.

- C. Measure steady state load currents at each panelboard feeder. If necessary, rearrange circuits in the panelboard to balance the phase loads to within 20 % of each other. Maintain proper phasing for multi-wire branch circuits.
- D. Upon completion of the above adjustment and testing, the Contractor shall energize the system and demonstrate proper operation of all equipment in the presence of the Owner's representative. Notify Owner's representative at least one (1) week in advance of the dates when the demonstration will be undertaken. Demonstration shall include:
  - 1. Apparatus arranged for manual operation shall be operated under power then returned to their normal position.
  - 2. Operation all control equipment and verify that it operates properly. Tests of control equipment shall include at least two operating cycles.
- E. Any deficiencies discovered as a result of the above tests shall be rectified and the work affected by such deficiencies shall be completely retested at the Contractor's expenses.
- F. Instruments, gauges, testing equipment, protective devices and safety equipment for all testing shall be provided by the Contractor. Energy for the tests will be furnished by the Owner.

# 3.5 TRAINING

- A. The Contractor shall provide one (1) hour minimum of training for maintenance personnel in the maintenance and operation of the equipment. Training shall also cover maintenance and operation of other similar equipment, including enclosed circuit breakers and safety switches.
- B. A training plan shall be submitted in advance for approval, outlining the topics to be covered, the publications to be used, and the training schedule.
- C. The training shall be conducted by personnel thoroughly familiar with the equipment and its features. The training shall include instruction and over-the-shoulder hands-on training. As a minimum, the training shall cover:
  - 1. Recommended maintenance procedures and intervals.
  - 2. Operation of all control equipment to demonstrate that is operates in accordance with the requirements of this section.

#### 1.1 SECTION INCLUDES

- A. Metering provisions
- B. Arrangement with Electric Power Utility Company for permanent electric service

#### 1.2 RELATED SECTIONS

- A. Section 26 05 26 Grounding and Bonding
- B. Section 26 05 30 Conduit
- C. Section 26 05 43 Ductbank

## 1.3 REFERENCES

- A. EUSERC Electrical Utility Service Equipment Requirements Committee
- B. UL 50 Electrical Cabinets and Boxes
- C. UL 414 Meter Sockets
- D. UL 869 Electrical Service Equipment

#### 1.4 SCOPE

- A. The Electric Power Utility Company will provide the primary conductors, pad mounted transformer, current transformers, meter and meter wiring
- B. The Contractor shall provide trenching, backfilling and conduit for the primary conductors, a transformer pad, secondary conductors and conduit, a metering transformer cabinet, meter base, meter conduit and all secondary work in addition to any other materials, equipment or labor required to completely install an operable system for service of electrical energy to the project.
- C. The Contractor shall adjust and test the electrical service equipment and shall place it as required to deliver electrical energy to the project.

#### 1.5 SUBMITTALS FOR REVIEW

- A. Product Data: Submit information covering every type of transformer cabinet and meter base to be provided on the project, as follows: Component list, descriptive bulletins, voltage, equipment ratings, including bus ampacities and withstand capacities, and conductor terminal sizes.
- B. Shop Drawings: For each item of service equipment, show the following: Outline and support points, with dimensions, location of neutral bus, wiring gutter dimensions, field connection locations, and anchorage details.

## 1.6 INFORMATION FOR O&M MANUAL

- A. Submittals: Information submitted for review.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and start-up of product.
- C. Maintenance Data: Furnish the following information: Replacement parts listing, including source, recommended maintenance procedures and intervals, and wiring diagrams.
- D. Test Reports: Indicate field test and inspection procedures and results.

## 1.7 RECORD DOCUMENTS

- A. Record final location of service equipment
- B. Record actual route and elevation of service conduits.

## 1.8 QUALITY ASSURANCE

A. Utility Service: Perform work in accordance with Electric Power Utility Company written requirements. Maintain one (1) copy of each document on site.

## 1.9 REGULATORY REQUIREMENTS

- A. Products: Service equipment shall be UL listed and classified as suitable for the indicated purpose.
- B. Where required by the Electrical Power Utility Company, service equipment shall comply with applicable EUSERC Standards.

## 1.10 PRE-INSTALLATION MEETING

A. Convene one (1) week prior to commencing service work. Review service entrance requirements and details with Electric Power Utility Company representative.

#### PART 2 PRODUCTS

#### 2.1 METERING CABINETS

- A. Description: Cabinet shall be sheet metal enclosure with cover, conforming to Electric Power Utility Company requirements, with provisions for locking and sealing. Enclosures located outdoors shall be NEMA 3R rated.
- B. Size: As required by Utility Company. Enclosure shall have adequate space for current transformers and wiring. Allow for proper bend radius and compression-type spade connectors on conductor terminations.

## 2.2 METER BASES

- A. Description: Meter base shall conform to Utility Company requirements, with ampere rating and number of sockets to match Utility Company meters. Enclosures located outdoors shall be NEMA 3R rated.
- B. Size: As required by Utility Company.

## PART 3 EXECUTION

## 3.1 PREPARATION

- A. Field Measurement: Verify that field measurements are as indicated, and that equipment will fit in the available space while maintaining required working space clearances.
- B. Examination: Verify that service equipment is ready to be connected and energized.
- C. Electric Service: Arrange with Electric Power Utility Company to obtain prompt delivery of permanent electric service to the Project as it is required. Only the signing of the request for service will not be the responsibility of the Contractor.
- D. Coordination: It shall be the responsibility of the Contractor to coordinate with the Electric Power Utility Company as required to provide service to the building in a timely manner. Service shall be of the type, voltage and phase characteristics indicated.

## 3.2 INSTALLATION

- A. Coordinate the service equipment installation with the Utility Company.
- B. Provide metering cabinet and meter base as required by Electric Power Utility Company
- C. Provide service conduits and conductors per Electric Power Utility Company requirements.
- D. Provide 1-1/4" conduit from Utility meter to building mechanical room for reporting to building EMS system.
- E. Where service conduits terminate at a riser pole, extend rigid steel conduit to height required by the Electric Power Utility Company. Mount conduit on the side of the pole where directed by the Utility Company. Provide mounting hardware per Utility Company requirements. Provide excess conductor length as required by Utility Company to leave drip loop in service conductors.

#### 3.3 ADJUSTMENT AND TESTING

- A. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Check tightness of bolted connections using calibrated torque wrench or torque screwdriver per manufacturer's instructions.
- B. Arrange for the Electric Power Utility Company to adjust voltage taps on transformer for optimum operating level. After making adjustments, the Contractor shall record secondary voltage phase-to-phase and phase-to-neutral for transformers. Include record of secondary voltage measurements in the "Operation and Maintenance Manuals."

- C. The Contractor shall notify the Owner's representative at least one week in advance of the dates when the above testing will be undertaken.
- D. Any deficiencies discovered as a result of the above tests shall be rectified, and the work affected by such deficiencies shall be completely retested at the Contractor's expense.
- E. Instruments, gauges, testing equipment, protective devices and safety equipment for all testing shall be provided by the Contractor.

## 1.1 SECTION INCLUDES

- A. Hinged cover enclosures
- B. Cabinets
- C. Terminal blocks
- D. Accessories

#### 1.2 RELATED SECTIONS

A. Section 26 27 27 - Supporting Devices

## 1.3 REFERENCES

- A. NECA Standard of Installation (National Electrical Contractors Association)
- B. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)
- C. NEMA ICS 4 Terminal Blocks for Industrial Control Equipment and Systems
- D. NFPA 70 National Electrical Code

#### 1.4 SUBMITTALS

A. Product Data: Provide manufacturer's standard data for enclosures, cabinets, terminal blocks, and accessories.

#### 1.5 REGULATORY REQUIREMENTS

A. Products: Listed and classified by Underwriters Laboratories, Inc. or other testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

#### PART 2 PRODUCTS

## 2.1 CABINETS AND HINGED COVER ENCLOSURES

- A. Manufacturers:
  - 1. Circle AW
  - 2. Hoffman
  - 3. Rittal
  - 4. Or approved equal
- B. Construction: NEMA 250, Type 1 steel enclosure, unless otherwise indicated.
- C. Size: As indicated on the drawings. If not so indicated, sized to accommodate all devices within.

- D. Covers: Continuous hinge, and flush lock keyed to match branch circuit panelboard.
- E. Interior Panels: Provide 14 gauge, white enamel, and removable panels for mounting of equipment or terminal blocks.
- F. Knockouts: Manufacturer's standard knockouts.
- G. Enclosure Finish: Manufacturer's standard gray baked enamel.
- H. Provide metal barriers to form separate compartments wiring of different systems and voltages.
- I. Provide accessory feet for free-standing equipment.

## 2.2 TERMINAL BLOCKS

- A. Terminal Blocks: NEMA ICS 4
- B. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
- C. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
- D. Provide ground bus terminal block, with each connector bonded to enclosure.

#### 2.3 FABRICATION

- A. Shop assemble enclosures and cabinets housing terminal blocks or electrical components in accordance with ANSI/NEMA ICS 6.
- B. Provide conduit hubs in exterior and wet locations and knockouts in interior dry locations.
- C. Provide protective pocket inside front cover with schematic diagram, connection diagram, and layout Drawing of control wiring and components within enclosure.

#### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation."
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section 26 27 27.
- C. Install cabinet fronts plumb.

## 3.2 CLEANING

- A. Clean electrical parts to remove conductive and harmful materials.
- B. Remove dirt and debris from enclosure.
- C. Clean finishes and touch up damage.

## 1.1 SECTION INCLUDES

- A. Wall switches
- B. Receptacles
- C. Device plates and decorative box covers

#### 1.2 RELATED SECTIONS

A. Section 26 05 32 - Boxes

## 1.3 REFERENCES

- A. NECA Standard of Installation
- B. NEMA WD 1 General Requirements for Wiring Devices
- C. NEMA WD 6 Wiring Device Dimensional Requirements
- D. NFPA 70 National Electrical Code

#### 1.4 SUBMITTALS FOR REVIEW

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

#### 1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

#### 1.6 REGULATORY REQUIREMENTS

A. Provide products listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

#### 1.7 EXTRA MATERIALS

A. Furnish two of each style, size, and finish wall plate.

#### PART 2 PRODUCTS

- 2.1 WIRING DEVICES
  - A. Wiring devices shall be of the same manufacturer insofar as possible. Devices shall be specification grade. General switches and receptacles shall be rated 20 amperes. Receptacles shall be grounding type. Devices shall be side wired only.
  - B. Except as otherwise specified on the drawings, wiring devices shall be Hubbell, Pass & Seymour, Cooper, or Leviton and shall be in accordance with the following schedule:

		Pass &		
	Hubbell	Seymour	Cooper	Leviton
Device	Catalog #	Catalog #	Catalog #	Catalog #
Single Pole Switch	1221	20AC1	1221	1221-2
Single Pole Switch w/pilot light (120V)	1221-PLC	20AC1-CPL	1221ILC	1221-PLC
2-pole Switch	1222	20AC2	1222	1222-2
3-way Switch	1223	20AC3	1223	1223-2
4-way Switch	1224	20AC4	1234	1224-2
Key Switch (Barrel Type)	1221-RKL	Equal	Equal	Equal
Duplex Receptacle, Half- Switched (20A)	BR20C1I	Equal	Equal	Equal
Duplex Receptacle, GFI	GF5362	Equal	Equal	Equal
Duplex Receptacle (20A, 125V)	CR5362	Equal	Equal	Equal
Single Receptacle (20A, 125V)	5361	Equal	Equal	Equal
Single Receptacle (30A, 125V)	9308	5920	5716N	5371
Single Receptacle (30A, 250V)	9330	5930	5700N	5372
Single Receptacle (30A, 125/250V)	9430	5744	9344N	278
Single Receptacle (50A, 250V)	9367	5950	5709N	5374
Single Receptacle (50A, 125/250V)	9450	5754	7985N	279

- C. Receptacles connected to generator supplied circuits shall be RED in color. Hubbell #CR5362. Confirm color of all devices with Owner prior to order.
- D. Receptacles connected to UPS supplied circuits shall be BLUE in color. Hubbell #CR5362. Confirm color with Owner prior to order.
- E. Wiring device colors shall be as selected by the Architect. Cover plates shall be stainless steel.
- F. Where only one receptacle, single or duplex, is supplied by a branch circuit (dedicated circuit), the receptacle shall have the same ampere rating as the overcurrent protective device ahead of the circuit.
- G. Where receptacles are provided for equipment not having grounding-type cords and cord caps, the Contractor shall furnish and install new cords and cord caps on equipment to match new receptacles.
- H. Key operated switches shall be same as above except with lock type mechanism. All switches shall use the same key.
- I. Weatherproof devices shall be the same as standard devices except with die-cast lockable weatherproof plate equal to Intermatic #WP1010HMC.
- J. Switch and receptacle combinations shall be devices as above in a 2-gang box.

- K. Ground fault interrupting receptacles shall be duplex type with "Test" and "Reset" buttons. Receptacle shall have feed-through provisions for protection of downstream receptacles. Unit shall be complete with cover plate. Receptacles located on the building exterior, in toilet rooms, and elsewhere as shown on the drawings shall be GFI type. Receptacles located within 6 feet of a water source or sink edge shall be GFI type. Provide cast weatherproof cover plates with hinge on top for receptacles on the building exterior.
- L. Dropcords shall have Kellems K022-16-005 or K073-04-1279 cable grips with Kellems K203-02-001 springs supporting 600V, type SO cable and twistlock connector body. Dropcords shall be in conformance with the following schedule:

0			
	Connector Body	Type SO Cable	
120V, 15 Amp	Hubbell #2323	3/C-#12	
120V, 20 Amp	Hubbell #2313	3/C-#12	
120V, 30 Amp	Hubbell #2613	3/C-#10	
120V, 50 Amp	Hubbell #3762	3/C-#6	

- M. Provide half-controlled, switched receptacles where called for on the drawings. Switched receptacles shall be factory marked to indicate the controlled plug. Device tabs shall be factory broken to allow switched and unswitched plugs within the same duplex outlet. See 2.1(C) this section for product specifications. Switched receptacles shall be controlled by the room occupancy sensor via a switching device of the same manufacturer as the lighting control system. Refer to section 26 09 43 for details.
- N. 120V 15A and 20A receptacles located below 5-1/2 feet in all areas of educational facilities shall be tamper resistant type per NEC 406.12.

## 2.2 DEVICE PLATES

- A. Device boxes and blanked outlets shall have stainless steel plates equal to Sierra S-Line. Blank outlet plates shall be factory marked to identify the system to which it is connected. Stainless steel plates shall be 0.04 inch thick with #302 satin finish.
- B. Recessed wall plates for wall mount TV locations shall be equal to Hubbell netSELECT series flat panel connection enclosure.

## PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that outlet boxes are installed at proper height.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

## 3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

#### 3.3 INSTALLATION

- A. Install devices plumb and level.
- B. Install switches with OFF position down.
- C. Do not share neutral conductor on load side of dimmers.
- D. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- E. Unless otherwise indicated, switches and receptacles shall be oriented vertically, except that horizontal orientation shall be permitted above counters where vertical space is constricted. Weatherproof receptacles shall be mounted horizontally with the hinge at the top.
- F. Unless otherwise indicated, switches shall be mounted with bottom of the outlet box at 48 inches above the floor. Over counter receptacles shall be mounted with center 8 inches above counter top or higher where required to clear backsplash. Unless otherwise indicated, other receptacles shall be mounted with bottom of the outlet box at 16 inches above floor. Receptacles for equipment shall be mounted at a height appropriate for connection to the equipment.
- G. Receptacles for electric water coolers shall be concealed behind the water cooler enclosure.
- H. Where vertically oriented, receptacles shall be installed with the grounding slot at the bottom. Where horizontally oriented, receptacles shall be installed with the grounding slot to the right.
- I. Wiring shall be connected to the side wiring terminals on wiring devices.
- J. Barrel type keyed switches shall be used to control lighting in corridors, gyms, cafeterias and restrooms. Excludes single occupant restrooms.
- K. All weatherproof switch and receptacle covers shall be professionally powder-coated to match adjacent finishes. Coordinate finish color with architect.

#### 3.4 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

## 3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

# 3.6 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

## 1.1 SECTION INCLUDES

- A. Conduit and equipment supports
- B. Anchors and fasteners
- 1.2 REFERENCES
  - A. NECA Standard of Installation (National Electrical Contractors Association)
  - B. NFPA 70 National Electrical Code

## 1.3 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Section 26 01 02.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.

#### 1.4 PROJECT FINALIZATION

- A. Submit under provisions of Section 26 01 02.
- B. Operation and Maintenance Data: Include manufacturer's descriptive literature, installation instructions, maintenance and repair data, and parts listing.

# 1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

#### PART 2 PRODUCTS

#### 2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Corrosion resistant.
- B. Select materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit, including weight of wire in conduit.
- C. Anchors and Fasteners:
  - 1. Concrete Structural Elements: Use precast inserts, expansion anchors and preset inserts.
  - 2. Steel Structural Elements: Use beam clamps, spring steel clips, and welded fasteners.
  - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
  - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
  - 5. Solid Masonry Walls: Use expansion anchors and preset inserts.
  - 6. Sheet Metal: Use sheet metal screws.
  - 7. Wood Elements: Use wood screws.

## 2.2 FORMED STEEL CHANNEL

- A. Manufacturers:
  - 1. B-Line or equal
- B. Description: Galvanized steel or zinc plated.

## 2.3 HANGERS & STRAPS

- A. One or two hole pipe straps shall be Kindorf HS-100 or HS-900.
- B. Lay-in pipe hangers shall be Kindorf C-149.
- C. Trapeze or wall surface supports shall be Kindorf "bolt-hole" base galvanized steel channels with C105 and C106 single bolt pipe straps.

## 2.4 ROOF CONDUIT SUPPORTS

A. Cooper B-Line Dura-Blok supports or approved equal.

## PART 3 EXECUTION

## 3.1 INSTALLATION

- A. Locate and install anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
  - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
  - 2. Do not drill or cut structural members.
  - 3. Obtain permission from Architect/Engineer before drilling or cutting structural members.
  - 4. Untopped Structural Decking is not a structural support for building systems such as mechanical, electrical, audio visual, fire protection etc. to be hung from; coordinate systems to be structurally supported from building joists and beams.
- B. Fabricate supports from structural steel or formed steel members. Rigidly weld members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- C. Secure floor mounted equipment to floor with machine bolts and anchors in accordance with the manufacturer's recommendations and seismic requirements.
- D. Install surface-mounted cabinets and panelboards with minimum of four (4) anchors. Cabinets and panelboards shall not be secured to hollow masonry, plaster, or gypsum board partitions - provide additional blocking as required between studs to securely anchor the cabinet or panelboard.
- E. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
- F. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- G. Multiple rows of suspended conduit shall be supported from trapeze style hangers, providing 20% spare room for future electrical raceways.

- H. Multiple runs of conduit on ceiling or wall surfaces shall be mounted on flush or surface steel channels in unfinished areas.
- I. Where raceways traverse across flat roofs, conduit shall be supported every 8 feet on center.

#### 1.1 SECTION INCLUDES

- A. Fuses for use in power distribution circuits
- B. Spare fuse cabinet
- 1.2 RELATED SECTIONS
  - A. Section 26 28 16 Safety Switches

## 1.3 REFERENCES

- A. NEMA FU1 Low Voltage Cartridge Fuses
- B. UL 50 Enclosures for Electrical Equipment
- C. UL 198C High-Interrupting-Capacity Limiting Type Fuses
- D. UL 198D High-Interrupting-Capacity Class K Fuses
- E. UL 198E Class R Fuses
- F. UL 198H Class T Fuses

#### 1.4 SCOPE

A. The Contractor shall provide fuses as indicated on the drawings and associated schedules.

## 1.5 SUBMITTALS FOR REVIEW

- A. Product Data: Submit information covering every type of fuse to be provided on the project as follows: Component list, descriptive bulletins, voltage, and interrupting capacity ratings.
- B. Shop Drawings: For each spare fuse cabinet, show the following: Outline and support points, with dimensions.
- 1.6 INFORMATION FOR O & M MANUAL
  - A. Submittals: Information submitted for review.

#### 1.7 RECORD DOCUMENTS

- A. Record final fuse size used for each set of fuses.
- B. Record final location of spare fuse cabinet.

# 1.8 QUALITY ASSURANCE

A. Products: Fuses shall be manufactured in accordance with the latest revision of NEMA FU1.

## 1.9 REGULATORY REQUIREMENTS

A. Products: Fuses shall be UL listed and classified as suitable for the purpose indicated.

## 1.10 MAINTENANCE MATERIALS

- A. Provide 10 % spare fuses, but not less than three (3) of each size and type used on the project.
- B. Furnish two (2) fuse pullers of each type required to facilitate removal of fuses provided on project.

## PART 2 PRODUCTS

## 2.1 FUSES

- A. Manufacturers: Bussman, Shawmut, and Littlefuse.
- B. Fuses shall be provided as indicated on the drawings and shall be current-limiting type.
- C. Fuses in switchboards shall be Class L or Class J type, unless otherwise indicated on the drawings and/or associated schedules.
- D. Fuses in safety switches, busway plug-in units, and panelboards shall be Class RK1, unless otherwise indicated on the drawings and/or associated schedules.
- E. Fuses in combination motor starters and fuses protecting motors or transformers shall be Class RK5 dual-element time-delay type.
- F. Interrupting Capacity: 200,000 amperes RMS symmetrical.
- G. Provide one (1) complete set (3 per size) of spare fuses in a metal cabinet.
- H. Provide fusing as follows:

MAIN SWITCHES	250V	600V
0-600A	LPNRK	LPSRK
ABOVE 600A	KRPC	KRPC
FEEDERS		
0-600A	LPNRK	LPSRK
ABOVE 600A	KRPC	KRPC
GENERAL PURPOSE	FRNR	FRSR
TRANSFORMERS (LINE	LPNRK	LPSRK
SIDE		

#### 2.2 SPARE FUSE CABINET

- A. Description: Surface-mounted galvanized steel sheet metal cabinet with shelves, suitably sized to store spare fuses and fuse pullers specified. Trim shall be same height and width as box.
- B. Doors: Trim shall be supplied with a hinged door. Door shall be flush with trim. Door shall have a flush cylinder lock and catch assembly.

- C. Lock: Door lock shall be flush cylinder type, keyed same as panelboard locks.
- D. Finish: Finish cabinet with one coat of zinc chromate and one coat of gray baked enamel.

# PART 3 EXECUTION

## 3.1 INSTALLATION

- A. Install fuses in accordance with manufacturer's instructions.
- B. Install each fuse with label oriented such that manufacturer, type, and size are easily read.
- C. Install spare fuse cabinet plumb on wall. Anchor cabinet to structure. Neatly arrange spare fuses and fuse pullers in cabinet.

## 1.1 SECTION INCLUDES

- A. Fusible switches
- B. Non-fusible switches

#### 1.2 RELATED SECTIONS

A. Section 26 28 13 - Fuses

## 1.3 REFERENCES

- A. NEMA KS1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
- B. UL 50 Electrical Cabinets and Boxes
- C. UL 98 Enclosed and Dead Front Switches
- D. UL 512 Fuseholders
- E. UL 869 Electrical Service Equipment

#### 1.4 SCOPE

- A. The Contractor shall provide safety switches as indicated on the drawings and associated schedules.
- B. The Contractor shall adjust and test the safety switches.

## 1.5 SUBMITTALS FOR REVIEW

- A. Product Data: Submit information covering every type of fused switch to be provided on the project, as follows: component list; descriptive bulletins; voltage; ampere and horsepower ratings; and conductor terminal sizes.
- B. Shop Drawings: For each safety switch, show the following: outline and support points, with dimensions; location of neutral and ground buses; wiring gutter dimensions.

#### 1.6 INFORMATION FOR O&M MANUAL

- A. Submittals: Information Submitted for Review.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protections, examination, preparation and installation of product.
- C. Maintenance Data: Furnish the following information:
  - 1. Replacement parts listing, including source.
  - 2. Recommended maintenance procedures and intervals.

## 1.7 QUALITY ASSURANCE

A. Products: Safety switches shall be designed and manufactured in accordance with the latest revision of NEMA KS1.

## 1.8 REGULATORY REQUIREMENTS

A. Products: Safety switches shall be UL listed and classified as suitable for the purpose indicated.

# PART 2 PRODUCTS

## 2.1 GENERAL DESCRIPTION

- A. Manufacturers: Eaton Electrical, General Electric, and Square D.
- B. Type: Safety switches shall be enclosed heavy-duty type, with externally operable handle and enclosed load-interrupter knife switch.
- C. Construction: Switch mechanism shall be quick-make quick-break type, such that the operation of the contacts shall not capable of being restrained by the operating handle after the closing or opening action of the contacts has started.
  - 1. The handle shall travel at least 90 degrees between ON and OFF positions so the handle position is easily recognizable. Facilities shall be provided for padlocking handle in OFF position.
  - 2. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the ON position.
  - 3. Switches shall have line terminal shields.
  - 4. Current carrying parts shall be plated to resist corrosion.
  - 5. Switches shall have removable arc suppressors to facilitate easy access to line side lugs.
- D. Neutral Bus: A full-size insulated neutral bus shall be included in safety switches indicated with neutral. Neutral busing shall have suitable lugs for each incoming and outgoing circuit requiring a neutral connection.
- E. Ground Bus: A copper ground bus capable of being isolated shall be included in each safety switch. The ground bus shall be bonded to the switch enclosure, except where isolated ground bus is indicated. Ground busing shall have suitable lugs for the equipment grounding conductors associated with the incoming and outgoing circuits and for any bonding conductors.
- F. Enclosures: Rated to suit the installation location. Indoor switches shall have NEMA Type 1 general purpose enclosures, except as otherwise indicated on the drawings. Unless otherwise indicated, switches installed outdoors shall have NEMA Type 3R raintight enclosures.
  - 1. Enclosures shall be made from galvanized steel.
  - 2. Provide adequate gutter space for wire bending and termination. Where conductors supplying a safety switch are carried through its enclosure to supply other electrical equipment, the enclosure shall be sized to include the additional required wiring space.

#### 2.2 FUSIBLE SWITCHES

- A. Fuse Clips: Fusible switches shall be equipped with rejection-type fuse clips designed to accommodate Class R current-limiting fuses only, except as otherwise indicated.
- B. Service Equipment: Fusible switches used as service-entrance equipment shall be UL listed and labeled as suitable for such use.

## PART 3 EXECUTION

## 3.1 PREPARATION

A. Field Measurement: Verify that field measurements are as indicated and that equipment will fit in the available space while maintaining required working space clearances.

## 3.2 DELIVERY, STORAGE AND HANDLING

- A. Inspect and report concealed damage to carrier within their required time period. Damaged equipment shall be replaced or repaired prior to installation.
- B. Handle carefully to avoid damage to safety switch internal components, enclosure, and finish.
- C. Store in a clean, dry environment. Maintain factory packaging. If required to protect equipment from dirt, water, construction debris, and traffic, provide an additional heavy canvas or heavy plastic cover.

## 3.3 INSTALLATION

- A. Install safety switches in accordance with manufacturer's instructions.
- B. Install safety switches plumb. Anchor safety switches to structure.
- C. Mount safety switches with top of operating handle 54 inches above floor when in its highest position, except as otherwise indicated. In no case shall the handle be mounted more than 78 inches above the floor when in its highest position.
- D. Neatly arrange and lace conductors in safety switch enclosures by means of nylon twine or wraps.
- E. Apply adhesive tag on inside door of each fusible switch indicating fuse class and size installed.

#### 3.4 ADJUSTMENT AND TESTING

- A. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Check tightness of bolted connections using calibrated torque wrench or torque screwdriver per manufacturer's instructions.
- B. Inspect complete installation for physical damage, proper alignment, anchorage and grounding.

- C. Upon completion of the above adjustment and testing, the Contractor shall energize the system and demonstrate proper operation of all equipment in the presence of the Owner's representative. Notify Owner's representative at least one week in advance of the dates when the demonstration will be undertaken. Demonstration shall include:
  - 1. Apparatus arranged for manual operation shall be operated under power then returned to their normal position.
- D. Any deficiencies discovered as a result of the above tests shall be rectified and the work affected by such deficiencies shall be completely retested at the Contractor's expense.
- E. Instruments, gauges, testing equipment, protective devices and safety equipment for all testing shall be provided by the Contractor. Energy for the tests will be furnished by the Owner.

#### 1.1 SECTION INCLUDES

- A. Molded-case enclosed circuit breakers
- 1.2 RELATED SECTIONS
  - A. Section 26 05 53 Electrical Identification: Engraved nameplates
  - B. Section 26 27 27 Supporting Devices

#### 1.3 REFERENCES

- A. NEMA AB1 Molded Case Circuit Breakers
- B. UL 50 Enclosures for Electrical Equipment
- C. UL 489 Molded Case Circuit Breakers and Circuit Breaker Enclosures
- D. UL 869 Electrical Service Equipment
- E. UL 943 Ground-Fault Circuit Interrupters

#### 1.4 SCOPE

- A. The Contractor shall provide enclosed circuit breakers as indicated on the drawings and associated schedules.
- B. The Contractor shall adjust and test the enclosed circuit breakers.

#### 1.5 SUBMITTALS FOR REVIEW

- A. Product Data: Submit information covering every type of enclosed circuit breaker to be provided on the project, as follows: Component list, descriptive bulletins, voltage, interrupting capacity ratings, conductor terminal sizes, trip units, if applicable, and accessories.
- B. Shop Drawings: For each enclosed circuit breaker, show the following: Outline and support points, with dimensions, location of neutral and ground buses, and wiring gutter dimensions.

#### 1.6 PROJECT FINALIZATION

- A. Submit under provisions of Section 26 01 02.
- B. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- C. As-Built Drawings: Record final location of each enclosed circuit breaker.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with the manufacturer.

## 1.7 QUALITY ASSURANCE

- A. Products: Circuit Breakers shall be manufactured in accordance with the latest revision of NEMA AB1.
- 1.8 REGULATORY REQUIREMENTS
  - A. Products: Enclosed circuit breakers shall be UL listed and classified as suitable for the purpose indicated.
- 1.9 WARRANTY
  - A. Submit under provisions of Section 26 01 02.
  - B. The enclosed transfer switch furnished under this section shall be guaranteed against defective parts or workmanship for a period of one year after the date of substantial completion. The guarantee shall cover full parts and labor.
- PART 2 PRODUCTS

## 2.1 GENERAL DESCRIPTION

- A. Manufacturers: Eaton Electrical, General Electric, and Square D.
- B. Type: Enclosed circuit breakers shall be provided with dead-front enclosures. The circuit breaker handle or operating mechanism shall be accessible through the front cover.
- C. Neutral Bus: A full-size insulated neutral bar shall be included in each enclosed circuit breaker indicated with neutral. Neutral busing shall have suitable lugs for all incoming and outgoing circuits requiring a neutral connection.
- D. Ground Bus: A copper ground bus capable of being isolated shall be included in each enclosed circuit breaker. The ground bus shall be bonded to the enclosure, except where ground bus is indicated to be isolated. Ground busing shall have suitable lugs for the equipment grounding conductors associated with all incoming and outgoing circuits and for any bonding conductors.
- E. Enclosures: Enclosures shall be suitable for locations as indicated on the drawings. Except as otherwise indicated, enclosures located indoors shall be NEMA Type 1 general purpose enclosures, and enclosures located outdoors shall be NEMA Type 3R rain-tight enclosures.
  - 1. Enclosed circuit breakers shall be surface-mounted or flush-mounted as indicated. Surface trims shall be same height and width as box. Flush trims shall overlap the box by <sup>3</sup>/<sub>4</sub> inch on all sides.
  - 2. Enclosures shall be made from galvanized steel. Provide adequate gutter space for wire bending and termination. Where conductors supplying the enclosed circuit breaker are carried through its box to supply other electrical equipment, the enclosure shall be sized to include the additional required wiring space.
- F. Finish: In finished areas, finish enclosed circuit breakers with one coat of zinc chromate and one coat of primer sealer. In all other locations, finish enclosed circuit breakers with one coat of zinc chromate and one coat of gray baked enamel.

G. Service Equipment: Enclosed circuit breakers used as service-entrance equipment shall be UL listed and labeled as suitable for such use.

## 2.2 SHORT CIRCUIT RATINGS

- A. Each enclosed circuit breaker shall be labeled with a UL integrated equipment short circuit rating. All circuit breakers shall have the interrupting capacity rating as indicated without relying upon series-connected ratings.
- B. Enclosed circuit breakers applied at 240 volts or less shall have short circuit ratings as indicated on the drawings and/or associated schedules, but not less than 10,000 amperes RMS symmetrical.
- C. Enclosed circuit breakers applied at 480 volts or less shall have short circuit ratings as indicated on the drawings and/or associated schedules, but not less than 14,000 amperes RMS symmetrical.
- D. Series rated equipment is not permitted. All equipment shall be fully rated.

## 2.3 CIRCUIT BREAKERS

- A. Circuit breakers shall be molded-case type, with inverse time and instantaneous tripping characteristics. Breakers shall be fully rated, bolt-on type. Series rated breakers are not acceptable.
- B. Each circuit breaker shall be operated by a single toggle-type handle and shall have a quickmake, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle positions. Contacts shall be non-welding silver alloy type with arc extinction chutes. Multiple-pole circuit breakers shall be common trip.
- C. Where indicated, circuit breakers shall be current-limiting type. Such circuit breakers shall have automatically-resetting current limiting elements in each pole, coordinated with the thermal and instantaneous trip elements. Let-through current and energy level shall be less than permitted for same size Class RK-5 fuse.
- D. The trip rating of each unit shall be clearly indicated and visible or identified on a permanently affixed nameplate. Adjustments shall be accessible without removing covers, unless such removal does not require use of tools.
- E. Where serving NEC 700 or 702 systems, circuit breakers shall be equipped with a tripping system consisting of three (3) current sensors, a trip unit, and a flux-transfer shunt trip. The trip unit shall provide adjustable time-current protection functions. Interchangeable rating plugs shall establish the continuous trip ratings of each circuit breaker. The trip unit shall include adjustments for:
- F. Long-time pick-up and delay
- G. Short-time pick-up and delay, with I2t curve-shaping option
- H. Instantaneous pick-up
- I. The trip rating of the circuit breakers shall be imprinted in the handle.

- J. Ground fault interrupting circuit breakers shall have "Test" button and pigtail for neutral connection.
- K. Circuit breakers located in non-air conditioned spaces or outside the building shall be ambient compensated type.
- L. Circuit breakers used for switching lighting circuits shall be UL labeled "SWD".
- M. Circuit breakers used for air conditioning equipment shall be UL labeled "HACR".
- N. Circuit breakers shall have mechanical screw type removable connector lugs, AL/CU rated.

## 2.4 ACCESSORIES

- A. Handle Lock: Enclosed circuit breakers shall include provisions for padlocking.
- B. Provide kirk-key interlocks, shunt trips, and auxiliary switches as indicated on the drawings.

## PART 3 EXECUTION

## 3.1 PREPARATION

A. Field Measurement: Verify that field measurements are as indicated and that the equipment will fit in the available space while maintaining required working clearances.

## 3.2 DELIVERY, STORAGE AND HANDLING

- A. Inspect and report concealed damage to carrier within their required time period. Damaged equipment shall be replaced or repaired prior to installation.
- B. Handle carefully to avoid damage to enclosed circuit breaker internal components, enclosure and finish.
- C. Store in a clean, dry environment. Maintain factory packaging. If required to protect equipment from dirt, water, construction debris and traffic, provide an additional heavy canvas or heavy plastic cover.

#### 3.3 INSTALLATION

- A. Install enclosed circuit breakers in accordance with manufacturer's instructions.
- B. Install enclosed circuit breakers plumb. Recessed enclosed circuit breakers shall be installed flush with wall surface. Anchor enclosed circuit breakers to structure.
- C. Mounting Height: 60 inches to operating handle.
- D. Neatly arrange and lace conductors in enclosures by means of nylon twine or wraps.

## 3.4 ADJUSTMENT AND TESTING

A. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Check tightness

of bolted connections and circuit breaker connections using calibrated torque wrench for torque screwdriver per manufacturer's instructions.

- B. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.
- C. Adjust trip settings so that circuit breakers coordinate with other overcurrent protective devices in circuit, yet provide adequate protection from overcurrent and fault currents.
- D. Upon completion of the above adjustment, the Contractor shall energize the system and demonstrate proper operation of all equipment and materials in the presence of the Owner's representative. Notify Owner's representative at least one (1) week in advance of the dates when the above demonstration will be undertaken. Demonstration shall include:
- E. Apparatus arranged for manual operation shall be operated under power then returned to their normal position.
- F. Operate all control equipment and verify that it operates properly. Tests of control equipment shall include at least two operating cycles.
- G. Any deficiencies discovered as a result of the above tests shall be rectified and the work affected by such deficiencies shall be completely retested at the Contractor's expenses.
- H. Instruments, gauges, testing equipment, protective devices and safety equipment for all testing shall be provided by the Contractor. Energy for the tests will be furnished by the Owner.

#### 1.1 SECTION INCLUDES

- A. This Section includes photovoltaic (PV) panels and their associated mounting systems, photovoltaic system, inverters, and Data Acquisition System (DAS).
- 1.2 RELATED SECTIONS
  - A. Section 26 01 01 Basic Electrical Requirements
  - B. Section 26 05 26 Grounding and Bonding
  - C. Section 26 05 19 Building Wire and Cable
  - D. Section 26 05 30 Conduit
  - E. Section 26 05 32 Boxes
  - F. Section 26 28 16 Enclosed Switches
  - G. Section 26 28 17 Enclosed Circuit Breakers

## 1.3 REFERENCES

- A. American National Standards Institute (ANSI):
  - 1. C12.1: Standard for Electricity Meters.
  - 2. C12.20: Standard for Electrical Meters.
- B. The Institute of Electrical and Electronics Engineers, Inc (IEEE):
  - 1. IEEE 929: Recommended Practice for Utility Interface of Intermediate PV Systems.
  - 2. IEEE 80: Recommended Grounding Practices.
- C. Underwriters Laboratories, Inc. (UL):
  - 1. 1741: Standard for Safety for Static Inverters, Converters, Controllers, and Interconnection System Equipment for Use in Photovoltaic Power Systems.
  - 2. 1703: Standard for Flat-Plate Photovoltaic Modules and Panels.
- D. International Electrotechnical Commission (IEC)
  - 1. 61727: Photovoltaic (PV) Systems Characteristics of the utility interface
  - 2. 62109-1: Safety of power converters for use in photovoltaic power systems Part 1: General Requirements
  - 3. 62109-2: Safety of power converters for use in photovoltaic power systems Part 2: Requirements for inverters

## 1.4 SUBMITTALS FOR REVIEW

A. Product Data: Submit for panels, mounting hardware, inverters, Data Acquisition System (DAS), combiner boxes, wiring, conduits, disconnect switches, fuses, accessories, and components indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

- B. Site Parameters Report: Submit report identifying environmental and bioclimatic conditions at site including, but not limited to, solar irradiation, solar insolation, altitude, humidity, maximum temperature, minimum temperature, rooftop ambient temperature, and seasonal ambient conditions that impact energy production of PV system.
- C. Shop Drawings: For PV system and related equipment, submit the following:
  - 1. Detailed system calculations, dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
    - a. PV system array and equipment layouts.
    - b. Mounting system and associated structural calculations.
    - c. Mounting angle
    - d. Sections and elevations.
    - e. Roof penetrations.
    - f. Construction staging and storage areas.
    - g. Test reports.
    - h. System weight, including subtotals by area.
  - 2. Wiring Diagrams: Submit complete wiring diagrams indicating required power, signal, monitoring, and control wiring. Include all single line diagrams, overcurrent protection sizes, wire sizes, and similar information. Wiring diagrams shall differentiate between manufacturer-installed and field-installed wiring details.
- D. PV Data Monitoring: For data monitoring, submit the following product data:
  - 1. Technical specifications for measurement devices to be utilized.
  - 2. Catalog cut sheets of all devices to be used. Clearly indicate which model number is being submitted on all cut sheets.
  - 3. Technical specifications for all types of wires to be provided.
  - 4. One example of charts and reports as described herein.
  - 5. Identification of deviations from materials or methods described in this Section.
  - 6. Proofs of all display screens for owner editing and approval. Refer to Part 2 Article on PV data monitoring system.
- E. Factory Test Reports: Solar panels and inverters.
- F. Field Test Reports: Submit written test reports; include the following:
  - 1. Test procedures used.
  - 2. Final test results. Include all test results and demonstrate their comparison to and compliance with requirements. Provide test results on uplift of the pedestals supporting PV systems.
  - 3. Report shall include results of all failed tests and corrective action taken to achieve test results that comply with requirements.
- G. Operation and Maintenance Manuals:
  - 1. Each item of equipment and each system: Include description of unit or system, and component parts. Give function, normal operating characteristics, and limiting conditions. Include commercial number of replaceable parts.
  - 2. Provide approved engineering submittals. Include equipment sizing calculations.
  - 3. Provide manufacturer's installation wiring diagrams and schematic diagrams.
  - 4. Include as-installed color-coded wiring diagrams and schematic diagrams with wire functions labeled on the diagrams.

- 5. Operating procedures: Include routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instruction. Include summer, winter, and any special operating instructions. Include the preferred mounting angle of solar panels for optimum performance throughout the year.
- 6. Maintenance requirements: Include required materials, routine procedures and guide for cleaning, troubleshooting, and repairing solar panels including disassembly, repair and reassembly instructions, alignment, adjusting, balancing, and checking instructions. Include procedures for testing printed circuit boards, cells, and modules.
- 7. Include manufacturer's printed installation manuals, operation and maintenance instructions, and repair guides.
- 8. Provide manufacturer's control diagram and repair guide for each piece of equipment.
- 9. Provide original manufacturer's parts list, illustration, assembly drawings, repair guide, and diagrams required for maintenance.
- 10. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- 11. Provide a screen shot of each display page of DAS output.
- 12. For PV systems with solar panels installed in a manner that limits maintenance access to less than two sides of each solar panel, provide preferred method for servicing and maintaining solar panels.
- 13. Spare parts inventory: List of spare parts being turned over to owner at completion of project, and list of spare part required for ongoing maintenance of system.

## 1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Product Selection for Mounting:
  - 1. Support PV systems associated with new construction using fixed mounted system as specified herein and in contract documents.
- B. Structural Performance: Provide mounting systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Design loads
  - 2. Dead loads
  - 3. Wind loads
  - 4. Seismic loads
  - 5. Load combinations

#### 1.6 QUALITY ASSURANCE

- A. All materials supplied for this project shall be new.
- B. Source Limitations: Use Silfab 490W modules, or an approved equal. Mounting for PV system specified in this Section shall be from single manufacturer. PV system inverters shall be from single manufacturer. PV system DC combiner boxes and AC combiner panels shall be from single manufacturer.
- C. Manufacturer: Manufacturer of any PV equipment shall be company specializing in manufacturer of PV equipment and have at least 5 years of documented experience with their hardware in commercial applications in field.
- D. Listing and Labeling: Electrical components, devices, and accessories, list, and label, as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- E. Certificate of Compliance: Provide certificate of compliance to referenced standards from manufacturer of PV Systems.
- F. Qualifications:
  - 1. Provide qualifications of Testing Facility and individual who will be performing tests.
  - 2. Installation Personnel: Submits evidence prior to work that persons who are to perform work herein have appropriate training or experience in PV system installation and design and hold proper licenses where applicable.
- G. Preinstallation Conference: Before installation of PV system begins, conduct pre-installation conference at project site with installers, power monitoring system supplier and other interested parties to review procedures, schedules, safety, and coordination of installation with other elements of the work. Contractor shall notify architect of anticipated date of this conference at least three weeks prior to meeting. Several conferences may be needed, depending upon system complexities and construction schedule.

# 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and receive all PV system materials required for the work.
- B. Prior to and during construction, provide secure storage on site for all PV system materials stored on site.
- C. Store and handle to comply with manufacturer's directions, and as required to prevent damage to glass, PV materials, and system component electronics.
- D. If stored in areas subjected to weather, cover PV panels and system component electronics to provide protection from weather, dirt, dust, corrosive substances, and physical damage.
- E. Replace any scratched or damaged PV system materials or system components.

### 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following site-specific conditions, unless otherwise indicated:
  - 1. Ambient Temperature: 0 deg C to 48 deg C.
  - 2. Altitude: 1900'.
  - 3. Relative humidity: 95% non-condensing ambient.

## 1.9 COORDINATION

- A. Coordinate layout and installation of PV System and components with other construction, including conduit, piping, equipment, roof drains, roof penetrations, antennas, and adjacent obstructions and surfaces. Maintain required clearances for workspace and equipment access.
- B. Coordinate size and locations of mounting bases with structural.

- C. Coordinate system with structural capability of roof structure. Coordination of loading from PV mounting system with design of building is responsibility of Structural Engineer of Record.
- D. Coordinate Roof Slope: Project-specific application will define PV system slope; however, mounting system requires coordination with roof slope for water drainage.
- E. Coordination With Roof Membrane: Contractor shall coordinate type, thickness, and construction of roof membrane. PV System shall be able to function with installed roof membrane and not create leaks in roof. Contractor shall ensure that PV system does not cause roof to leak.
- F. Provide system technical coordination for utility interconnection agreements. Provide Photovoltaic sequence of operation.

#### 1.10 WARRANTIES

- A. General: Provide 5 years of technical phone support for technicians and designated maintenance personnel for PV system components and Data Acquisition System (DAS).
- B. PV Panels: Panels installed in system shall have 10-year product warranty from written acceptance of PV system by owner, to exhibit power output of not less than 80 percent of rated power specified at time of delivery. If during this period any solar panels exhibits power output of less than 80 percent, manufacturer shall replace affected solar panels.
- C. All PV mounting structures shall have 20 years design life.
- D. Power Conditioning Equipment: Power conditioning equipment shall have 5-year product warranty from written acceptance of PV system by owner, with option to purchase 10-year warranty. During warranty period, manufacturer shall repair or replace power conditioning unit. Warranty shall include on-site troubleshooting completed by local electrician with phone support from equipment manufacturer.

# 1.11 EXTRA MATERIALS

- A. Based upon systems used for this project, furnish extra materials described below that match products installed, packaged with protective covering for storage, and identified with labels describing contents.
  - 1. Solar panels: 5
  - 2. Fuses: 5 of each type/model used in the PV system
  - 3. Connectors: 10 of each type/model used in the PV system

#### 1.12 MAINTENANCE SERVICE

- A. Continuing Maintenance Proposal:
  - 1. Furnish proposal from Installer to Owner for continuing maintenance agreement for period of five one-year, annually renewable periods starting from end of Initial Maintenance Period. State services, obligations, conditions, and terms of agreement period; intent is to obtain full-service coverage. Services shall include annual inspections and annual 4-hour on-site refresher training. Services are not intended to cover costs of parts and labor resulting from system damage due to significantly unusual natural forces or vandalism.

2. Upon execution of agreement with Owner, commence maintenance service on date when initial maintenance services are concluded.

# PART 2 PRODUCTS

# 2.1 MANUFACTURERS

- A. Solar Panel Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Silfab
  - 2. Canadian Solar
  - 3. SunPower
  - 4. Approved equal
- B. String Inverter Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. SolarEdge
  - 2. Canadian Solar
  - 3. SMA
  - 4. Approved equal
- C. PV Mounting System: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. K2 systems
  - 2. UniRac
  - 3. Approved equal

## 2.2 GENERAL

- A. Solar Panel Electrical Termination: Potted block with factory installed positive and negative multi-contact connectors as indicated on the contract drawings or an approved equal.
- B. All cell interconnections on all types of PVs shall be made with the encapsulation.
- C. Diodes: All solar panels shall be supplied with factory installed by-pass diodes.
- D. The PV mounting system shall be made of the following acceptable materials:
  - 1. Stainless steel with corrosion resistance equal to or better than Type 430 stainless steel.
    - 2. Anodized aluminum utilizing 6000 series aluminum alloy.
- E. Three Phase Inverters: Match inverter frequency to local utility company frequency. Match inverter output voltage to local utility company utilization voltage. Provide isolation transformers as needed.
- F. Provide AC disconnect switches or circuit breakers to building power distribution system.
- G. Exposed Conduit: All exterior exposed conduits shall be galvanized rigid steel (RMC) with threaded fittings.

- H. Disconnect Switches: Provide AC and DC disconnect switches as required.
- I. Multi-Connect Connectors: Provide connectors as recommended by manufacturer. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Multi-Contact
  - 2. Tyco
  - 3. Huber+Suhner
  - 4. Approved equal
- J. PV system Output: PV system shall not produce power in excess of what will be consumed at site. Coordinate all requirements with local utility company. Refer to Division 26 Section "Basic Electrical Requirements" for additional metering requirements. Provide safety disconnect switches to disconnect PV system from local utility line in event of utility failure.
- K. Battery Storage: No battery storage system is required as part of this PV system.
- L. Rapid shutdown: PV system shall include all components necessary for compliance with NEC 690.12 for rapid shutdown.

## 2.3 MOUNTING SYSTEMS

A. Ballasted mounted supported systems.

## 2.4 INVERTERS

A. DC-AC Inverters: Inverters shall provide output waveform to match building power distribution system when grid tied to local utility. Inverter output shall comply with all local utility company requirements. Inverters shall be compatible with its associated PV system array output and utility input as indicated on Construction Drawings. Inverters shall be capable of complete automatic unattended operation including start-up, synchronization, and disconnect, and operating in parallel with other inverters and utility. Voltage and frequency tolerances shall be plus/minus 10 percent. The inverters shall be capable of shutting down without damage when PV array output is outside tolerance parameters of inverter. Manufacturer shall connect array to ground in inverter in accordance with array requirements, as indicated on Construction Drawings. Inverters shall be at minimum listed to UL1741 and compliant with IEEE 929. Inverters shall be at minimum 95.5 percent efficient.

## 2.5 ACCESSORIES

- A. Devices and enclosures shall be rated for application and environment. Exterior installations of components shall have minimum steel NEMA 3R rating with corrosion resistant high-performance coating for exterior locations; provide exterior equipment with NEMA 3X or NEMA 4X ratings where available due to the corrosive exterior environment. Enclose interior installations in minimum steel NEMA 1 enclosures.
- B. Fabrication of supports for system components (excluding PV module support) shall be heavy-duty, self-supporting galvanized steel channel provided with captive clips for panels, boxes and conduits.
- C. Cabling: All conductors, cabling, and associated connectors shall be UL listed for environmental conditions in which they will operate.

# 2.6 PV DATA MONITORING SYSTEM

- A. Provide all data exporting equipment required for complete and working PV data monitoring system. Equipment shall include all connections and wiring required to measure and record parameters indicated herein.
- B. All equipment supplied for data monitoring shall have capability of operating at voltage and frequency available at installation location.
- C. The PV monitoring system shall perform the following tasks:
  - 1. Sample listed parameters data at least 6 times per hour and log the average values to data storage area in maximum of 15-minute intervals.
  - 2. Retain logged data upon loss of power.
  - 3. Start logging data and reestablish network connections automatically when power is restored.
  - 4. Store logged data for a minimum of five years. An integrated web server for display of live data
- D. Daily file shall be generated by PV monitoring system that includes, at minimum, 15-minute averaged data over entire day for each of parameters listed above in tabular format.
- E. Monthly file shall be generated by PV monitoring system that includes, the following parameters in tabular format presented for each day in month.
  - 1. Peak irradiance (watts/m<sup>2</sup>)
  - 2. Total AC power produced by PV system (kWh)
  - 3. Peak AC power output for PV system (kW)
- F. Real time display of PV monitoring data from the web server shall include in graphical format, at minimum, the following:
  - 1. Combined instantaneous AC power being produced by all PV systems.
  - 2. Total daily electrical energy harvest produced by all PV system as running sum.
  - 3. Total year to date electrical energy harvest produced by all PV systems as running sum.
  - 4. Total lifetime electrical energy harvest produced by all PV systems as running sum.
  - 5. Aggregate amount of CO<sub>2</sub> abated by use by all PV systems as running total.
- G. Provide web-based software for display and monitoring of the PV data monitoring system information such that owner can access information from any PV on network.
  - 1. Provide complete setup and configuration of the software and verify functionality.
  - 2. Provide a minimum of 2 hours of training on the software.
  - 3. Verify all display screens with owner.
- H. All exposed wiring, including weather instrumentation sensor leads, shall be made with sunlight resistant wire.
- I. Provide labeling to conduit runs. This labeling shall identify content of conduit and shall be visible by maintenance personnel. Labels shall be printed in permanent and durable manner, and in size constant with conductor diameter. Repeat labels as required for continuous identification purposes.

### 2.7 FACTORY TESTING

- A. Factory test PV System components. Compare watts output of solar panels and inverters tested in comparison to published, rated values of equipment.
- B. All test results shall be documented, including all failed tests.
- C. Any failed tests shall be re-tested.
- D. Notify Engineer at least 7 days in advance of Factory inspection/testing; testing may be witnessed by Engineer.
- PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine elements and surfaces to receive PV system components for compliance with installation tolerances and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Mounting of PV array:
  - 1. Furnish and install a complete mounting system for the PV panels equal to Unistrut.
    - a. Mounting system shall include a family of UL listed products, connectors, clips and brackets from a single manufacturer which are designed for the intended purpose.
    - b. Mounting system shall be designed to orient the PV panels at the optimum mounting angle indicated on the drawings.
    - c. Mounting system shall be ballasted and shall not attach to the structure or penetrate the roof membrane.
  - 2. Securely fasten combiners, collectors and system components to self-supportive structure located adjacent to array.
- B. Three Phase Inverters: Inverters will be mounted on Unistrut structure located as shown on the drawings.
- C. Once installed, solar panels shall be visually uniform and shall be subject to visual inspection for consistency. Replacement of unacceptable solar panels is responsibility of Contractor.
- D. Work of this Section includes work required for PV systems up to, and connection to, each PV system to AC building power distribution system disconnect switches.
- E. PV array arrangement shall facilitate maintenance access to all roof drains, antennas, and equipment mounted adjacent to PV array.
- F. Safety Requirements:
  - 1. Provide clear and unobstructed access route to PV installations.
  - 2. Installations shall be in accordance with OSHA requirements.
  - 3. Where required provide OSHA approved safety railings at and along access routes to PV systems.

### 3.3 CONNECTIONS

- A. Install equipment grounding conductors for components, with ground continuity to main electrical ground bus of building electrical system to which PV system is connected.
- B. Tighten bus joints, electrical connectors, and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

### 3.4 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."
- B. Appropriately identify and label PV system equipment as indicated in NFPA 70 with permanent, self-adhesive, engraved red stock with white core plastic with minimum thickness 0.06" (or approved equal). Lettering shall be standard engravers letter style using standard size appropriate for application in accordance with NFPA 70.
- C. Label DC combiners, AC collectors, DC-AC inverters, DAS enclosures, and PV system disconnects. Use permanent, self-adhesive, printed labels identifying system component pertaining to PV system, and provided in English. Lettering shall be standard engravers letter style using standard size appropriate for application in accordance with NFPA 70.
- D. Provide warning signs for PV system startup and restart for inverters with DC disconnect switch. Refer to Article on Start-Up Services.
- E. Provide warning signs for PV system at DC disconnect switches indicating that voltage is present on DC solar panel portion of circuit during daylight hours. Provide warning signs for PV system at AC disconnect switches indicating that voltage is present on local electrical utility portion of circuit when utility power is available.
- F. Operating Instructions: Printed basic instructions for PV system components, including operation, disconnection, and emergency procedures.
- G. Label DC system components with material described herein for operating DC current (Imax), system operating DC Voltages (Vmax), maximum string DC voltage (Voc), and maximum system DC current (Isc).

#### 3.5 FIELD QUALITY CONTROL

- A. Testing: After installing PV System components and after building electrical system has been energized, demonstrate product capability and compliance with requirements.
- B. Contractor shall be present for complete system review and startup acceptance test with Owner's representatives. Contractor shall be prepared at any time during this process to provide access to all portions of installation and shall remedy any portion of system that is not in compliance with this specification, that does not perform to manufacturer's operating specifications, or that fails to operate due to poor workmanship.
- C. In addition to the following test sequence, Contractor shall perform all tests required by manufacturer as outlined in inverter's installation and operator's manual.
  - 1. Ensure that inverter is switched off before proceeding.

- 2. Test and record AC line voltage at the inverter to ensure that it is within proper limits as stated by the manufacturer.
- 3. Test that phase sequencing is correct, if applicable.
- 4. Check continuity of all fuses.
- 5. Check that DC open circuit voltage is within manufacturer's recommended range at DC disconnects.
- 6. If DC voltage is correct, close inverter cover, close DC and AC disconnect switches, and turn on inverter.
- 7. After Manufacturer's specified start-up time, confirm that inverter is operating by recording DC operating voltage and currents, AC Phase voltages and phase currents and inverter power.
- 8. Close all open equipment enclosures.
- 9. Look and listen for, find the cause of, and remedy anything unusual from the PV array or PV system components.
- D. Additional testing shall demonstrate proper functional operation of control and protective features under normal and abnormal conditions. In some cases, devices external to inverters can handle one or more of these features:
  - 1. Confirm wake-up and sleep operations of PV system.
  - 2. Confirm inverter sleep operation during loss of building power and loss of array.
- E. Provide photo record of installation and major components, including solar panels, inverters, transformers, combiners, collectors, and all display screens shall be made. Include photos showing connections within all installed enclosures. Provide electronic copies of photo record on USB 'Thumb Drive' and hard copy of the photo record (with labels for each photo) in Operation and Maintenance Manual identified in Submittals article.

# 3.6 PRE-OPERATIONAL APPROVALS

A. For sites served by local electric utility company, do not connect PV system to building electrical power distribution system for testing purposes without written permission from local electric utility company. Once entire PV system is correctly installed and properly wired, and preliminary field-testing, system review and start-up test are successfully completed, Contractor shall contact utility to schedule and be present for any inspections required for PV system approval. Written notice of approval from local electric utility company must be received before system is permanently paralleled with their system. Contractor shall obtain this approval from local electric utility company and include a copy in the Operation and Maintenance Manual.

## 3.7 CLEANING

- A. Remove all excess sealants, fillings, grease, tape residue, dust, and debris from PV system components.
- B. Protect work from damage by other trades.
- C. Ensure site is clean and secure, in workman like condition, during and at completion of the project.

### 3.8 STARTUP SERVICES

- A. Perform testing as prescribed in this specification and in accordance with manufacturer's recommendations.
- B. For PV system incorporating inverters with ON switch, all PV system disconnects are in CLOSED position prior to turning on inverter. For PV system incorporating inverters that do not incorporate an ON switch, PV system will be turned on when all PV system disconnects are in CLOSED position.
- C. Ensure there is written permission from local utility company for interconnection of PV system with utility grid. Local utility company and or Owner may require that representative of utility be on-site during initial interconnection; Contractor shall accommodate this requirement, if stated by utility or Owner.
- 3.9 DEMONSTRATION AND TRAINING
  - A. Provide 8 hours on-site training session for PV system components and Data Acquisition System (DAS). Provide Instructor with at least 5-years' experience in installation, operation, and training of PV systems and DAS used in project. Session shall review system, including review of wiring diagrams, equipment list, and spare parts inventory.

END OF SECTION 263105