GENESEE COUNTY PURCHASING

A Division of the Genesee County Controller's Office

COUNTY ADMINISTRATION BLDG
1101 BEACH STREET, ROOM 361,
FLINT, MICHIGAN 48502
Phone: (810) 257-3030
www.gc4me.com

May 15, 2018

GENESEE COUNTY INVITATION FOR BID #18-139

Sealed bids will be received until **3:00 P.M. (EDT), Wednesday, May 30, 2018,** at the Genesee County Purchasing Department, 1101 Beach Street, Room 361, Flint, MI, 48502 for **GENERATOR FOR MCCREE BUILDING.**

This procurement is conducted in accordance with the Genesee County Purchasing Regulations, a copy of which is on file and available for inspection at the Genesee County Purchasing Department or at the website www.gc4me.com.

Each offeror is responsible for labeling the exterior of the sealed envelope containing the bid response with the bid number, bid name, bid due date and time, and your firm's name. The bid request number and due date for this IFB are:

DUE DATE:	**3:00 P.M. (EDT), Wednesday, May 30, 2018**
BID REQUEST NUMBER:	**#18-139**

Cindy Carnes
CINDY CARNES, PURCHASING MANAGER

bid2\2018\18-139
Attachments

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IFB #18-139 GENERATOR FOR MCCREE BUILDING

SECTION 1 - INSTRUCTIONS TO PROPOSERS

1. Sealed bids will be received until **3:00 P.M. (EDT), Wednesday, May 30, 2018,** at the Genesee County Purchasing Department, 1101 Beach Street, Room 343, Flint, MI, 48502. The Genesee County Purchasing Department hours of operation are 8:00. to 5:00 p.m., closed holidays and furlough days, check website for closed days. Label the envelope containing the bid response as described on page 1. **LATE BIDS AND BIDS SENT BY FACSIMILE OR E-MAIL WILL NOT BE ACCEPTED.**

2. **Submit one original, one paper copy and one electronic copy of your bid**. All bids become the property of Genesee County. The original must include a signature on the Signature Page of a person authorized to make a binding offer. Additionally the bid response must consist of one copy in electronic format on a CD, DVD or USB flash drive formatted in Adobe (.pdf), Microsoft Word, and/or Microsoft Excel. Failure to provide the required number of duplicate copies may result in rejection of your bid. Bids may be submitted at the MITN site for this offering.

3. Michigan Inter-governmental Trade Network**–** an alternate review of the GENERATOR FOR MCCREE BUILDING can be done at https://www.bidnetdirect.com/mitn.
    a. Genesee County has partnered with BidNet as part of the Michigan Inter-governmental Trade Network (MITN) and will post their bid opportunities to this site. As a vendor, you can register with Michigan Inter-governmental Trade Network (use hyperlink or https://www.mitn.info/Registration.asp?ID=2340) and be sure that you see all available bids and opportunities. By selecting automatic bid notification, your company will receive emails once Genesee County has a bid opportunity that matches your company's business. In addition, the site handles bid opportunities, RFPs, and RFQs for other member governmental agencies. If you need help registering, please call Michigan Inter-governmental Trade Network support department toll free 1-800-835-4603.

4. All communications, any modifications, clarifications, amendments, questions, responses or any other matters related to this IFB, shall be made by and through the purchasing contact reference in this solicitation. No contact regarding this solicitation made with other County employees is permitted. Any violation of this condition may result in immediate rejection of bid.

5. All prospective proposers shall be responsible for routinely checking the Genesee County Purchasing Department website at http://www.gc4me.com/departments/purchasing for issued addenda and other relevant information. Genesee County shall not be responsible for the failure of a prospective proposer to obtain addenda and other information issued at any time related to this IFB.

6. The County's Standard Proposed Contract is attached to this IFB. After the award is made to the successful proposer, the County and the successful proposer will negotiate a final contract that substantially conforms to the Standard Proposed Contract. Any exceptions to the terms and conditions of the Standard Proposed Contract and this IFB must be clearly set forth in your bid and referenced on company letterhead. The County will not entertain negotiations to change any terms and conditions of the Standard Proposed Contract or IFB unless those changes are requested in your bid.

7. The County of Genesee requires a signed Genesee County Insurance Checklist with each bid submitted. Insurance required per the specifications governing this work must be provided prior to the contract starting date and kept in full effect and compliance during entire contract period. Failure to comply with these provisions will cause termination of the contract.

   The contractor agrees to be responsible for any loss or damage to property or persons due to the performance of services herein contracted and further agrees to indemnify and defend the County of Genesee against all claims or demands whatsoever, and to hold the County of Genesee harmless from any loss or damage resulting therefrom.

8. Bid Format: Bids must be submitted in the format outlined in SECTION 8 - INFORMATION REQUIRED FROM BIDDERS to be deemed responsive.

SECTION 2 - STANDARD TERMS & CONDITIONS

1. See Genesee County website, Purchasing Department for Standard Terms and Conditions

SECTION 3 - ADDITIONAL TERMS & CONDITIONS

1. Purpose: Through this IFB, Genesee County ("the County") is soliciting bids from qualified firms who can provide and install a generator.

2. Issuing Office: This IFB is issued by the Genesee County Purchasing Department on behalf of the Genesee County Health Department. The contact person is Ms. Cindy Carnes, Purchasing Manager, Genesee County, 1101 Beach Street, Room 361, Flint, Michigan 48502, phone: (810)-257-3030, and ccarnes@co.genesee.mi.us. Email is the preferred method of contact.

3. Questions & Inquiries: All questions regarding this IFB shall be submitted in writing and received no later than **12:00 p.m., Tuesday, May 22, 2018** to the Genesee County Purchasing Department as listed above. E-mail is the preferred method of contact for all inquiries concerning this IFB. No verbal interpretation to any respondent as to the meaning of any requirement stated in this IFB shall be binding on Genesee County. All responses to questions regarding this IFB shall be issued in writing and distributed as an addendum by Genesee County.

4. **Addenda:** Genesee County reserves the right to amend and provide clarification of this IFB prior to the date for bid submission. In such an event, an addendum will be posted on the Purchasing Department website **(http://www.gc4me.com/Purchasing/currentbids.htm.)**. Further, all proposers shall acknowledge having seen any and all addendums issued (1, 2, 3, etc.) on the Signature Page**.**

5. **Responsive Bids:** To ensure proper consideration, all proposers are encouraged to submit a complete response to this IFB using the format outlined in Section 8, **INFORMATION REQUIRED FROM BIDDERS**. In addition, at least one of the paper bids must be signed with an **original signature** of the official authorized to bind the proposer to its provisions**.**

6. **Validity Period:** Any bid submitted as a result of this Request for Bid shall be binding on the proposer for 120 calendar days following the due date.

7. **Disclosure:** All information in an offeror's bid is subject to disclosure under the provisions of Public Act N. 442 of 1976 known as the "Freedom of Information Act". This Act also provides for the complete disclosure of contracts and attachments thereto. In the event that a proposer wishes to designate any portion of their submission as "confidential" or "proprietary," the proposer must contact the Purchasing Manager prior to submission of the bid. All requests regarding disclosure and requests for confidentiality of a bid response to this IFB shall be submitted in writing and received no later than 12:00 p.m., Thursday, May 17, 2018, to the Genesee County Purchasing Department as listed above.

8. **Statement of Exceptions:** The proposer shall furnish a statement on company letterhead giving a complete description of all exceptions to the terms, conditions, and specifications set forth in the bid. Failure to furnish this statement shall mean that the proposer agrees to meet all requirements set forth in this solicitation.

9. **Acceptance of Bid Content:** It is proposed that, if a contract is entered into as a result of this IFB, the IFB will serve as the basis for the contract. The contents of the bid of the successful offeror may become contractual obligations if a contract is issued. Failure of the successful offeror to accept these obligations will result in cancellation of contract award.

SECTION 4 - QUALIFICATIONS OF PROPOSERS

In order to qualify for award, a proposer shall have the capability in all respects to perform the work and the integrity and reliability, which will assure good faith performance. This requirement shall include, but is not limited to, the availability of the appropriate financial, material, equipment, facility, personnel, ability, expertise and experience necessary to meet all procurement requirements.

No bid will be considered from any proposer unless known to be skilled and regularly engaged in work of a character similar to that covered by the solicitation documents.

The following requirements are necessary for consideration of contract award:

1. Properly licensed by the State of Michigan for relevant licenses or certifications.
2. Proposer shall be financially stable and have the financial wherewithal to carry out the requirements of this solicitation.

If a proposer does not convince Genesee County that it possesses the above minimum qualifications with the bid submission, Genesee County shall not consider its bid for award.

SECTION 5 - STATEMENT OF WORK

The scope of work for the generator project includes the following:

1. Provide new 125kw 480/277volt 3phase 4wire Natural Gas Generator and 200A
2. Provide complete grounding system as shown on plans.
3. Provide all electrical connections and circuiting as shown on plans.
4. Provide 200A 480/277V 3phase 4wire 42 circuit panelboard, 75kva transformer and
5. 200A 208Y/120V 3phase 4wire 42 circuit panelboard. Refer to panel schedules on plans for details.
6. Provide structure steel as shown on plans for mounting of Generator on roof.
7. Provide Natural Gas piping as shown on plans to feed new generator.

SECTION 6 - SPECIFICATIONS

SECTION 26 05 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions, Special Conditions and Division 1 specification sections, apply to work of this section.
B. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labor, materials, equipment and incidentals necessary and required for their completion.
C. The items in this section are supplementary to the requirements set forth in other portions of the specifications as indicated under Item "A" above.

1.2 DRAWINGS

A. The drawings show the location and general arrangement of equipment, electrical systems and related items. They shall be followed as closely as elements of the construction will permit.
B. Examine the drawings of other trades and verify the conditions governing the work on the job site. Arrange work accordingly, providing such fittings, conduit, junction boxes and accessories as may be required to meet such conditions.

C. Deviations from the drawings, with the exception of minor changes in routing and other such incidental changes that do not affect the functioning or serviceability of the systems, shall not be made without the written approval of the Architect/Engineer.
D. The architectural and structural drawings take precedence in all matters pertaining to the building structure, mechanical drawings in all matters pertaining to mechanical trades and electrical drawings in all matters pertaining to electrical trades. Where there are conflicts or differences between the drawings for the various trades, report such conflicts or differences to the Architect/Engineer for resolution.

1.3 INSPECTION OF SITE

A. Visit the site, examine and verify the conditions under which the work must be conducted before submitting proposal.
B. The submitting of a proposal implies that the contractor has visited the site and understands the conditions under which the work must be conducted.

1.4 CONTRACT BREAKDOWN

A. Within two (2) weeks following award of contract, submit to the Architect/Engineer for approval a contract amount breakdown. Breakdown shall be submitted on a form similar to the form available at the Architect/Engineer's office. All requests for payment shall be based on the approved breakdown.

1.5 TEMPORARY FACILITIES

A. Provide and remove upon completion of the project, in accordance with the general conditions, a complete temporary electrical and telephone service during construction.

1.6 ALTERNATES

A. See Alternate Section and other applicable parts of the specifications.

1.7 GUARANTEE

A. Contractor guarantees that the installation is free from defects and agrees to replace or repair, any part of this installation which becomes defective within a period of one year following final acceptance, unless noted otherwise, provided that such failure is due to defects in the equipment, material or installation or to follow the specifications and drawings. File with the Owner any and all guarantees from the equipment manufacturers.

1.8 CODES, PERMITS AND FEES

A. Unless otherwise indicated, all required permits, licenses, inspections, approvals and fees for electrical work shall be secured and paid for by the contractor. All work shall conform to all applicable codes, rules and regulations.
B. Rules of local utility companies shall be complied with. Check with the utility company supplying service to the installation and determine all devices including, but not limited to, all current and potential transformers, meter boxes, C.T. cabinets and meters which will be required and include the cost of all such items in proposal.

C. All work shall be executed in accordance with the rules and regulations set forth in local and state codes. Prepare any detailed drawings or diagrams which may be required by the governing authorities. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern.

1.9 STANDARDS OF MATERIAL AND WORKMANSHIP:

A. All materials shall be new. The electrical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:
   1. A.N.S.I.American National Standards Institute
   2. A.S.T.M.American Society for Testing Materials
   3. I.C.E.A.Insulated Cable Engineers Association
   4. I.E.E.E.Institute of Electrical and Electronics Engineers
   5. N.E.C.National Electrical Code
   6. N.E.M.A.National Electrical Manufacturer's Association
   7. U.L.Underwriters Laboratories, Inc.
B. Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved.
C. All equipment of the same or similar systems shall be by the same manufacturer.

1.10 RECORD DRAWINGS

A. Provide complete operating and maintenance instruction manuals covering all electrical equipment herein specified, together with parts lists. All literature shall be furnished in triplicate for Owner and shall be bound in book or ring binder form as directed by Architect/Engineer.
B. The operating and maintenance instructions shall include a brief, general description for all electrical systems including, but not limited to:
C. Routine maintenance procedures.
D. Trouble-shooting procedures.
E. Shop Drawings
F. Any equipment offered as a substitution shall be equal in quality, durability, appearance, ampacity, and efficiency through all ranges of operation, shall conform with arrangements and space limitations of the equipment shown on the plans and/or specified, shall be compatible with the other components of the system. All costs to make these items of equipment comply with these requirements including, but not limited to, conduit, wiring, bus work, enclosures and building alterations shall be included in the original bid. Similar equipment shall be by one manufacturer.

1.11 SHOP DRAWINGS/SUBMITTALS

A. All shop drawings shall be submitted in groupings of similar and/or related items (lighting fixtures, switchgear, etc.). Incomplete submittal groupings will be returned unchecked.
B. Submit for approval eight (8) copies of shop drawings for all electrical systems or equipment but not limited to the items listed below. Where items are referred to by symbolic designation on the drawings and specifications, all submittals shall bear

the same designation (light fixtures). Refer to other sections of the electrical specifications for additional requirements.

1. Distribution Switchboards
2. Panelboards
3. Disconnect Switches
4. Lighting Control Switches
5. Wiring Devices
6. Lighting Fixtures
7. Fire Alarm System
8. Transformers

1.12 MANUFACTURERS LISTED

A. The listing of specific manufacturers does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed are not relieved from meeting these specifications in their entirety.
B. Products in compliance with the specification and manufactured by others not named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

1.13 USE OF EQUIPMENT

A. The use of any equipment, or any part thereof for purposes other than testing even with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor be construed to obligate the Owner in any way to accept improper work or defective materials.
B. Do not use Owner's lamps for temporary lighting except as allowed and directed by the Owner. Equip lighting fixtures with new lamps when the project is turned over to the Owner.

PART 2 EXECUTION

2.1 INSTALLATION OF EQUIPMENT

A. Install all equipment in strict accordance with all directions and recommendations furnished by the manufacturer. Where such directions are in conflict with the drawings and specifications, report such conflicts to the Architect/Engineer for resolution.

2.2 COORDINATION

A. Install work to avoid interference with work of other trades including, but not limited to, architectural and mechanical trades. Remove and relocate any work that causes an interference at contractor's expense. Disputes regarding the cause of an interference will be resolved by the Construction Manager or Architect/Engineer.

2.3 CHASES AND RECESSES

A. Provided by the architectural trades, but the contractor shall be responsible for their accurate location and size.

2.4 CUTTING, PATCHING AND DAMAGE TO OTHER WORK

A. Refer to General Conditions for requirements.
B. All cutting, patching and repair work shall be performed by the contractor through approved, qualified subcontractors. Contractor shall include full cost of same in bid.

2.5 EQUIPMENT FOUNDATION AND SUPPORTS

A. Shall be as required or as shown on plans or specified.
B. Provide concrete bases and supports for floor mounted electrical equipment.
C. Provide concrete house keeping bases 4" above finished floor, with leveling channels, where noted, for floor-mounted equipment.
D. For equipment suspended from ceilings or walls, furnish and install all inserts, rods, structural steel frames, brackets and platforms required.

2.6 EQUIPMENT CONNECTIONS

A. Make connections to equipment, motors, lighting fixtures, and other items included in the work in accordance with the approved shop drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. All additional connections not shown on the drawings, but called out by the equipment manufacturer's shop drawings shall be provided.

2.7 CLEANING

A. All debris shall be removed daily as required to maintain the work area in a neat, orderly condition.
B. Final cleanup shall include, but not be limited to, washing of fixture lenses or louvers, switchboards, substations, motor control centers, panels, etc. Fixture reflectors and lenses or louvers shall be left with no water marks or cleaning streaks.

2.8 PROTECTION AND HANDLING OF EQUIPMENT AND MATERIALS

A. Equipment and materials shall be protected from theft, injury or damage.
B. Protect conduit openings with temporary plugs or caps.
C. Provide adequate storage for all equipment and materials delivered to the job site. Location of the space will be designated by the Construction Manager or Architect/Engineer. Equipment set in place in unprotected areas must be provided with temporary protection.

2.9 NAMEPLATES AND DIRECTORIES

A. Identify switchgear, motor controls, panelboards, safety switches, etc., with manufacturer's nameplate, shop order, where applicable on composite assemblies, and designations used on the Drawings. Nameplates shall be laminated phenolic plastic, beveled edged white with engraved black letters. Except where impractical, letters and numerals shall be a minimum of 1/4 inch high. Nameplates shall be mechanically secured. Pressure sensitive nameplates are not acceptable. Panel directories shall be neatly typed, showing equipment served and location for each breaker or switch with a clear plastic protective cover.
B. For detailed requirements refer to Section 26 0553 IDENTIFICATION FOR ELECTRICAL SYSTEMS.

2.10 EXTRA WORK

A. For any extra electrical work which may be proposed, this Contractor shall furnish to the Construction Manager, an itemized breakdown of the estimated cost of the materials and labor required to complete this work. The Contractor shall proceed only after receiving a written order from the Construction Manager establishing the agreed price and describing the work to be done.

2.11 DRAWINGS AND MEASUREMENTS

A. These Specifications and accompanying Drawings are intended to describe and provide for finished work. They are intended to be cooperative, and what is called for by either shall be as binding as if call for by both. The Contractor will understand that the work herein described shall be complete in every detail.
B. The Drawings are not intended to be scaled for rough-in measurements nor to serve as Shop Drawings. Field measurements necessary for ordering materials and fitting the installation to the building construction and arrangement shall be taken by the Contractor. The Contractor shall check latest Architectural drawings and locate light switches from same where door swings are different from Electrical Drawings.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Single conductor building wire.
- B. Service entrance cable.
- C. Metal-clad cable.
- D. Power and control tray cable.
- E. Manufactured wiring systems.
- F. Wiring connectors.
- G. Electrical tape.
- H. Heat shrink tubing.
- I. Oxide inhibiting compound.
- J. Wire pulling lubricant.
- K. Cable ties.

1.2 RELATED REQUIREMENTS
- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS
- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
- E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2011).
- F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2007 (Reapproved 2012).
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
- H. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); Federal Specification; Revision A, 2008.
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- J. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.

K. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
L. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.
M. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
O. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
P. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
Q. UL 183 - Manufactured Wiring Systems; Current Edition, Including All Revisions.
R. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
S. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
T. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
U. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
V. UL 1277 - Electrical Power and Control Tray Cables with Optional Optical-Fiber Members; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS, for submittal procedures.
B. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.
C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Strategic Energy Solutions, Inc. and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
    1. Exceptions:
        a. Use manufactured wiring systems for branch circuits where concealed under raised floors.
        b. Use power and control tray cable for installation in cable tray.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
D. Comply with NEMA WC 70.
E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
G. Conductor Material:
    1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
        a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:
        b. Where aluminum conductors are substituted for copper, comply with the following:
            1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
            2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.

3) Provide aluminum equipment grounding conductor sized according to NFPA 70.
4) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

H. Minimum Conductor Size:
1. Branch Circuits: 12 AWG.
a. Exceptions:
1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

I. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

J. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
a. 480Y/277 V, 3 Phase, 4 Wire System:
1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.
4) Neutral/Grounded: Gray.
b. 208Y/120 V, 3 Phase, 4 Wire System:
1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Neutral/Grounded: White.
c. Equipment Ground, All Systems: Green.
d. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
a. Cerro Wire LLC: www.cerrowire.com.
b. Encore Wire Corporation: www.encorewire.com.
c. Southwire Company: www.southwire.com.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):

a. Encore Wire Corporation: www.encorewire.com.
b. Southwire Company: www.southwire.com.
c. Stabiloy, a brand of General Cable Technologies Corporation: www.stabiloy.com.

B. Description: Single conductor insulated wire.
C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.
D. Insulation Voltage Rating: 600 V.
E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
a. Size 4 AWG and Larger: Type XHHW-2.
b. Installed Underground: Type XHHW-2.
c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.
2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.4 POWER AND CONTROL TRAY CABLE
A. Manufacturers:
1. Encore Wire Corporation: www.encorewire.com.
2. Okonite: www.okonite.com.
3. Southwire Company: www.southwire.com.
B. Description: NFPA 70, Type TC cable listed and labeled as complying with UL 1277.
C. Conductor Stranding: Stranded.
D. Insulation Voltage Rating: 600 V.
E. Insulation: Type XHHW or XHHW-2.
F. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.5 MANUFACTURED WIRING SYSTEMS
A. Manufacturers:
1. AFC Cable Systems Inc[]: www.afcweb.com.
2. Wiremold, a brand of Legrand North America, Inc: www.legrand.us.
B. Description: Manufactured wiring assemblies complying with NFPA 70 Article 604, and listed and labeled as complying with UL 183.
C. Provide components necessary to transition between manufactured wiring system and other wiring methods.
D. Branch Circuit Cables:
1. Conductor Stranding (Size 10 AWG and Smaller): Solid.
2. Insulation Voltage Rating: 600 V.
3. Insulation: Type THHN.
4. Grounding: Full-size integral equipment grounding conductor.
5. Armor: Steel, interlocked tape.

E. Connectors: Keyed and color-coded to prevent interconnection of different voltages.
F. Fixture Leads: Type TFN insulation.

2.6 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Aluminum Conductors: Use compression connectors for all connections.
E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
H. Mechanical Connectors: Provide bolted type or set-screw type.
I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.7 WIRING ACCESSORIES

A. Electrical Tape:
   1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
   2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
E. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.
B. Verify that work likely to damage wire and cable has been completed.
C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
D. Verify that field measurements are as indicated.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 INSTALLATION

A. Circuiting Requirements:
    1. Unless dimensioned, circuit routing indicated is diagrammatic.
    2. When circuit destination is indicated without specific routing, determine exact routing required.
    3. Arrange circuiting to minimize splices.
    4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
    5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
    6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
B. Install products in accordance with manufacturer's instructions.
C. Perform work in accordance with NECA 1 (general workmanship).
D. Install aluminum conductors in accordance with NECA 104.
E. Install metal-clad cable (Type MC) in accordance with NECA 120.
F. Installation in Raceway:
    1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
    2. Pull all conductors and cables together into raceway at same time.
    3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
    4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
G. Exposed Cable Installation (only where specifically permitted):
    1. Route cables parallel or perpendicular to building structural members and surfaces.
    2. Protect cables from physical damage.
H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction.

Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

J. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

K. Install conductors with a minimum of 12 inches of slack at each outlet.

L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

N. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
   6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

P. Insulate ends of spare conductors using vinyl insulating electrical tape.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.4 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.
B. Conductors for grounding and bonding.
C. Connectors for grounding and bonding.
D. Ground bars.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.
D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2014.
G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Verify exact locations of underground metal water service pipe entrances to building.
    2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
    3. For signal reference grids, coordinate the work with access flooring furnished in accordance with Section 09 69 00.
    4. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
    1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
C. Shop Drawings:
D. 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.
E. Field quality control test reports.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
D. Grounding System Resistance:
    1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Strategic Energy Solutions, Inc.. Precipitation within the previous 48 hours does not constitute normally dry conditions.
    2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
    3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
E. Grounding Electrode System:
    1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
        a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):
   a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
   b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
   c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal In-Ground Support Structure:
   a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
   a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
   a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
   b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
   c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
7. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.

F. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal air ducts.
8. Provide bonding for metal building frame.
9. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
10. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.

G. Isolated Ground System:
1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.
2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.
3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.

H. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
   a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
   b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
   c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
1. Use insulated copper conductors unless otherwise indicated.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
      2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
    1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
    2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
    3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
D. Ground Bars:
    1. Description: Copper rectangular ground bars with mounting brackets and insulators.
    2. Size: As indicated.
    3. Holes for Connections: As indicated or as required for connections to be made.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that work likely to damage grounding and bonding system components has been completed.
B. Verify that field measurements are as indicated.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION
A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
D. Make grounding and bonding connections using specified connectors.
    1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
    2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
    3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
    4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
    5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL
A. Inspect and test in accordance with NETA ATS except Section 4.
B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.
B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.
C. Section 26 05 34 - Conduit: Additional support and attachment requirements for conduits.
D. Section 26 05 36 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.
E. Section 26 05 37 - Boxes: Additional support and attachment requirements for boxes.
F. Section 26 25 01 - Low-Voltage Busways: Additional support and attachment requirements for busway.
G. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
H. Section 26 51 13 - Luminaires, Ballasts, and Drivers - Lutron: Additional support and attachment requirements for luminaires.
I. Construction requirements for concrete bases

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2015.
B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
C. MFMA-4 - Metal Framing Standards Publication; 2004.
D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

C. ANSI/ TIA/ EIA 568 Commercial Building Telecommunications Cabling Standard, current revision level.
D. ANSI/ TIA/ EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces, current revision level.
E. ANSI/ TIA/ EIA 568 Commercial Building Telecommunications Cabling Standard, current revision level.
F. ANSI/ TIA/ EIA 569 Commercial Building Standard for Telecommunications Pathways and Spaces, current revision level.

1.5 SUMMARY

A. ASTM A682 Standard Specification for Steel, Strip, High-Carbon, Cold-Rolled, Spring Quality.
B. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the system of conduit hangers and supports as described in this specification.
C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this project, with a minimum structural safety factor of five times the applied force.

1.6 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
D. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
E. Installer's Qualifications: Include evidence of compliance with specified requirements.
F. 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.

1.7 QUALITY ASSURANCE

A. Comply with NFPA 70.
B. Comply with applicable building code.
C. Installer Qualifications for Field-Welding: As specified in Section 05 50 00.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
B. Conduit hangers and supports shall have the manufacturer's name and part number stamped on the part for identification.
C. Manufacturer: Company specializing in manufacturing products specified in this section with a minimum of five years documented experience in the industry, and certified ISO 9000.

1.9 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
    1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
    2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
    3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
    4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
    5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
        a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
        b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
    1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
    2. Conduit Clamps: Bolted type unless otherwise indicated.
    3. Manufacturers:
        a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
        b. Erico International Corporation: www.erico.com.
        c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
        d. Thomas & Betts Corporation: www.tnb.com.
C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

1. Manufacturers:
    a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
    b. Erico International Corporation: www.erico.com.
    c. O-Z/Gedney, a brand of Emerson Industrial Automation: www.emersonindustrial.com.
    d. Thomas & Betts Corporation: www.tnb.com.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
    1. Comply with MFMA-4.
    2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
    3. Manufacturers:
        a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
        b. Thomas & Betts Corporation: www.tnb.com.
        c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
        d. Substitutions: See Section 01 60 00 - Product Requirements.
        e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
    1. Minimum Size, Unless Otherwise Indicated or Required:
        a. Equipment Supports: 1/2 inch diameter.
        b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.

F. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
    1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
    2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
    3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
    4. Manufacturers:
        a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
        b. Erico International Corporation: www.erico.com.
        c. PHP Systems/Design: www.phpsd.com.
        d. Unistrut, a brand of Atkore International Inc: www.unistrut.com.

G. Anchors and Fasteners:
    1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
    2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
    3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
    4. Hollow Masonry: Use toggle bolts.
    5. Hollow Stud Walls: Use toggle bolts.

6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
10. Manufacturers - Powder-Actuated Fastening Systems:
    a. Hilti, Inc: www.us.hilti.com.
    b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com.
    c. Powers Fasteners, Inc: www.powers.com.
    d. Simpson Strong-Tie Company Inc: www.strongtie.com.

H. Power-Strut, Division of Allied Support Systems
I. Hilti Corporation
J. ERICO, International Corporation.
K. Hangers, Supports, Anchors, and Fasteners - General: Protective zinc coating either Electro-Plated (ASTM B633 SCI or SC3), Pre-Galvanized (ASTM a525 coating designation G90) or Hot-Dip Galvanized after fabrication (ASTM A123). The minimum thickness of zinc coating shall be 0.2 mill (5 micrometers)..
L. Provide materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
    1. Product: Pre-galvanized strut.
    2. Product: Hilti DX Series
M. Conduit Hangers:
    1. Shall have a vertical load limit of 100 lbs, and a horizontal load limit of 25 lbs..
    2. Shall be available with either a plain hole for 1/4” bolt or a 1/4-20 thread impression.
    3. Shall be available for 3/8” through 2” EMT, rigid, and aluminum conduit.
    4. Shall be available pre-assembled with manufacturer's specialty fasteners for connection to building structures like beam, flange, drop wire/rod, wood structure, concrete and acoustical tee grid.
N. Wire Rope Hangers:
    1. Wire rope hanger assemblies shall be made of galvanized steel.
    2. Hanger shall meet the fire rating requirements for DIN 4102-2 for 30 minutes at 30 percent of rated load.
    3. Rope hangers shall have a minimum safety factor of 5:1.
    4. Rope hangers are not permitted to support conduits.
    5. Rope hangers are permitted to hang light fixtures, were applicable.
    6. Hangers shall be fully adjustable.
    7. Manufacturer of wire rope hangers shall be:
        a. ERICO, INC., Speed Link series.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
D. Unless specifically indicated or approved by Strategic Energy Solutions, Inc., do not provide support from suspended ceiling support system or ceiling grid.
E. Unless specifically indicated or approved by Strategic Energy Solutions, Inc., do not provide support from roof deck.
F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
G. Equipment Support and Attachment:
    1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
    2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
    3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
    4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
H. Conduit Support and Attachment: Also comply with Section 26 05 34.
I. Cable Tray Support and Attachment: Also comply with Section 26 05 36.
J. Box Support and Attachment: Also comply with Section 26 05 37.
K. Busway Support and Attachment: Also comply with Section 26 25 01.
L. Interior Luminaire Support and Attachment: Also comply with Section 26 51 00.
M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
N. Secure fasteners according to manufacturer's recommended torque settings.
O. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Inspect support and attachment components for damage and defects.
C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
D. Correct deficiencies and replace damaged or defective support and attachment components.
E. Mounting and Anchorage of surface-mounted equipment and components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
    1. To wood: Fasten with lag screws or through bolts.
    2. To new concrete: Bolt to concrete inserts

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4-inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Beam clamps (MSS type 19,21,23,25,or 27) complying with MSS SP-69.
6. To light steel: Sheet metal screws.

END OF SECTION

SECTION 26 05 34 – CONDUIT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Intermediate metal conduit (IMC).
C. Flexible metal conduit (FMC).
D. Liquidtight flexible metal conduit (LFMC).
E. Electrical metallic tubing (EMT).
F. Rigid polyvinyl chloride (PVC) conduit.
G. Electrical nonmetallic tubing (ENT).
H. Conduit fittings.
I. Conduit, fittings and conduit bodies.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
C. Section 26 05 53 - Identification for Electrical Systems.
D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
J. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT); 2014.
K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
N. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
R. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
S. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
C. Shop Drawings:
1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
2. Include proposed locations of roof penetrations and proposed methods for sealing.
D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.
E. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, flexible nonmetallic conduit, nonmetallic tubing, fittings, and conduit bodies.
F. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches.

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.
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.

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
C. Underground:
    1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
    2. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
D. Embedded Within Concrete:
    1. Within Slab Above Ground (within structural slabs only where approved by Structural Engineer): Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, or rigid PVC conduit.
E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
G. Concealed Below Accessible Floors: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
I. Connections to Vibrating Equipment:
    1. Dry Locations: Use flexible metal conduit.
    2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
    3. Maximum Length: 6 feet unless otherwise indicated.
    4. Vibrating equipment includes, but is not limited to:
        a. Transformers.
        b. Motors.

2.2 CONDUIT REQUIREMENTS

A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Minimum Conduit Size, Unless Otherwise Indicated:
    1. Branch Circuits: 1/2 inch (16 mm) trade size.
    2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
    3. Control Circuits: 1/2 inch (16 mm) trade size.
    4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
B. Fittings:
    1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
    2. Material: Use steel or malleable iron.
    3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
B. Fittings:
    1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
    2. Material: Use steel or malleable iron.
    3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
B. Fittings:
    1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
    2. Material: Use steel or malleable iron.
C. Description: Interlocked steel construction.
D. Fittings: NEMA FB 1.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

2.7 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.
C. Description: ANSI C80.3; galvanized tubing.
D. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.9 ELECTRICAL NONMETALLIC TUBING (ENT)

A. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA TC 13 and listed and labeled as complying with UL 1653.
B. Fittings:
   1. Manufacturer: Same as manufacturer of ENT to be connected.
   2. Use solvent-welded type fittings.
   3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive conduits.
C. Verify that conditions are satisfactory for installation prior to starting work.
D. Verify routing and termination locations of conduit prior to rough-in.
E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).
C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
F. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.
G. Conduit Routing:
    1. Unless dimensioned, conduit routing indicated is diagrammatic.
    2. When conduit destination is indicated without specific routing, determine exact routing required.
    3. Conceal all conduits unless specifically indicated to be exposed.
    4. Conduits in the following areas may be exposed, unless otherwise indicated:
        a. Electrical rooms.
        b. Mechanical equipment rooms.
    5. Unless otherwise approved, do not route conduits exposed:
        a. Across floors.
        b. Across roofs.
        c. Across top of parapet walls.
        d. Across building exterior surfaces.
    6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
    7. Arrange conduit to maintain adequate headroom, clearances, and access.
    8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
    9. Arrange conduit to provide no more than 150 feet between pull points.
    10. Route conduits above water and drain piping where possible.
    11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
    12. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
        a. Heaters.
        b. Hot water piping.
        c. Flues.
H. Conduit Support:
    1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
    2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
I. Connections and Terminations:
    1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
    2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
    3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

K. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 23 16.13.

L. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):
1. Secure conduits to prevent floating or movement during pouring of concrete.

M. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where conduits are subject to earth movement by settlement or frost.

O. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.

2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

P. Provide grounding and bonding in accordance with Section 26 05 26.

3.3 FIELD QUALITY CONTROL

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Warning signs and labels.
- F. Field-painted identification of conduit.

1.2 RELATED REQUIREMENTS
- A. Section 09 91 13 - Exterior Painting.
- B. Section 09 91 23 - Interior Painting.
- C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D. Section 26 05 36 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.
- E. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.
- F. Section 27 10 05 - Structured Cabling for Voice and Data - Inside-Plant: Identification for communications cabling and devices.

1.3 REFERENCE STANDARDS
- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.
- E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS
- A. Coordination:
  1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS, for submittal procedures.
B. Product Data: Provide catalog data for nameplates, labels, and markers.
C. 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.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.
B. Conform with ANSI A13.1 and ANSI C2.
C. Conform with 29 CFR 1910.145.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
    1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
        a. Switchgear:
            1) Identify ampere rating.
            2) Identify voltage and phase.
            3) Identify power source and circuit number. Include location when not within sight of equipment.
            4) Use identification nameplate to identify main and tie devices.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
    1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
B. Sequencing:
    1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
    2. Do not install identification products until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS, for submittal procedures.
B. Product Data: Provide catalog data for nameplates, labels, and markers.
C. 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.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.7 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.
B. Conform with ANSI A13.1 and ANSI C2.
C. Conform with 29 CFR 1910.145.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
    1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
        a. Switchgear:
            1) Identify ampere rating.
            2) Identify voltage and phase.
            3) Identify power source and circuit number. Include location when not within sight of equipment.
            4) Use identification nameplate to identify main and tie devices.
            5) Identify power source and circuit number for both normal power source and standby power source. Include location.
            6) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
    2. Service Equipment:
        a. Use identification nameplate to identify each service disconnecting means.
        b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
        c. Use identification nameplate at each piece of service equipment to identify the available fault current and the date calculations were performed.
    3. Emergency System Equipment:
        a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
        b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
    4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
    5. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
    6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
        a. Service equipment.

b. Industrial control panels.
c. Motor control centers.
d. Elevator control panels.
e. Industrial machinery.

7. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
   a. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.
   b. Service Equipment: Include the following information in accordance with NFPA 70.
      1) Nominal system voltage.
      2) Available fault current.
      3) Clearing time of service overcurrent protective device(s).
      4) Date label applied.
8. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
   2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.

C. Identification for Raceways:
   1. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
      a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
         1) Color Code:
            (a) Emergency Power System: Red.
            (b) Fire Alarm System: Red.
         2) Field-Painting: Comply with Section 09 91 23 and 09 91 13.
         3) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.

D. Identification for Cable Tray: Comply with Section 26 05 36.

E. Identification for Boxes:
   1. Use voltage markers to identify highest voltage present.
   2. Use voltage markers or color coded boxes to identify systems other than normal power system.
      a. Color-Coded Boxes: Field-painted in accordance with Section 09 91 23 and 09 91 13 per the same color code used for raceways.

F. Identification for Devices:
   1. Identification for Communications Devices: Comply with Section 27 10 05.
   2. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
   3. Use identification label to identify fire alarm system devices.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
   2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
   3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
   4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
   5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
B. Identification Labels:
   1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
C. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch by 2.5 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/4 inch.
   5. Color: Black text on white background unless otherwise indicated.
D. Format for Caution and Warning Messages:
   1. Minimum Size: 2 inches by 4 inches.
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/2 inch.
   5. Color: Black text on yellow background unless otherwise indicated.
E. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
F. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, and control device stations.

2.3 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve,

plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
C. Legend: Power source and circuit number or other designation indicated.
D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
E. Minimum Text Height: 1/8 inch.
F. Color: Black text on white background unless otherwise indicated.
G. Description: Vinyl cloth type self-adhesive wire markers.

2.4 VOLTAGE MARKERS
A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
C. Minimum Size:
1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
D. Legend:
1. Markers for Voltage Identification: Highest voltage present.
2. Markers for System Identification:
a. Emergency Power System: Text "EMERGENCY".
E. Color: Black text on orange background unless otherwise indicated.

2.5 WARNING SIGNS AND LABELS
A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
B. Warning Signs:
1. Materials:
2. Minimum Size: 7 by 10 inches unless otherwise indicated.
C. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION
A. Clean surfaces to receive adhesive products according to manufacturer's instructions.
B. Degrease and clean surfaces to receive nameplates and labels.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Inside of equipment door.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Conduits: Legible from the floor.
   8. Boxes: Outside face of cover.
   9. Conductors and Cables: Legible from the point of access.
   10. Devices: Outside face of cover.
C. Install identification products centered, level, and parallel with lines of item being identified.
D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
F. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26 22 00

LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. General purpose transformers.

1.2 RELATED REQUIREMENTS
- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 34 - Conduit: Flexible conduit connections.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 24 16 - Panelboards.

1.3 REFERENCE STANDARDS
- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers; 1982 (R2006).
- C. IEEE C57.96 - Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2009.
- F. NEMA ST 20 - Dry-Type Transformers for General Applications; 2014.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- H. NEMA TP 2 - Standard Test Method for Measuring the Energy Consumption of Distribution Transformers; National Electrical Manufacturers Association; 2005.
- I. NEMA TP 3 - Standard for the Labeling of Distribution Transformer Efficiency; National Electrical Manufacturers Association; 2000.
- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- M. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS
- A. Coordination: Coordinate the work with placement of support framing and anchors required for mounting of transformers.

1.5 SUBMITTALS
- A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS, for submittal procedures.

B. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
   1. Vibration Isolators: Include attachment method and rated load and deflection.
C. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.
D. Project Record Documents: Record actual locations of transformers.

1.6 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

1.8 FIELD CONDITIONS
A. Ambient Temperature: Do not exceed the following maximum temperatures during and after installation of transformers.
   1. Greater than 10 kVA: 104 degrees F maximum.
   2. Less than 10 kVA: 77 degrees F maximum.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Eaton Corporation: www.eaton.com.
B. General Electric Company: www.geindustrial.com.
C. Schneider Electric; Square D Products: www.schneider-electric.us.
D. Siemens Industry, Inc: www.usa.siemens.com.

2.2 TRANSFORMERS - GENERAL REQUIREMENTS
A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
   1. Altitude: Less than 3,300 feet.
   2. Ambient Temperature:
      a. Greater than 10 kVA: Not exceeding 104 degrees F.
      b. Less than 10 kVA: Not exceeding 77 degrees F.
   3. Ambient Temperature: Not exceeding 86 degrees F average or 104 degrees F maximum measured during any 24 hour period.
C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially

below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.

D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
E. Basic Impulse Level: 10 kV.
F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
G. Isolate core and coil from enclosure using vibration-absorbing mounts.
H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

2.3 GENERAL PURPOSE TRANSFORMERS

A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
B. Primary Voltage: 480 volts delta, 3 phase.
C. Secondary Voltage: 208Y/120 volts, 3 phase.
D. Insulation System and Allowable Average Winding Temperature Rise:
    1. 15 kVA and Larger: Class 220 degrees C insulation system with 115 degrees C average winding temperature rise.
E. Coil Conductors: Continuous aluminum windings with terminations brazed or welded.
F. Winding Taps:
    1. 15 kVA through 300 kVA: Two 2.5 percent full capacity primary taps above and four 2.5 percent full capacity primary taps below rated voltage.
    2. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
    1. Test efficiency according to NEMA TP 2.
    2. Label transformer according to NEMA TP 3.
H. Sound Levels: Standard sound levels complying with NEMA ST 20.
I. Mounting Provisions:
    1. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
    2. Larger than 75 kVA: Suitable for floor mounting.
J. Transformer Enclosure: Comply with NEMA ST 20.
    1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    2. Construction: Steel.
        a. Less than 15 kVA: Totally enclosed, non-ventilated.
        b. 15 kVA and Larger: Ventilated.
    3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
    4. Provide lifting eyes or brackets.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install transformers in accordance with NECA 409 and IEEE C57.94.
D. Use flexible conduit, under the provisions of Section 26 05 34, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
F. Mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 03 30 00.
G. Mount floor-mounted transformers using vibration isolators suitable for isolating the transformer noise from the building structure.
H. Mount trapeze-mounted transformers as indicated.
I. Provide grounding and bonding in accordance with Section 26 05 26.
J. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
K. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

3.4 ADJUSTING

A. Measure primary and secondary voltages and make appropriate tap adjustments.
B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from transformer components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS
- A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 22 00 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.

1.3 REFERENCE STANDARDS
- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- F. NEMA PB 1 - Panelboards; 2011.
- G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
- H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- L. UL 67 - Panelboards; Current Edition, Including All Revisions.
- M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- N. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- O. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS
- A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS, for submittal procedures.
B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
C. Manufacturer's Installation 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.
D. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
    1. Panelboard Keys: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.
B. General Electric Company: www.geindustrial.com.
C. Schneider Electric; Square D Products: www.schneider-electric.us.
D. Siemens Energy & Automation, Inc.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
    1. Altitude: Less than 6,600 feet.
    2. Ambient Temperature:
        a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
C. Short Circuit Current Rating:
    1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location.
D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
    1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
G. Conductor Terminations: Suitable for use with the conductors to be installed.
H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
    1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    2. Boxes: Galvanized steel unless otherwise indicated.
        a. Provide wiring gutters sized to accommodate the conductors to be installed.
    3. Fronts:
        a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
        b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
    4. Lockable Doors: All locks keyed alike unless otherwise indicated.
I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
J. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.

K. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.

2.3 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
B. Conductor Terminations:
   1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors.
   2. Main and Neutral Lug Type: Mechanical.
C. Bussing:
   1. Phase and Neutral Bus Material: Copper
   2. Ground Bus Material: Copper.
D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.

2.4 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.
C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Copper.
   3. Ground Bus Material: Copper.
D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Provide clear plastic circuit directory holder mounted on inside of door.

2.5 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:

a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
   1) 22,000 rms symmetrical amperes at 240 VAC or 208 VAC.
   2) 14,000 rms symmetrical amperes at 480 VAC.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

3. Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
8. Do not use handle ties in lieu of multi-pole circuit breakers.
9. Provide the following features and accessories where indicated or where required to complete installation:
   a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

2.6 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
C. Verify that mounting surfaces are ready to receive panelboards.
D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.
C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
E. Provide required supports in accordance with Section 26 05 29.
F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
J. Provide grounding and bonding in accordance with Section 26 05 26.
K. Install all field-installed branch devices, components, and accessories.
L. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
M. Provide filler plates to cover unused spaces in panelboards.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.
B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1. Tests listed as optional are not required.
C. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
D. Test GFCI circuit breakers to verify proper operation.
E. Test shunt trips to verify proper operation.
F. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
B. Adjust alignment of panelboard fronts.
C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 32 13

ENGINE GENERATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Packaged engine generator system and associated components and accessories:
   1. Engine and engine accessory equipment.
   2. Alternator (generator).
   3. Generator set control system.
   4. Generator set enclosure.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
D. Section 26 36 00 - Transfer Switches.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
B. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.
C. NEMA MG 1 - Motors and Generators; 2014.
D. NFPA 30 - Flammable and Combustible Liquids Code; 2015.
E. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2015.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. NFPA 110 - Standard for Emergency and Standby Power Systems; 2013.
H. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.
I. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
      a. Transfer Switches: See Section 26 36 00.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.

5. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.

1.5 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.
   1. Include generator set sound level test data.
   2. Include characteristic trip curves for overcurrent protective devices upon request.

C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

E. Manufacturer's factory emissions certification.

F. Source quality control test reports.

G. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
   1. Certified prototype tests.
   2. Torsional vibration compatibility certification.
   3. NFPA 110 compliance certification.
   4. Certified rated load test at rated power factor.

H. Manufacturer’s detailed field testing procedures.

I. Field quality control test reports.

J. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
   1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.

K. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.

L. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Filter Elements: One of each type, including fuel, oil and air.

1.6 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).

2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.
B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Packaged Engine Generator Set - Basis of Design: Cummins Power Generation Inc.as indicated under product description below; www.cumminspower.com.
B. Packaged Engine Generator Set - Other Acceptable Manufacturers:
1. Generac Power Systems Inc: www.generac.com/industrial
2. Kohler Co: www.kohlerpower.com.

C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
D. Source Limitations: Furnish engine generator sets and associated components and accessories produced by a single manufacturer and obtained from a single supplier.

2.2 PACKAGED ENGINE GENERATOR SYSTEM

A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. System Description:
   1. Application: Emergency/standby.
   2. Configuration: Multiple packaged engine generator sets operated in parallel.
   3. Total System Power Rating: As indicated on drawings, standby.
D. Packaged Engine Generator Set:
   1. Type: Gaseous (spark ignition).
   2. Basis of Design: Cummins Power Generation Inc.www.cumminspower.com.
   3. Power Rating: As indicated on drawings, standby.
   4. Voltage: 480Y/277 V, 3 phase, 60 Hz.
E. Generator Set General Requirements:
   1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
   2. Factory-assembled, with components mounted on suitable base.
   3. List and label engine generator assembly as complying with UL 2200.
   4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
   5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
G. Starting and Load Acceptance Requirements:
   1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
   2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
   3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
H. Exhaust Emissions Requirements:
   1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
   2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.
I. Sound Level Requirements:
   1. Do not exceed 82 dBA when measured at 23 feet from generator set in free field (no sound barriers) while operating at full load; include manufacturer's sound data with submittals.

2.3 ENGINE AND ENGINE ACCESSORY EQUIPMENT

A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.
B. Engine Fuel System - Gaseous (Spark Ignition):

1. Fuel Source: Natural gas.
2. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
3. Provide components/features indicated and as necessary for operation and/or required by applicable codes, including but not limited to:
    a. Carburetor.
    b. Gas pressure regulators.
    c. Fuel shutoff control valves.
    d. Low gas pressure switches.

C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
2. Battery(s):
    a. Battery Type: Lead-acid.
    b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
    c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
4. Battery Charger:
    a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
    b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
    c. Recognized as complying with UL 1236.
    d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
    e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
    f. Provide alarm output contacts as necessary for alarm indications.

D. Engine Speed Control System (Governor):
1. Multiple Engine Generator Sets Operated in Parallel: Provide electronic isochronous governors with automatic load sharing controls.
2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.

E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.

F. Engine Cooling System:
   1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
   2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
   3. Coolant Heater: Provide thermostatically controlled coolant heater to improve starting under cold ambient conditions; size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature.
G. Engine Air Intake and Exhaust System:
   1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
   2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.
   3. Exhaust Silencer: Provide critical grade or better exhaust silencer with sound attenuation not less than basis of design; select according to manufacturer's recommendations to meet sound performance requirements, where specified.

2.4 ALTERNATOR (GENERATOR)
A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.
B. Exciter:
   1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
   2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
   3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.
C. Temperature Rise: Comply with UL 2200.
D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.
E. Enclosure: NEMA MG 1, drip-proof.
F. Total Harmonic Distortion: Not greater than five percent.

2.5 GENERATOR SET CONTROL SYSTEM
A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.
B. Control Panel:
   1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
   2. Generator Set Control Functions:
      a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
      b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
      c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.

d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.

3. Generator Set Status Indications:
   a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
   b. Current (Amps): For each phase.
   c. Frequency (Hz).
   d. Real power (W/kW).
   e. Reactive power (VAR/kVAR).
   f. Apparent power (VA/kVA).
   g. Power factor.
   h. Duty Level: Actual load as percentage of rated power.
   i. Engine speed (RPM).
   j. Battery voltage (Volts DC).
   k. Engine oil pressure.
   l. Engine coolant temperature.
   m. Engine run time.
   n. Generator powering load (position signal from transfer switch).
4. Generator Set Protection and Warning/Shutdown Indications:
   a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
      1) Overcrank (shutdown).
      2) Low coolant temperature (warning).
      3) High coolant temperature (warning).
      4) High coolant temperature (shutdown).
      5) Low oil pressure (shutdown).
      6) Overspeed (shutdown).
      7) Low fuel level (warning).
      8) Low coolant level (warning/shutdown).
      9) Generator control not in automatic mode (warning).
      10) High battery voltage (warning).
      11) Low cranking voltage (warning).
      12) Low battery voltage (warning).
      13) Battery charger failure (warning).
   b. In addition to NFPA 110 requirements, provide the following protections/indications:
      1) High AC voltage (shutdown).
      2) Low AC voltage (shutdown).
      3) High frequency (shutdown).
      4) Low frequency (shutdown).
      5) Overcurrent (shutdown).
   c. Provide contacts for local and remote common alarm.
   d. Provide lamp test function that illuminates all indicator lamps.

5. Other Control Panel Features:
    a. Event log.
    b. Communications Capability: Compatible with system indicated. Provide all accessories necessary for proper interface.
    c. Remote monitoring capability network connection.

2.6 GENERATOR SET ENCLOSURE

A. Enclosure Type: Sound attenuating, weather protective.
B. Enclosure Material: aluminum.
C. Hardware Material: Stainless steel.
D. Color: Manufacturer's standard.
E. Access Doors: Lockable, with all locks keyed alike.
F. Openings: Designed to prevent bird/rodent entry.
G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.
H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating material.
I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rated load under worst case ambient temperature.

2.7 SOURCE QUALITY CONTROL

A. Perform production tests on generator sets at factory to verify operation and performance characteristics prior to shipment. Include certified test report with submittals.
B. Generator Set production testing to include, at a minimum:
    1. Operation at rated load and rated power factor.
    2. Single step load pick-up.
    3. Transient and steady state voltage and frequency performance.
    4. Operation of safety shutdowns.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.
B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.
C. Verify that rough-ins for field connections are in the proper locations.
D. Verify that mounting surfaces are ready to receive equipment.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1.
B. Install products in accordance with manufacturer's instructions.
C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.
D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Provide required support and attachment in accordance with Section 26 05 29.
F. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.
G. Provide grounding and bonding in accordance with Section 26 05 26.
H. Identify system wiring and components in accordance with Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. Notify Owner and Strategic Energy Solutions, Inc. at least two weeks prior to scheduled inspections and tests.
B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
C. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.
D. Preliminary inspection and testing to include, at a minimum:
    1. Inspect each system component for damage and defects.
    2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
    3. Check for proper oil and coolant levels.
E. Prepare and start system in accordance with manufacturer's instructions.
F. Perform acceptance test in accordance with NFPA 110.
G. Inspection and testing to include, at a minimum:
    1. Verify compliance with starting and load acceptance requirements.
    2. Verify voltage and frequency; make required adjustments as necessary.
    3. Verify phase sequence.
    4. Verify control system operation, including safety shutdowns.
    5. Verify operation of auxiliary equipment and accessories (e.g. battery charger, heaters, etc.).
    6. Perform load tests in accordance with NFPA 110 (1.5 hour building load test followed by 2 hour full load test).
H. Provide field emissions testing where necessary for certification.
I. Sound Level Tests: Measure sound levels for compliance with specified requirements. Identify and report ambient noise conditions.
J. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.4 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.
B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
    1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
    2. Provide minimum of four hours of training.
    3. Instructor: Manufacturer's authorized representative.

4. Location: At project site.

C. After successful acceptance test and just prior to Substantial Completion, replace air, oil, and fuel filters and fill fuel storage tank.

3.6 PROTECTION

A. Protect installed engine generator system from subsequent construction operations.

3.7 MAINTENANCE

A. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

B. Maintain an on-site log listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced.

END OF SECTION

SECTION 26 36 00

TRANSFER SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
   1. Automatic transfer switches.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
D. Section 26 32 13 - Engine Generators: For interface with transfer switches.
   1. Includes code requirements applicable to work of this section.
   2. Includes additional testing requirements.
   3. Includes related demonstration and training requirements.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
C. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2005.
D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2013.
G. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
      a. Engine Generators: See Section 26 32 13.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   5. Notify Strategic Energy Solutions, Inc. of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week before starting work of this section; require attendance of all affected installers.
C. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

1.5 SUBMITTALS

A. See SECTION 8 - INFORMATION REQUIRED FROM BIDDERS, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
C. Shop Drawings: Include dimensioned plan views and sections indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing all factory and field connections.
    1. Clearly indicate whether proposed short circuit current ratings are based on testing with specific overcurrent protective devices or time durations; indicate short-time ratings where applicable.
D. Specimen Warranty: Submit sample of manufacturer's warranty.
E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
F. Manufacturer's certification that products meet or exceed specified requirements.
G. Source quality control test reports.
H. Manufacturer’s detailed field testing procedures.
I. Field quality control test reports.
J. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
    1. Include contact information for entity that will be providing contract maintenance and trouble call-back service.
K. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.
L. Project Record Documents: Record actual locations of system components, installed circuiting arrangements and routing, and final equipment settings.
M. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.6 QUALITY ASSURANCE

A. Comply with the following:
    1. NFPA 70 (National Electrical Code).
    2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 26 32 13.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.
B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

A. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Transfer Switches - Basis of Design: ASCO Power Technologies.
B. Transfer Switches - Other Acceptable Manufacturers:
   1. ASCO Power Technologies, a brand of Emerson Network Power: www.emersonnetworkpower.com.
   2. General Electric Company: www.geindustrial.com.
   3. Thomson Power Systems: www.thomsonps.com/#sle.
C. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.
D. Source Limitations: Furnish transfer switches and accessories produced by a single manufacturer and obtained from a single supplier.

2.2 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Applications:
   1. Utilize open transition transfer unless otherwise indicated or required.
D. Construction Type: Only "contactor type" (open contact) transfer switches are acceptable. Do not use "breaker type" (enclosed contact) transfer switches.

E. Automatic Transfer Switch:
    1. Transfer Switch Type: Automatic transfer switch.
    2. Transition Configuration: Open-transition (no neutral position).
    3. Voltage: 480/277 V, 3 Phase, 4 Wire.
    4. Ampere Rating: As indicated on the drawings.
    5. Neutral Configuration: Solid neutral (unswitched), except as indicated.
    6. Primary Source: As indicated on the drawings.
    7. Alternate Source: As indicated on the drawings.
F. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).
G. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.
H. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.
I. Switching Methods:
    1. Open Transition:
        a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
        b. Where in-phase transfer is indicated, utilize in-phase monitor to initiate transfer when phase angle difference between sources is near zero to limit in-rush currents.
    2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.
J. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.
K. Enclosures:
    1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
        a. Indoor Clean, Dry Locations: Type 1 or Type 12.
    2. Finish: Manufacturer's standard unless otherwise indicated.
L. Short Circuit Current Rating:
    1. Withstand and Closing Rating: Provide transfer switches, when protected by the supply side overcurrent protective devices to be installed, with listed withstand and closing rating not less than the available fault current at the installed location.
M. Automatic Transfer Switches:
    1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.
    2. Control Functions:
        a. Automatic mode.
        b. Test Mode: Simulates failure of primary/normal source.
        c. Voltage and Frequency Sensing:
            1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.

2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.

d. Outputs:
1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
2) Auxiliary contacts; one set(s) for each switch position.

e. Adjustable Time Delays:
1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
2) Transfer to alternate/emergency source time delay.
3) Retransfer to primary/normal source time delay.
4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.

f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.

g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.

3. Status Indications:
a. Connected to alternate/emergency source.
b. Connected to primary/normal source.
c. Alternate/emergency source available.

4. Automatic Sequence of Operations:
a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

END OF SECTION

SECTION 7 - SUPPLEMENTAL CONDITIONS

1. **Reference Form:** All proposers shall include information for current or prior project references similar to the projects referenced in this solicitation (see Reference Page). The name, address, and telephone numbers of the appropriate contact for each reference shall be submitted as part of the bid. Particular attention will be paid to references from other municipalities and/or public sector entities in the state of Michigan.

2. **Surety Bonds:**
   A. Performance Bond: The successful proposer must provide a Performance Bond insuring the Contractor's performance of awarded structures/projects (required on all jobs over $50,000.00).

   B. Payment Bond: The successful proposer must provide a Materials & Labor Payment Bond insuring that the Contractor's subcontractors will be paid according to their subcontracts (required on all jobs over $50,000.00).

   C. Maintenance Bond: The successful proposer must provide a 24 month maintenance bond insuring the Contractor's performance of awarded structures/projects. The maintenance bond commences with final acceptance of project completion.

   D. General Conditions: The Bonds must be issued by a surety authorized to issue bonds in the State of Michigan and must have a penal amount at least equal to 100% of the total amount due to the Contractor under this Agreement.

3. **Permits and Fees:** The successful contractor shall be responsible for all permits and fees associated with the successful completion of the work relevant to this solicitation.

4. **Payment:** Genesee County will make payment based on cost of the equipment, the cost of installation and the total price in the bid submitted and per the terms and conditions of this IFB. The cost proposed shall include all labor, material, equipment, office and field overheads, profit, insurance, etc., necessary to cover all finished work.

   FINAL PAYMENT
   Final Payment will be processed when the project is finished and site restoration is complete to the satisfaction of the County per all terms and conditions included in this Invitation for Bid.

5. **Prevailing Wage Requirement:** The successful proposer and all subcontractors shall adhere to Genesee County's Prevailing Wage Policy (required on all jobs over $2500.00). Genesee County requires the rates of wages and fringe benefits to be paid to each class of construction mechanics by the contractor and all of his/her subcontractors, on this project, shall not be less than the wage and fringe benefits currently prevailing in the County of Genesee. Further, the County requires the contractor and all subcontractors to pay their construction

mechanics per the prevailing wage schedule as determined by the State of Michigan Department of Labor and Economic Growth (DLEG). Prevailing Wage information is available at http://www.michigan.gov/documents/lara/Genesee_519899_7.pdf

The contractor shall be required to submit certified payroll reports to the County. The reports shall detail the rates of wages and fringe benefits paid to each class of construction mechanics by the contractor and all of his/her subcontractors. Further, the Certified Payroll Reports must be submitted by the contractor with all invoices for payment.

6. Sub-Contractors

All sub-contractors must be identified and are subject to approval by the County.

Bidders shall submit a list of all construction mechanics called for in this project and possible contract. The information shall include the corresponding prevailing wages and fringe benefits to be paid for each class of relevant construction mechanics.

7. Security:

The Contractor will be required:

- to have criminal records check for each individual who will be on site during the project. This would be done by the Genesee County Sheriff. The court has LEIN terminal access in the courthouse.
- All owners, supervisors and employees who are on site should display a photo ID issued from their company/employer at all times.
- Use a security access card to access reserved parking lot and facility entrance. Access cards will be issued during the project to permit facility entrance and building navigation. The access cards will be restricted to those areas necessary for the project, to the extent possible.
- To obtain keys, if necessary, will be limited to the least number of contractors, supervisors or other lead personnel on site with a “sign upon receipt and return” basis.
- to access the building based upon an agreed upon construction schedule.
- To provide for the appropriate supervision level at all times. This may be delegated to a supervisor or lead person on site. Genesee County Building and Grounds will be the contact for county issues. Building and Grounds will have the 1st shift weekend building and grounds staff cell phone number made available as a contact. The Building and Grounds director will also provide his cell phone for questions.

SECTION 8 - INFORMATION REQUIRED FROM BIDDERS
(BID FORMAT)

In order to be deemed responsive, bids must be submitted in the format outlined below:

1. Business organization, state the full name and address of your organization, and, if applicable, the branch office or other subordinate element that will perform or assist in performing the work. Include the names and phone numbers of personnel at your organization authorized to negotiate the proposed contract.
2. Statement of Exceptions: See Section 1.6 for clarification.
3. Signed Signature Page: See page 77 of this solicitation.
4. Executed Insurance Checklist: See page 78 of this solicitation.
5. References: See page 79 of this solicitation. Prior experience with similar projects is essential for any firm to provide the services required in this solicitation. This section shall consist of a minimum of three (3) references with project descriptions. In addition, contact information for each reference shall be provided with the name, address, phone number and email address. The contacts for each reference must be knowledgeable of the offeror's performance on the referenced project and the scope of services performed by the proposer.
6. Most Recent Financial Audit or audited Financial Statements
7. Completed Financial Bid Form See page 76

FINANCIAL BID FORM
GENESEE COUNTY IFB #18-139

Total cost for GENERATOR FOR MCCREE BUILDING: $_____

The above cost includes:

1. Provide new 125kw 480/277volt 3phase 4wire Natural Gas Generator and 200A
2. Provide complete grounding system as shown on plans.
3. Provide all electrical connections and circuiting as shown on plans.
4. Provide 200A 480/277V 3phase 4wire 42 circuit panelboard, 75kva transformer and
5. 200A 208Y/120V 3phase 4wire 42 circuit panelboard. Refer to panel schedules on plans for details.
6. Provide structure steel as shown on plans for mounting of Generator on roof.
7. Provide Natural Gas piping as shown on plans to feed new generator.

List of all construction mechanics called for in this project and possible contract. The information shall include the corresponding prevailing wages and fringe benefits to be paid for each class of relevant construction mechanics.

Construction Mechanic	Wage	Fringe Benefits	

Time frame for completion _____ days

_____
Company Name

SIGNATURE PAGE
GENESEE COUNTY IFB #18-139
GENERATOR FOR MCCREE BUILDING

The undersigned represents that he or she:

1. is duly authorized to make binding offers on behalf of the company,
2. has read and understands all information, terms, and conditions in the IFB,
3. has not engaged in any collusive actions with any other potential proposers for this IFB,
4. hereby offers to enter into a binding contract with Genesee County for the products and services herein offered, if selected by Genesee County within 120 days from bid due date,
5. certify that it, its principals, and its key employees are not "Iran linked businesses," as that term is described in the Iran Economic Sanctions Act, P.A. 2012, No. 517, codified as MCL 129.311, et seq.
6. acknowledges the following addenda _____ issued as part of the IFB:

Conflict of Interest:

____To the best of our knowledge, the undersigned firm has no potential conflict of interest due to any other County contracts, or property interest for this bid.

OR

____The undersigned firm by attachment to this form, submits information which may be a potential conflict of interest due to other County contracts, or property interest for this Bid.

Exceptions to Solicitation and/or Standard Contract: NO_____ YES_____ (include attached statement)

Name (typed):_____

Signature:_____ Title:_____

Company:_____

Federal Employee Identification Number (FEIN): _____

DUNS Number: _____

Date:_____

Contact Person of company representative for matters regarding this IFB

_____

CONTACT NAME POSITION

_____

E-MAIL

_____

MAILING ADDRESS CITY STATE ZIP CODE

_____

PHONE FAX

GENESEE COUNTY INSURANCE CHECKLIST IFB #18-139

PROFESSIONAL SERVICES CONTRACT FOR: **GENERATOR FOR MCCREE BUILDING**

Coverage Required	**Limits (Figures denote minimums)**
_X_ 1. Workers' Compensation	Statutory limits of Michigan
_X_ 2. Employers' Liability	$100,000 accident/disease $500,000 policy limit, disease Including Premises/operations
_X_ 3. General Liability	$1,000,000 per occurrence with $2,000,000 aggregate Including Products/Completed Operations and Contractual Liability
___ 4. Professional liability	$1,000,000 per occurrence with $2,000,000 aggregate Including errors and omissions
___ 5. Medical Malpractice	$200,000 per occurrence $800,000 in aggregate
_X_ 6. Automobile liability	$1,000,000 combined single limit each accident- Owned, Hired, Non-owned
___ 7. Umbrella liability/Excess Coverage	$ 1,000,000 BI & PD and PI

_X_ 8 Genesee County named as an additional insured on other than workers' compensation via endorsement. A copy of the endorsement or evidence of blanket Additional Insured language in the policy must be included with the certificate.

___ 9. Other insurance required: Environmental Impairment Liability - $1,000,000 limit

_X_ 10. Best's rating: A VIII or better, or its equivalent (Retention Group Financial Statements)
_X_ 11. The certificate must state bid number and title

Insurance Agent's Statement

I have reviewed the requirements with the bidder named below. In addition:

_____ The above required policies carry the following deductibles:

_____

_____ Liability policies are ***occurrence*** _____ ***claims made*** _____

_____ _____
Insurance Agent Signature

Prospective Contractor's Statement

I understand the insurance requirements and will comply in full if awarded the contract.

_____ _____
Contractor Signature

Required general insurance provisions are provided in the checklist above. These are based on the contract and exposures of the work to be completed under the contract. Modifications to this checklist may occur at any time prior to signing of the contract. Any changes will require approval by the vendor/contractor, the department and County Risk Manager. To the degree possible, all changes will be made as soon as feasible.

REFERENCES

List 3 references of similar projects Submitted by: _____

1. Company	Phone Number
Contact Name and Position	E-mail Address
Address	
Type of Work/ Project	$ Dollar Amount of the Project
Project Description	
2. Company	Phone Number
Contact Name and Position	E-mail Address
Address	
Type of Work/ Project	$ Dollar Amount of the Project
Project Description	
3. Company	Phone Number
Contact Name and Position	E-mail Address
Address	
Type of Work/ Project	$ Dollar Amount of the Project
Project Description	

GENERATOR FOR MCCREE BUILDING CONTRACT

This Contract for Professional Services (the "Contract") is by and between the County of Genesee, a Michigan Municipal Corporation, whose principal place of business is located at 1101 Beach Street, Flint, Michigan 48502 (the "County"), and **[Contractor Name]**, a **[State] [Entity Type]**, whose principal place of business is located at **[Contractor Address]** (the "Contractor") (the County and the Contractor together, the "Parties").

1. Agreement and Authority

Execution of this Agreement is authorized by Resolution #_____ issued by the Genesee County Board of Commissioners.

2. Term

2.1 Initial Term

The initial term of this Contract commences on **[Start Date]**, and shall be effective through **[End Date]** (the "Initial Term").

2.2 Extension Terms

None

3. Scope of Work

The Contractor agrees to perform the services described on Exhibit A (the "Services").

4. Compensation

Flat Fee. The Contractor shall be paid a flat fee of $_____ for the performance of the Services. Upon completion of the Services, the Contractor must provide to the County an invoice in a form acceptable to the County, along with any necessary supporting documentation. The County will pay the Contractor within sixty (60) days of the County's acceptance of the invoice and supporting documentation.

5. Taxes. The County is a Michigan Municipal Corporation. The Contractor acknowledges that the County is exempt from Federal Excise Tax and Michigan Sales Tax.

6. Contract Administrator

The contract administrator for this Contract is **Josh Freeman** (the "Contract Administrator"). The Contractor acknowledges that the Contract Administrator is the primary County contact for notices and instructions related to this Contract. The Contractor agrees to provide a copy of all notices related to this Contract to the Contract Administrator.

7. Warranties

The Contractor warrants that:

7.1 The Services will be performed in a good and workmanlike manner and in accordance with generally acceptable practices in the industry.

7.2 The Contractor will comply with all federal, state, and local laws in the performance of the Services.

7.3 The Contractor will comply with the requirements of any federal or state grants used to fund or support this Contract.

7.4 The Contractor will obtain and maintain all applicable licenses and permits necessary to provide the Services for the entire term of this Contract.

The Contractor agrees to indemnify, defend and hold the County, its officials, officers, agents, and employees harmless from any and all claims, damages, or liability, including defense costs, arising out of the Contractor's breach of these warranties.

8. Suspension of Work

8.1 Order to Suspend Performance

Upon written order of the Contract Administrator, the Contractor agrees to immediately suspend performance of the Services. The Contractor shall not be entitled to compensation for any Services performed during any period in which the Contract Administrator has directed that the Services be suspended.

8.2 Necessary Actions Before Suspension

If immediate suspension of the Services would cause harm, injury, or damage to persons or property, the Contractor must immediately notify the Contract Administrator of the nature of such harm, injury, or damage, and obtain written authorization from the Contract Administrator to take such necessary action as to prevent or minimize such harm, injury or damage. Actions authorized by the Contract Administrator pursuant to this paragraph are compensable.

9. Termination

9.1 Termination for Cause

If the Contractor is in breach of any provision of this Contract, and such breach continues for fourteen (14) days after written notice is issued to the Contractor by the County of the breach, the County may terminate this

Contract. Such termination for cause is effective upon receipt of the notice of termination by the Contractor.

In addition to any other remedies provided by law or this Contract, the Contractor shall be responsible for all costs incurred by the County as a result of the Contractor's breach and termination, including any costs to obtain substitute performance.

9.2 Immediate Termination

If the County, in its discretion, determines that the Contractor's breach of this Contract constitutes a threat to public health, safety, or welfare, the County may terminate this Contract immediately upon notice to the Contractor.

In addition to any other remedies provided by law or this Contract, the Contractor shall be responsible for all costs incurred by the County as a result of the Contractor's breach and termination, including any costs to obtain substitute performance.

9.3 Termination for Convenience

If the County determines that it is in the County's best interests, the County may terminate this Contract upon thirty (30) days written notice to the Contractor.

The County shall pay for all work properly performed up to the effective date of the notice of termination.

9.4 Termination for Lack of Funding

If this Contract is funded by public funds or a grant from a public or private entity, and the funds are not appropriated or the grant is discontinued, the County may terminate this Contract by written notice specifying the date of termination.

The County shall pay for all work properly performed up to the effective date of the notice of termination.

10. Nondiscrimination

The Contractor covenants that it will not discriminate against an employee or applicant of employment with respect to hire, tenure, terms, conditions, or privileges of employment, or a matter directly or indirectly related to employment, because of race, color, religion, national origin, age, sex, height, weight, marital status or a disability that is unrelated to the individual's ability to perform the duties of a particular job or position, and that it will require the same non-discrimination assurances from any subcontractor who may be used to carry out duties described in this contract. Contractor covenants that it will not discriminate against

businesses that are owned by women, minorities or persons with disabilities in providing services covered by this Contract, and that it shall require the same assurances from subcontractors. Breach of this covenant shall be regarded as a material breach of this contract.

11. Freedom of Information Act

This Contract and all attachments, as well as any other information submitted by the Contractor to the County, are subject to disclosure under the provisions of MCL 15.231, *et seq*., known as the "Freedom of Information Act".

12. Intellectual Property

Any intellectual property created by the Contractor in the performance of the Services shall be considered a work made for hire, and any and all rights in such intellectual property shall belong solely to the County. Upon the County's request, the Contractor agrees to execute any documents necessary to convey ownership of such intellectual property to the County.

13. Audit Rights

13.1 Certification of Accurate Information

Contractor certifies that all information provided to the County by the Contractor relating to the award or modification of this Contract, or any payment or dispute related to this Contract, is true and correct. The Contractor further certifies that its accounting system conforms to generally accepted accounting principles.

13.2 Inspection

The Contractor agrees that the County may inspect the Contractor's plant, place of business, or worksite to ensure compliance with the terms of this Contract. If this Contract is funded or supported with any state or federal grant funds, the state or federal agencies responsible for administering the applicable grants may examine the Contractor's plant, place of business, or worksite to ensure compliance with the terms of this Contract and the terms of the applicable grant.

13.3 Audit

The Contractor agrees that the County may examine the Contractor's records to ensure compliance with the terms of this Contract. If this Contract is funded or supported with any state or federal grant funds, the state or federal agencies responsible for administering the applicable grants may examine the Contractor's records to ensure compliance with the terms of this Contract and the terms of the applicable grant.

13.4 Records Retention

The Contractor agrees to maintain any business records related to this Contract or the Contractor's performance under this Contract for a period of at least three (3) years after final payment.

14. Identity Theft Prevention

14.1 In the event that the Contractor will obtain identifying information during the performance of the Services, the Contractor must take reasonable precautions to ensure that such identifying information is protected from unauthorized disclosure and is used only for the purpose of performing the Services.

14.2 For the purposes of this Paragraph, "identifying information" means any name or number that may be used, alone or in conjunction with any other information, to identify a specific person, including but not limited to name, address, telephone number, social security number, date of birth, driver's license number, taxpayer identification number, or routing code.

15. Insurance Requirements and Indemnification

The Contractor agrees to obtain insurance coverage of the types and amounts required as set forth in the Insurance Checklist attached as Exhibit B and keep such insurance coverage in force throughout the life of this Contract.

15.1 Insurance Certificate and Additional Insured Coverage

The Contractor further agrees to provide certificates of insurance to the County evidencing the coverages specified in the Insurance Checklist, and including the County as an additional insured. Additional insured coverage is to be by proof of blanket additional insured coverage within the general liability policy or as provided by an endorsement specifying the County as an additional insured to the policy. Contractor's agent must provide a copy of the endorsement or language from the policy with the certificate of insurance.

15.2 Indemnification

The Contractor agrees to indemnify, defend and hold the County, its officials, officers, agents, and employees harmless from any and all claims, damages, or liability, including defense costs, arising out of the Contractor's performance of the Services or presence on the County's property or worksite.

16. Independent Contractor

The Contractor and its agents and employees are independent contractors and are not the employees of the County.

17. General Provisions

17.1 Entire Contract

This Contract, consisting of the following documents and Exhibits, embodies the entire Contract between the Parties.

17.1.1. The Contract – This Professional Services Contract

17.1.2. Exhibit A – The Scope of Work

17.1.3. Exhibit B – The Insurance Checklist

There are no promises, terms, conditions, or obligations relating to the Services other than those contained herein. In the event of a conflict between this Contract and any Exhibit, the terms of this Contract shall control.

17.2 No Assignment

The Contractor may not assign or subcontract this Contract without the express written consent of the County.

17.3 Modification

This Contract may be modified only in writing executed with the same formalities as this Contract.

17.4 Binding Effect

The provisions of this Contract shall apply to and bind the heirs, executors, administrators, and assigns all of the parties hereto.

17.5 Headings

The paragraph headings in this Contract are used only for ease of reference, and do not limit, modify, construe, and or interpret any provision of this Contract.

17.6 Governing Law and Venue

This Contract is entered into under the laws of the State of Michigan. Any litigation between the Parties arising out of this Contract must be initiated within two years of the cause of action accruing and must be brought in a court of competent jurisdiction in Genesee County, Michigan.

17.7 Severability and Survival

In the event that any provision of this Contract is deemed by any court of competent jurisdiction to be legally ineffective, such decision shall have no effect on the remaining provisions of this Contract.

17.8 Interpretation

Each Party has had opportunity to have this Contract reviewed by legal counsel and has had equal opportunity to contribute to its contents. In the event of any dispute concerning the interpretation of this Contract, there shall be no presumption in favor of any interpretation solely because the form of this Contract was prepared by the County.

17.9 Remedies

All remedies specified in this Contract are non-exclusive. The County reserves the right to seek any and all remedies available under this Contract and applicable law in the event that the Contractor fails to abide by the terms of this Contract.

IN WITNESS WHEREOF, the Parties have caused this Contract to be executed by their duly authorized agents.

CONTRACTOR NAME	COUNTY OF GENESEE
By:_____	By:_____
Name of Contractor Signatory	Mark Young, Chairperson
Title of Contractor Signatory	Board of County Commissioners
Date:_____	Date:_____

Approved as to form:

_____

Chief Assistant Prosecuting Attorney – Civil Division

EXHIBIT A
Description of the Services

1. Provide new 125kw 480/277volt 3phase 4wire Natural Gas Generator and 200A
2. Provide complete grounding system as shown on plans.
3. Provide all electrical connections and circuiting as shown on plans.
4. Provide 200A 480/277V 3phase 4wire 42 circuit panelboard, 75kva transformer and
5. 200A 208Y/120V 3phase 4wire 42 circuit panelboard. Refer to panel schedules on plans for details.
6. Provide structure steel as shown on plans for mounting of Generator on roof.
7. Provide Natural Gas piping as shown on plans to feed new generator.

EXHIBIT B
Insurance Checklist

[INSTRUCTIONS: You must contact the Risk Management Division of the Controller's Office to obtain an Insurance Checklist. This ensures that the Contractor has provided sufficient insurance to protect the County from reasonably anticipated risks.]