BID PROPOSAL
AND
ELECTRICAL SPECIFICATIONS
FOR
EATON ELEMENTARY SCHOOL-STANDBY GENERATOR

RFB # 19-0303

EMERGENCY MANAGEMENT/911

COUNTY COMMISSIONERS

JONATHAN BARFIELD, JR., CHAIRMAN
JULIA OLSON-BOSEMAN, VICE-CHAIRMAN
PATRICIA KUSEK
WOODY WHITE
ROB ZAPPLE

CHRIS COUDRIET, COUNTY MANAGER
COUNTY OF NEW HANOVER, NORTH CAROLINA  

REQUEST FOR BIDS  

BLAIR ELEMENTARY SCHOOL-STANDBY GENERATOR  

RFB # 19-0303  

Pursuant to Section 143-129 of the General Statutes of North Carolina, sealed bids addressed to Lena Butler, Purchasing Supervisor, New Hanover County Finance Department, 230 Government Center Drive, Suite 165, Wilmington, NC 28403 and marked “BLAIR ELEMENTARY SCHOOL-STANDBY GENERATOR: RFB # 19-0303” will be accepted until 2:00 PM EST, Monday, January 28, 2019.  

The bids will be publicly opened and read immediately following the latest time for receipt of bids in the New Hanover County Finance Office, Suite 165, Conference Room 500, Wilmington, North Carolina 28403.  

The Bidding Documents may be obtained from the County’s website by clicking “Download Complete Document.”  

The County reserves the right to waive any informalities, to reject any or all bids, and to accept that Bid or Bids which is in the best interest of the County.  

Released: January 11, 2019
Section 2  Instructions to Bidders

2.1 Schedule

<table>
<thead>
<tr>
<th>Event</th>
<th>Date/Time</th>
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<tbody>
<tr>
<td>Advertisement</td>
<td>Friday, January 11, 2019</td>
</tr>
<tr>
<td>Deadline for Questions</td>
<td>Friday, January 18, 2019 at 3:00 PM EST</td>
</tr>
<tr>
<td>Responses to Questions</td>
<td>Wednesday, January 23, 2019</td>
</tr>
<tr>
<td>Deadline for Receipt of Bids</td>
<td>Monday, January 28, 2019 at 2:00 PM EST</td>
</tr>
</tbody>
</table>

New Hanover County Finance Office
230 Government Center Drive, Suite 165
Wilmington, North Carolina 28403
(Opening to be held in Finance Conference Room 500)

2.2 Preparation of Bid Form

2.2.1 Completion of Bid Form: Bidders are expected to examine the specifications, schedule, and all instructions. Failure to do so will be at the Bidder’s risk. Each bidder shall furnish the information required by the bid form. Bids must be on the bid form contained in this bid package. All prices and notations shall be written in ink or typed. Discrepancies between words and numerals will be resolved in favor of words. Discrepancies between the multiplication of units of work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Changes or corrections made on the Bid should be initialed by the individual signing the bid. No corrections will be permitted once bids have been opened.

2.2.2 Required Specifications: Bidder's bid shall be in strict accordance with the County's specifications. Any bid which is not in strict accordance with the County's specifications must list each exception as an attachment to the Bid.

2.2.3 Deviations: New Hanover County reserves the right to allow or disallow minor deviations or technicalities should the County deem it to be to the best interest of the County. New Hanover County shall be the sole judge of what is to be considered a minor deviation or technicality.
2.3 Submission of Bid Form

2.3.1 Bid Bond: A bid bond is not required.

2.3.2 Addressee: Bids must be on the form contained in this bid package and must be submitted in a sealed envelope properly marked “BLAIR ELEMENTARY SCHOOL-STANDBY GENERATOR: RFB # 19-0303” and shall be addressed to County at the following address:

New Hanover County Finance Office  
Attn: Lena Butler, Purchasing Supervisor  
230 Government Center Drive, Suite 165  
Wilmington, NC  28403

2.3.3 Unacceptable Bids: Bids submitted via telegraph, facsimile (FAX), telephone, and electronic means, including but not limited to e-mail, in response to the Invitation for Bids will not be acceptable.

2.3.4 Quality: Items offered must meet the specifications called for and the quality must be such that it will adequately serve the use and purpose for which it is intended.

2.3.5 Signature Required: Please be sure to sign your bid. Failure to sign bid prior to submittal shall render bid invalid.

2.3.6 Late Bids: Late bids will not be accepted. It is the responsibility of the Bidder to have the bid in the office specified in the Invitation for Bids by the time and date of the opening.

2.4 Communication

After the bid issue date, all communications between the County and prospective Bidders regarding this bid request shall be in writing. Any inquiries, requests for interpretation, technical questions, clarification, or additional information shall be directed to Lena Butler, Purchasing Agent by emailing lbutler@nhcgov.com. All questions concerning this bid shall reference the bid number, section number and paragraph. Questions and responses affecting the specifications of the bid will be provided by issuance of an Addendum. All questions shall be received no later than 3:00 P.M., EST, Friday, January 18, 2008. Answers to questions will be provided no later than Wednesday, January 23, 2019.
2.5 Material and Workmanship

All equipment furnished will be guaranteed to be new and of current manufacture, to meet all requirements of these specifications, and to be ready for use at time of delivery. All workmanship will be of high quality and accomplished in a professional manner so as to insure that the equipment is functional.

2.6 Trade Secret Confidentiality

All bids received and recorded at the bid opening are considered public record and available for public inspection. According to General Statutes 132-1.2, trade secrets contained in a bid may be kept confidential if the bidder, at the time the bid is submitted, designates the secret and requests that it be kept confidential. This right of privacy will be construed as narrowly as possible to protect the interests of the Contractor while attempting to maximize the availability of information to the public.

2.7 Time of Bid Opening

Bids will be opened promptly and read at the time and date set forth in the advertisement. Bidders or their authorized agents are invited to be present. Any bids received after the scheduled closing time for the receipt of bids will not be considered and will be returned to the bidder, unopened.

2.8 Withdrawal of Bids

Bidders may withdraw or withdraw and resubmit their bid at any time prior to the closing time for receipt of bids. No bid may be withdrawn after the scheduled closing time for receipt of bids for a period of sixty (60) days except as provided under G.S. 143-129.1 which allows a bidder to withdraw his/her bid from consideration after the bid opening without forfeiture of his/her bid security if the price bid was based upon a mistake, which constituted a substantial error, provided the bid was submitted in good faith, and the bidder submits credible evidence that the mistake was clerical in nature as opposed to a judgment error, and was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of work, labor, apparatus, supplies, materials, equipment, or services made directly in the compilation of the bid, which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of the original work papers, documents or materials used in the preparation of the bid sought to be withdrawn.

2.9 Award of Contract

The award of any contract resulting from this bid will be made to the lowest responsible bidder, taking into consideration quality, performance and time specified in the bid for the performance of the contract. In the event the lowest responsible, responsive bid is in excess of the funds available for the project, the County may enter into negotiations with the
lowest responsible, responsive bidder and may make reasonable changes in the plans and specifications to bring the price within the funds available for the project and award the bid. If such negotiations prove to be unsuccessful, the County will re-advertise the project after making such changes in the plans and specifications as may be necessary to bring the cost of the project within the funds available. New Hanover County reserves the right to add or delete items or adjust quantities.

2.10 Considerations in Award of Contract

In determining the lowest responsible bid in accordance with G.S. 143-129, the Board of Commissioners will consider, among other factors: modern, accepted practices; engineering, design, efficiency and workmanship; maintenance costs; availability of service and parts inventory; and performance (based on County's previous use of the same or similar equipment made by the manufacturer).

2.11 Federal Taxes

New Hanover County is exempt from and will not pay Federal Excise Taxes or Transportation Taxes.

2.12 North Carolina Sales Tax

If bidder is required to charge North Carolina sales tax on bidder's sales, bidder shall not include it as part of the bid price. The County will pay North Carolina sales tax over and above bid prices when invoiced.

2.13 Price

Prices quoted in bid shall include all costs: materials, supplies, labor, shipping, delivery, installation, and training if required. Bidder shall guarantee the prices quoted against any increase during the contract period required.

2.14 Responsibility of Compliance with Legal Requirements

The bidder's products, service and facilities shall be in full compliance with any and all applicable state, federal, local, environmental and safety laws, regulations, ordinances and standards or any standards adopted by nationally recognized testing facilities regardless of whether or not they are referred to in the bid documents.

2.15 Indemnity

Contractor shall indemnify and hold the County, its agents and employees, harmless against any and all claims, demands, causes of action, or other liability, including attorney fees, on account of personal injuries or death or on account of property damages arising out of or relating to the work to be performed by Contractor hereunder, resulting from the
negligence of or the willful act or omission of Contractor, his agents, employees and subcontractors.

2.16 Insurance.
Before commencing any work or services, Contractor shall procure insurance in Contractor’s name and maintain all insurance policies for the duration of the Contract of the types and in the amounts listed in this Contract. The insurance shall provide coverage against claims for injuries to persons or damages to property which may arise from operations or in connection with the performance of the work hereunder by Contractor, its agents, representatives, employees, or subcontractors, whether such operations by itself or anyone directly or indirectly employed by it.

2.16.1 Certificates and Notice of Cancellation.

Before commencing work under this contract, Contractor shall furnish County with certificates of all insurance required below. Certificates shall indicate the type, amount, class of operations covered, effective date and expiration date of all policies, and shall contain the following statement:

"The insurance covered by this certificate will not be canceled or materially altered, except after thirty (30) days written notice has been received by County”.

The Certificate of Insurance, naming New Hanover County as an additional insured, shall be further evidenced by an actual endorsement furnished to the County from the insurer within thirty (30) days of the signing of the contract between the Contractor and the County.

2.16.2 Workers Compensation and Employers Liability Insurance.

Contractor shall maintain Workers’ Compensation as required by the general statutes of the State of North Carolina and Employer’s Liability Insurance. Employer’s Liability, and if necessary, CUL insurance shall not be less than $500,000 for each accident for bodily injury by accident, $500,000 for each employee for bodily injury by disease, and $500,000 policy limit.

2.16.3 Commercial General Liability.

Contractor shall maintain Commercial General Liability (CGL) and if necessary, Commercial Umbrella Liability (CUL) insurance with a total limit of not less than $1,000,000 for each occurrence for bodily injury and property damage. If such CGL insurance contains a general aggregate limit, it shall apply separately to this work or services, or the general aggregate shall be twice the required limit.

New Hanover County shall be named as an additional insured under this policy.
2.16.4 Automobile Liability Insurance.

Contractor shall maintain applicable Business or Personal Auto Liability and, if necessary, CUL insurance with a limit of not less than $1,000,000 each accident. Personal auto insurance may be accepted in lieu of Business Auto Insurance.

2.16.5 Installation Floater

Contractor shall purchase and maintain in force Installation Floater insurance for the installation of equipment. Such insurance shall be written in an amount equal to the replacement cost of the equipment. The insurance shall apply on a replacement cost basis.

2.17 Addendum

The RFB package constitutes the entire set of instructions to the bidder. The County shall not be responsible for any other instructions, verbal or written, made by anyone. Any changes to the specifications will be in the form of an Addendum which will be sent to all known Bidders who notified the Purchasing Supervisor of their intent to submit a proposal and posted on the County’s website.

2.18 Compliance with Bid Requirements

Failure to comply with these provisions or any other provisions of the General Statutes of North Carolina will result in rejection of bid.

2.19 E-Verify

Pursuant to Session Law 2013-418, Bidder shall fully comply with the U.S. Department of Homeland Security employee legal status E-Verify requirements for itself and all its subcontractors. The County may require an affidavit attesting to Bidder’s compliance. Violation of the provision, unless timely cured, shall constitute a breach of contract.

2.20 Divestment from Companies that Boycott Israel

The vendor or contractor certifies that it has not been designated by the North Carolina State Treasurer as a company engaged in the boycott of Israel pursuant to NCGS 147-86.81. It is the responsibility of each vendor or contractor to monitor compliance with this restriction. Contract valued at less than $1,000 are exempt from this restriction.

2.20 Federal Uniform Guidance

If the source of funds for this contract is federal funds, the following federal provisions apply pursuant to 2 C.F.R. § 200.326 and 2 C.F.R. Part 200, Appendix II (as applicable):

2.21 **Right to Reject Bids**

The County reserves the right to reject any or all bids.
BLAIR ELEMENTARY SCHOOL-STANDBY GENERATOR

Deadline for Receipt of Bids: 2:00 PM EST, Monday, January 28, 2019

I certify that this bid is made without prior understanding, agreement or connection with any corporation firm, or person submitting a bid for the same services and is in all respects fair and without collusion or fraud. I understand collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards. I agree to abide by all conditions of this bid and certify that I am authorized to sign this bid for the bidder.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>TOTAL COST</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Generator</td>
<td></td>
</tr>
<tr>
<td>A.</td>
<td>Material</td>
<td>$</td>
</tr>
<tr>
<td>B.</td>
<td>Labor</td>
<td>$</td>
</tr>
<tr>
<td>2.</td>
<td>Concrete Pad</td>
<td></td>
</tr>
<tr>
<td>A.</td>
<td>Material</td>
<td>$</td>
</tr>
<tr>
<td>B.</td>
<td>Labor</td>
<td>$</td>
</tr>
<tr>
<td>3.</td>
<td>Conduit &amp; Fittings</td>
<td></td>
</tr>
<tr>
<td>A.</td>
<td>Material</td>
<td>$</td>
</tr>
<tr>
<td>B.</td>
<td>Labor</td>
<td>$</td>
</tr>
<tr>
<td>4.</td>
<td>Wire &amp; Cable</td>
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</tr>
<tr>
<td>A.</td>
<td>Material</td>
<td>$</td>
</tr>
<tr>
<td>B.</td>
<td>Labor</td>
<td>$</td>
</tr>
<tr>
<td>5.</td>
<td>Miscellaneous</td>
<td></td>
</tr>
<tr>
<td>A.</td>
<td>Material</td>
<td>$</td>
</tr>
<tr>
<td>B.</td>
<td>Labor</td>
<td>$</td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td>$</td>
</tr>
</tbody>
</table>

Attachments to Bid

1. Exceptions to bid (if any)
2. Proof of Insurance (Attach certificate showing limits of coverage)
3. Certification of Debarment, Suspension Form
Notice to Proceed

The undersigned, if awarded the bid, hereby agrees to execute a contract with New Hanover County in the form specified after the award and to begin the process of providing the STANDBY GENERATOR FOR BLAIR ELEMENTARY SCHOOL as specified in this bid upon receipt of a Purchase Order issued by New Hanover County and the fully executed contract.

Addendum

Receipt of the following Addendum is acknowledged:

Addendum No. _____________________ Date___________________, 2019
Addendum No. _____________________ Date___________________, 2019

Bidder Information

Please check as appropriate and complete the items below.

The Bidder is:

☐ An Individual

☐ A Partnership between: ____________________________________________

☐ A Joint Venture consisting of:_______________________________________

☐ A Corporation organized under the laws of the State of ________________

<table>
<thead>
<tr>
<th>Signature/Date:</th>
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</thead>
<tbody>
<tr>
<td>NAME/ TITLE:</td>
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</tr>
<tr>
<td>COMPANY:</td>
<td></td>
</tr>
<tr>
<td>ADDRESS:</td>
<td></td>
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<tr>
<td>TELEPHONE:</td>
<td></td>
</tr>
<tr>
<td>EMAIL:</td>
<td></td>
</tr>
</tbody>
</table>
CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY and VOLUNTARY EXCLUSION
LOWER TIER COVERED TRANSACTION

(1) The prospective lower tier participant certifies, by submission of this bid or proposal, that neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(2) The prospective Bidder/Contractor also certifies by submission of this bid or proposal that all subcontractors and suppliers (this requirement flows down to all subcontracts at all levels) are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

(3) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this bid or proposal.

COMPANY: ____________________________________________

NAME OF AUTHORIZED OFFICIAL: ____________________________

SIGNATURE: ______________________________________________

TITLE: ______________________________________________

EMAIL: ______________________________________________

DATE ____________________________
NORTH CAROLINA

NEW HANOVER COUNTY

AGREEMENT

THIS CONTRACT made and entered into this _____ day of ___________________ 20 ___ by and between NEW HANOVER COUNTY, a political subdivision of the State of North Carolina, hereinafter referred to as "County"; and ________________________________________, a ________________, hereinafter referred to as "Contractor."

W I T N E S S E T H:

That Contractor, for the consideration hereinafter fully set out, hereby agrees with County as follows:

1. Scope of Services. Contractor shall provide generator services for New Hanover County as more fully described the RFP attached hereto as Exhibit A and incorporated herein by reference.

2. Time of Performance. The term of this Agreement shall from Notice to Proceed and all work shall be completed by ____________________. The Agreement may be renewed upon the same terms and conditions for an additional two (2) years upon written notice by County.

3. Payment. County hereby agrees to pay for the cost of this Contract not to exceed a sum of ____________________ ($________) Dollars for each fiscal year of the Agreement term.

4. Extra Work. County and Contractor shall negotiate and agree upon the value of any extra work or services prior to the issuance of a County Change Order or Renewal/Amendment (CRA) form covering said extra work or services. Such Change Order or CRA shall set forth the corresponding adjustment, if any, to the Contract Price and Contract Time.

5. Indemnity. Contractor shall indemnify and hold County, its officers, officials, agents, and employees, harmless against any and all claims, demands, causes of action, or other liability, including attorney fees, for any property damages, personal injuries or death arising out of, relating to, or resulting from the negligence, willful act, or omission of Contractor, its agents, employees and subcontractors in the performance of work or services.
6. **Insurance.** Before commencing any work or services, Contractor shall procure insurance in Contractor’s name and maintain all insurance policies for the duration of the Contract of the types and in the amounts listed in this Contract. The insurance shall provide coverage against claims for injuries to persons or damages to property which may arise from operations or in connection with the performance of the work hereunder by Contractor, its agents, representatives, employees, or subcontractors, whether such operations by itself or anyone directly or indirectly employed by it.

7. **Minimum Scope and Limits of Insurance**

7.1. **Commercial General Liability**

7.1.1. Contractor shall maintain Commercial General Liability (CGL) and if necessary, Commercial Umbrella Liability (CUL) insurance with a total limit of not less than $1,000,000 for each occurrence for bodily injury and property damage. If such CGL insurance contains a general aggregate limit, it shall apply separately to this work or services, or the general aggregate shall be twice the required limit.

7.1.2. CGL insurance shall be written on Insurance Services Office (ISO) “occurrence” form CG 00 01 covering CGL or its equivalent and shall cover the liability arising from premises, operations, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract, including the tort liability of another assumed in a business contract.

7.1.3. County, its officers, officials, agents, and employees are to be covered as additional insureds under the CGL by endorsement CG 20 10 or CG 20 33 and CG 20 37 or an endorsement providing equivalent coverage as respects to liability arising out of activities performed by or on behalf of Contractor; products and completed operations of Contractor; premises owned, leased or used by Contractor; and under the CUL, if any. The coverage shall contain no special limitations on the scope of protection afforded to County, its officers, officials, agents, and employees.

7.1.4. Contractor’s CGL insurance shall be primary as respects County, its officers, officials, agents, and employees. Any other insurance or self-insurance maintained by County, its officers, officials, agents, and employees shall be in excess of and shall not contribute to Contractor’s insurance.

7.2. **Workers’ Compensation and Employer’s Liability**
7.2.1. Contractor shall maintain Workers’ Compensation as required by the general statutes of the State of North Carolina and Employer’s Liability Insurance.

7.2.2. Employer’s Liability, and if necessary, CUL insurance shall not be less than $500,000 for each accident for bodily injury by accident, $500,000 for each employee for bodily injury by disease, and $500,000 policy limit.

7.2.3. The insurer shall agree to waive all rights of subrogation against County, its officers, officials, agents, and employees for losses arising from work or services performed by Contractor for County.

7.3. Business Auto Liability

7.3.1. Contractor shall maintain applicable Business or Personal Auto Liability and, if necessary, CUL insurance with a limit of not less than $1,000,000 each accident. Personal auto insurance may be accepted in lieu of Business Auto Insurance.

7.3.2. Such insurance shall cover liability arising out of any auto, including owned, hired, and non-owned autos used in the performance of work or services.

7.3.3. Business Auto coverage shall be written on ISO form CA 00 01, or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide Contractual liability coverage equivalent to that provided in ISO form CA 00 01.

7.3.4. Contractor’s Business Auto Liability insurance shall be primary as respects County, its officers, officials, agents, and employees. Any other insurance or self-insurance maintained by County, its officers, officials, agents, and employees shall be in excess of and shall not contribute to Contractor’s insurance.

7.4. Installation Floater

7.4.1 Contractor shall purchase and maintain in force Installation Floater insurance for the installation of equipment. Such insurance shall be written in an amount equal to the replacement cost of the equipment. The insurance shall apply on a replacement cost basis.
7.4.2 Insured property shall include portions of the work located away from the site but intended for use at the site, and shall also cover portions of the work in transit.

7.4.3 Installation Floater insurance shall name County as loss payee and at a minimum, cover the perils insured under the ISO special causes of loss form (CP 10 30).

7.4.5 Any deductible applicable to the Installation Floater shall be paid by Contractor

7.4.6 If County is damaged by the failure of Contractor to maintain Installation Floater insurance, then Contractor shall bear all reasonable costs properly attributable to that failure.

7.5 Deductibles and Self-Insured Retentions

7.5.1. Any deductibles or self-insured retentions must be declared to and approved by County. At the option of County, either the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects County, its officers, officials, agents, or employees; Contractor shall procure a bond guaranteeing payment of deductibles or self-insured retentions.

7.5.2. Contractor shall be solely responsible for the payment of all deductibles to which all policies are subject, regardless of whether County is an insured under the policy.

7.6 Miscellaneous Insurance Provisions.

7.6.1. Any failure to comply with reporting provisions of the policies listed in this Contract shall not affect coverage provided to County, its officers, officials, agents, and employees.

7.6.2. Each insurance policy required by this Contract shall be endorsed to state that coverage shall not be canceled by either party except after thirty (30) days prior written notice has been given to County, 230 Government Center Drive, Ste. #125, Wilmington, NC 28403.

7.6.3. If Contractor’s liability policies do not contain the standard ISO separation of insureds provision, or a substantially similar clause, they shall be endorsed to provide cross-liability coverage.
7.7. **Acceptability of Insurers.** Insurance is to be placed with insurers licensed to do business in the State of North Carolina with an A.M. Best’s rating of no less than A VII unless County has granted a specific exemption.

7.8. **Evidence of Insurance**

7.8.1. Contractor shall furnish County with a certificate(s) of insurance, executed by a duly authorized representative of each insurer, showing compliance with the insurance requirements prior to commencing the work or services, and thereafter upon renewal or replacement of each certified coverage until all operations under this Contract are deemed complete.

7.8.2. Evidence of additional insured status shall be noted on the certificate of insurance as per requirements in this Contract.

7.9.3. With respect to insurance maintained after final payment in compliance with requirements, an additional certificate(s) evidencing such coverage shall be provided to County with final application for payment and thereafter upon renewal or replacement of such insurance until the expiration of the period for which such insurance must be maintained.

7.9. **Subcontractors.** Contractor shall include all subcontractors as insureds under its policies or shall furnish separate certificates for each subcontractor. All coverage for subcontractors shall be subject to all of the requirements stated herein. CGL coverage shall include independent contractors’ coverage, and Contractor shall be responsible for assuring that all subcontractors are properly insured.

7.10. **Conditions**

7.10.1. County may, at its discretion and with approval of Risk Management and the Finance Department, accept letters of credit or custodial accounts in lieu of specific insurance requirements.

7.10.2. Contractor shall warrant that the insurance contributing to the satisfaction of insurance requirements in this Contract and shall not be canceled, terminated, or modified by Contractor without prior written approval of County.

7.10.3. Contractor shall promptly notify New Hanover County Emergency Management and New Hanover County Risk Management at (910) 798-7497 of any accidents arising in the course of operations under the Contract causing bodily injury or property damage.
7.10.4. County reserves the right to obtain complete, certified copies of all required insurance policies.

7.10.5. Failure of County to demand a certificate of insurance or other evidence of full compliance with these insurance requirements or failure of County to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

7.10.6. County does not represent that coverage and limits will be adequate to protect Contractor and such coverage and limits shall not be deemed as a limitation of Contractor's liability under the indemnities granted to County in this Contract.

7.10.7. If Contractor fails to maintain the insurance as set forth herein, County shall have the right to purchase said insurance at Contractor's expense. Contractor agrees to reimburse County for all expenses incurred for such purchase.

7.10.8. Contractor or its agent may apply to County for approval of higher deductibles based on financial capacity and quality of the carrier affording coverage.

7.10.9. County shall have the right to prohibit Contractor or any subcontractor from performing work or services and may withhold payment until required certificates has been received and approved by County.

8. Independent Contractor. The parties mutually agree that the Contractor is an independent contractor and not an agent of the County, and as such, the Contractor shall not be entitled to any County employment benefits, such as, but not limited to, vacation, sick leave, insurance, workmen's compensation, or pension and retirement benefits.

9. Default and Termination. If Contractor fails to prosecute the work or services with such diligence as will insure its completion within the Contract time, or if Contractor breaches any of the terms or conditions contained in this Contract and fails to cure said breach within two (2) days of County's mailing of Notice of Default, or otherwise fails to perform the work or services hereunder to the County's reasonable satisfaction, County may terminate this Contract forthwith. Upon termination, County may, without prejudice to an action for damages or any other remedy, take the prosecution of the work or services out of the hands of Contractor. County may enter into another Contract for the
completion of the Contract, or use such other methods as may be required for the completion of the Contract. County may deduct all costs of completing the Contract from any monies due or which may become due to Contractor. In the event this Contract is terminated prior to completion of the services by the Contractor, the Contractor shall be paid for work or services performed to the date of termination. In no event will the amount due Contractor in the event of termination exceed that amount set forth in this Contract. Nothing contained herein shall prevent the County from pursuing any other remedy, which it may have against Contractor, including claims for damages.

10. **Termination for Convenience.** County may terminate this Contract for convenience at any time and without cause. Upon receipt of notice, Contractor shall immediately discontinue providing the work or service and, if applicable, the placing any orders for any materials, facilities, and supplies in connection with the performance of the work or services of this Contract.

11. **Non-appropriation.** All funds for payment by County under this Contract are subject to the availability of an annual appropriation of Commissioners for the services provided under the Contract, County will terminate the Contract, without termination charge or liability, on the last day of the then-current fiscal year or when the appropriation made for then-current year for the services/items covered by this Contract is spent, whichever occurs first. If at any time funds are not appropriated for the continuance of this Contract, cancellation shall be accepted by the Contractor on ten (10) business days’ prior written notice, but failure to give such notice shall be of no effect and County shall not be obligated under this Contract beyond the date of termination.

12. **Non-waiver of Rights.** The parties mutually agree that either party’s failure to insist upon the strict performance of any provision of this Contract or to exercise any right based upon a breach thereof, or the acceptance of any performance during such breach, shall not constitute a waiver of any rights under this Contract.

13. **Conflict of Interest.** No paid employee of the County shall have a personal or financial interest, direct or indirect, as a contracting party or otherwise, in the performance of this Contract.

14. **Subcontracts.** The Contractor shall utilize no subcontractors for performing the work or services to be performed under this Contract without the prior written approval of the County.
15. **Entire Contract.** This Contract constitutes the entire understanding of the parties.

16. **Binding Effect.** This Contract shall be binding upon the parties hereto, and their heirs, successors, executors, administrators and assigns.

17. **Severability.** If any provision of this Contract is held unenforceable, all remaining provisions of this Contract shall remain in full force and effect.

18. **Inclusive Terms.** Use of the masculine herein shall include the feminine and neuter, and the singular shall include the plural.

19. **Governing Law.** All of the terms and conditions contained herein shall be interpreted in accordance with the laws of the State of North Carolina.

20. **E-Verify Compliance.** Pursuant to N.C.G.S. 143-133.3, Contractor shall fully comply with the U.S. Department of Homeland Security employee legal status E-Verify requirements for itself and all its subcontractors. Violation of the provision, unless timely cured, shall constitute a breach of Contract.

21. **Compliance with Federal Law.** If applicable, all federally funded projects, loans, grants, and sub grants whether funded in part or wholly, must be procured in a manner that conforms with all applicable Federal laws, policies, and standards, including those under the Uniform Guidance (2 C.F.R. Part 200).

22. **Equal Opportunity.**

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

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

22.3 Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

22.4 Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

22.5 Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

22.6 In the event of Contractor's non-compliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated or suspended in whole or in part and Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

22.7 Contractor will include the provisions of this section in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a
result of such direction, Contractor may request the United States to enter into such litigation to protect the interests of the United States.

23. Contractor shall comply with the following additional federal provisions:

23.1. **Davis Bacon Act and Copeland Anti-Kickback Act.**

23.1.1 Contractor and its subcontractors agree to comply with the Copeland “Anti-Kickback” Act (18 U.S.C. 874; 40 U.S.C. § 3145) as supplemented in Department of Labor regulations (29 C.F.R. Part 3). The Copeland Anti-Kickback Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to FEMA.

23.1.2 Contractor shall comply with the Davis-Bacon Act (40 U.S.C. §§ 3141-3144 and 3146-3148) as supplemented by Department of Labor regulations at 29 C.F.R. Part 5 (Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction)). See 2 C.F.R. Part 200, Appendix II, ¶ D. In accordance with the statute, Contractor must be pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, Contractor must be pay wages not less than once a week.

23.1.3 A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12.

23.2. **Contract Work Hours and Safety Standards Act**

23.2.1 Under 40 U.S.C. § 3702, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of forty hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of forty hours in the work week.

23.2.2 **Overtime:** No contractor or subcontractors contracting for any part of the work under this Agreement which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or
mechanic in any work week in which he or she is employed on such work to work in excess of forty hours in such work week unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such work week.

23.2.3 Violation: liability for unpaid wages; liquidated damages: In the event of any violation of the provisions of this section, Contractor and any subcontractors responsible therefore shall be liable to any affected employee for his unpaid wages. In additions, such Contractor and subcontractors shall be liable to the United States for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic employed in violation of the provisions of this Agreement in the sum of $10 for each calendar day on which such employee was required or permitted to be employed on such work in excess of eight hours or in excess of his standard work week of forty hours without payment of the overtime wages required by this Agreement.

23.2.4 Withholding for unpaid wages and liquidated damages: County shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by Contractor or its subcontractors under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractors for unpaid wages and liquidated damages as provided in the clause set forth in this Agreement.

23.2.5 Subcontracts: Contractor or its subcontractors shall insert in any subcontracts the clauses set forth in this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in this Agreement.

23.3. Patent Rights: If any invention, improvement, or discovery is conceived or first actually reduced to practice in the course of or under this Agreement, and that invention, improvement, or discovery is patentable under the laws of the United States of America or any foreign country, County and Contractor agree to take actions
necessary to provide immediate notice and a detailed report to FEMA. Unless the Government later makes a contrary determination in writing, irrespective of Contractor’s status (a large business, small business, state government or state instrumentality, local government, nonprofit organization, institution of higher education, individual), County and Contractor agree to take the necessary actions to provide, through FEMA, those rights in that invention due the Federal Government as described in U.S. Department of Commerce regulations, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” 37 CFR, Part 401. Contractor agrees to include the above two paragraphs in each third party subcontract for experimental, developmental, or research work financed in whole or in part with Federal assistance provided by FEMA.

23.4. **Clean Water Act and Federal Water Pollution Control Act:**

23.4.1 Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.

23.4.2 Contractor agrees to report each violation to the County and understands and agrees that the County will, in turn, report each violation as required to assure notification to Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

23.4.3 Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.

23.4.4 Contractor agrees to report each violation to the County and understands and agrees that the County will, in turn, report each violation as required to assure notification to Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

23.4.5 Contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

23.4.6 Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq. and shall report each violation to County and
understands and agrees that County will, in turn, report each violation as required to assure notification to an appropriate Federal Emergency Management Agency, and an appropriate Environmental Protection Agency Regional Office.

23.4.7 Contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.”

23.5. Suspension and Debarment.

23.5.1 This Agreement is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such Contractor is required to verify that none of Contractor, its principals (defined at 2 C.F.R. § 180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

23.5.2 Contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

23.5.3 This certification is a material representation of fact relied upon by County. If it is later determined that Contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to County, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

23.5.4 Contractor agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient.

23.7. **Procurement of Recovered Materials.**


23.7.2 The requirements of Section 6002 include procuring only items designated in guidelines of the EPA at 40 C.F.R. Part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired by the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

23.7.3 In the performance of this contract, Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired:

i. Competitively within a timeframe providing for compliance with the contract performance schedule;

ii. Meeting contract performance requirements; or

iii. At a reasonable price.

Information about this requirement, along with the list of EPA-designate items, is available at EPA’s Comprehensive Procurement Guidelines web site, https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program.

23.8. **Access to Records.** The following access to records requirements apply to this contract:

23.8.1 Contractor agrees to provide County, the FEMA Administrator, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of Contractor
which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.

23.8.2 Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

23.8.3 Contractor agrees to provide the FEMA Administrator or his authorized representative(s) access to construction or other work sites pertaining to the work being completed under this Agreement.

23.9 Contractor shall not use the DHS seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific FEMA pre-approval.

23.10. Contractor will comply with all applicable federal law, regulations, executive orders, FEMA policies, procedures, and directives.

23.11. The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract.


24. Notices. All notices required hereunder to be sent to either party shall be sent to the following designated addresses, or to such other address or addresses as may hereafter be designated by either party by mailing of written notice of such change of address, by Certified Mail, Return Receipt Requested:

To County:
New Hanover County Emergency Management
Attn: Steve Still, Director
230 Government Center Drive, Ste. 115
Wilmington, NC 28403

To Contractor:
25. **Assignability.** The parties hereto agree that this Contract is not transferable and shall not be assigned by either party without the written consent of the other party to this Contract.

26. **Contract Under Seal.** The parties hereto expressly agree to create a Contract under seal.

IN WITNESS WHEREOF, the parties have hereunto affixed their hands and seals, the day and year first above written and by authority duly given.

NEW HANOVER COUNTY

[SEAL]

____________________________
County Manager

ATTEST:

____________________________
Clerk to the Board

CONTRACTOR

[SEAL]

____________________________(Seal)
President

ATTEST:

____________________________
Secretary

This instrument has been pre-audited in the manner required by the Local Government Budget and Fiscal Control Act.

Approved as to form:

____________________________
County Finance Officer

____________________________
County Attorney

STATE OF NORTH CAROLINA

NEW HANOVER COUNTY
I, __________________________________, a Notary Public of the State and County aforesaid, certify that Kymberleigh G. Crowell acknowledged that she is Interim Clerk to the Board of Commissioners of New Hanover County, and that by authority duly given and as the act of the Board, the foregoing instrument was signed in its name by its _________ County Manager, sealed with its corporate seal and attested by herself as its Clerk.

WITNESS my hand and official seal, this _____ day of ________________________, 20 ___.

______________________________
Notary Public

My commission expires: ________________

STATE OF _____________________
COUNTY OF ____________________

I, ______________________________, a Notary Public in and for the State and County aforesaid, certify that __________________________, personally came before me this day and acknowledged that (s)he is Secretary of ___________________________________ and that by authority duly given and as the act of the corporation the foregoing instrument was signed in its name by its Executive Director.

WITNESS my hand and official seal, this _____ day of ________________________, 20 ___.

______________________________
Notary Public

My commission expires: ________________
1.1 SCOPE OF WORK

A. The Instructions to Bidders, General Conditions of the Contract, Supplementary General Conditions and Division 1 bound herewith are a component part of this Division of the specifications and shall apply to this Division with equal force and shall be consulted in detail for instructions pertaining to the work.

B. Furnish all labor, materials and equipment and incidentals required to make ready for use complete electrical systems as shown on the Drawings and specified herein.

C. It is the intent of these Specifications that the electrical systems shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this Division shall be furnished at no extra cost.

D. The work shall include, but not be limited to, furnishing, coordinating, and installing the following:

1. Generator and connecting into existing electrical system.
2. Grounding.
3. Other special requirements and/or systems where shown.

E. Each bidder (or Representative) shall, before preparing a proposal, visit all areas of the existing site. If the work includes demolition, restoration, renovation and/or addition; then existing buildings and structures should be carefully inspected. The submission of the proposal by this Bidder shall be considered evidence that the Bidder (or Representative) has visited the site and noted the locations and conditions under which the work will be performed and that the Bidder takes full responsibility for a complete knowledge of all factors governing the work.

F. All power interruptions to existing equipment shall be at the Owner’s convenience with 24 hours (minimum) notice. Each interruption shall have prior approval.

G. The work shall include complete testing of all equipment and wiring at the completion of work and making any minor correction changes or adjustments necessary for all the proper functioning of the system and equipment. All work shall be of the highest quality; substandard work will be rejected.

H. Field verify all existing underground electrical and mechanical piping.

1.2 SUBMITTALS

A. Shop drawings shall be submitted for all equipment, apparatus, and other items as required by the Engineer. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.
B. Submittals are required for all materials shown in the individual specifications sections.

C. Submittals are required for materials used for penetrations of rated assemblies and for seismic restraints.

D. All shop drawings and submittals shall be submitted at the same time. Partial shop drawing and submittals will be rejected and not processed. Materials, equipment and long lead items that require special handling, if identified and requested by the contractor, will be processed separately.

E. Proposed equipment and/or materials substitutions shall be clearly indicated in shop drawings. All deviations from the specified quality, functionality, appearance or performance of the proposed equipment and/or materials shall be clearly summarized in the preface of each submittal.

F. The project shall be bid based on the equipment listed in these specifications and on the drawings. After award of the Electrical Contract the Contractor may wish to substitute equipment other than that specified, subject to approval. The Electrical Contractor shall bear the “burden of proof” for demonstrating substitute equipment equivalency and suitability.

G. The Electrical Contractor shall be required to replace installed “equivalent” equipment if the operation of this equipment does not meet the full design intent of the specified system.

H. Physical size of equipment used in the design layout are those of reputable equipment manufacturers. The Contractor is responsible for providing equipment which will fit the space provided. If the Contractor elects to use other manufacturer’s equipment, any resulting conflicts with space clearance or codes shall be the responsibility of the Contractor to correct at the Contractor’s expense.

I. The Contractor assumes all responsibility for providing code clearances. Submit a scale drawing of each electrical equipment room showing exact size and location of all proposed electrical equipment with code clearances and working space clearly indicated.

1.3 COORDINATION OF WORK

A. It is understood and agreed that the Contractor is, by careful examination, satisfied as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the general and local conditions and all other matters which can and may affect the work under this contract. The Contractor shall be held responsible for visiting the site and thoroughly familiarizing himself with the existing conditions and also any contractual requirements as may be set forth in the other Divisions of these Specifications. No extras will be considered because of additional work necessitated by obvious job conditions that are not indicated on the drawings.

B. The Contractor shall compare the electrical drawings and specifications with the drawings and specifications for other trades, and shall report any discrepancies between them to the Engineer and obtain written instructions for changes necessary in the
electrical work. The electrical work shall be installed in cooperation with other trades installing interrelated work. Before installation, the Contractor shall make proper provisions to avoid interferences in a manner approved by the Engineer. All changes required in the work of the Contractor caused by neglect to do so shall be made at the expense of the Contractor.

C. Location of electrical raceways, switches, panels, equipment, fixtures, etc., shall be adjusted to accommodate the work to interferences anticipated and encountered. The Contractor shall determine the exact route and location of each electrical raceway prior to make up and assembly.

1. Right of Way: Lines which pitch shall have the right of way over those which do not pitch. For example, steam, condensate and plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.

2. Offsets and changes in direction of electrical raceways shall be made as required to maintain proper headroom and to clear pitched lines whether or not indicated on the drawings. The Contractor shall furnish and install elbows, pull boxes, etc., as required to affect these offsets, transitions, and changes in directions. Conflicts between electrical raceways, fixtures, etc., and ductwork or piping which cannot be resolved otherwise, will be resolved by the Engineer.

D. Installation and Arrangements: The Contractor shall install all electrical work to permit removal (without damage to other parts) of any equipment requiring periodic replacement or maintenance. The Contractor shall arrange electrical raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, control components, etc., and to clear the opening of swinging and overhead doors and of access panels.

1.4 EQUIPMENT AND MATERIALS (GENERAL)

A. In compliance with North Carolina General Statute 133.3, the Engineer has, wherever possible, specified the required performance and design characteristics of all materials utilized in this construction. In some cases it is impossible to specify the required performance and design characteristics and when this occurs the Engineer has specified three or more examples of equal design or equivalent design, establishing an acceptable range for items of equal or equivalent design. Cited examples are used only to denote the quality standard of product desired and do not restrict bidders to a specific brand, make, manufacturer or specific name and are used only to set forth and convey to bidders the general style, type, character and quality of product desired. Equivalent products will be acceptable.

B. Substitution of materials, items, or equipment of equal or equivalent design shall be submitted to the Engineer for approval or disapproval. Equal or equivalent shall be interpreted to mean an item of material or equipment, similar to that named and which is suitable for the same use and capable of performing the same functions as that named, the Engineer being the judge of equality.

C. The materials used in all systems shall be new, unused and as hereinafter specified and shall bear the manufacturer’s name, trade name and UL label in every case where a standard has been established for the particular material. Equipment furnished under this
specification shall be essentially the standard product of manufacturers regularly engaged in the production of the required type of equipment, and shall be the manufacturer’s latest approved design. All materials where not specified shall be of the very best of their respective kinds. Samples of materials or manufacturer’s specifications shall be submitted for approval as required by the Engineer.

D. Protection: Electrical equipment shall at all times during construction be adequately protected against damage. Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry, permanent shelters. If an apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be replaced at no additional cost to the Owner. At the completion of the work, fixtures, equipment, and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Engineer. Damage or defects, developing before acceptance of the work shall be made good at the Contractor’s expense.

E. Any damage to factory applied paint finish shall be repaired using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted per the field painting specifications in Division 9, at no additional cost to the Owner.

F. Where materials such as wiring devices and plates, fire alarm equipment, paging system components, etc. are specified to match existing, provide materials to match existing equipment in finish, color, capacity, ratings, operating characteristics, performance, etc.

G. Delivery and Storage: Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed.

H. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.

I. Manufacturer’s directions shall be followed completely in the delivery, storage, protection, and installation of all equipment and materials. The Contractor shall promptly notify the Engineer, in writing, of any conflicts between any requirements of the Contract Documents and the manufacturer’s directions and shall obtain the Engineer’s written instructions before proceeding with the work. Should the Contractor perform any work that does not comply with the manufacturer’s direction or such written instructions from the Engineer, the Contractor shall bear all costs arising in correcting the deficiencies.

1.5 OPERATION AND MAINTENANCE MANUALS

A. Submit under relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. The Contractor shall provide two compilations of catalog data, bound in suitable loose leaf binders, for each manufactured item of equipment used in the electrical work. These shall be presented to the Engineer for transmittal to the Owner before the final inspection.
is made. Data shall include printed installation, operation and maintenance instructions for each item, indexed by product with heavy sheet dividers and tabs. All warranties shall be included with each item. Each manufacturer’s name, address and telephone number shall be clearly indicated.

C. Shop drawings with Engineer’s “as noted” markings are not acceptable for the above. “Approved” shop drawings are acceptable if adequate information is contained therein. Generally, shop drawings alone are not adequate.

1.6 PAINTING

A. All painting will be performed by the Electrical Contractor for the project, unless specifically indicated otherwise.

B. Conductors exposed in boxes and cabinets shall be protected against painting. Devices, cover plates, trims, etc., for panelboards and cabinets shall not be installed until painting has been completed.

C. The Electrical Contractor shall be responsible for touch up painting that may be required for electrical material or apparatus furnished with factory applied finish.

1.7 LOCATIONS AND MEASUREMENTS

Equipment is shown and located on the drawings as accurately as possible. All measurements shall be verified on the project and in all cases the work shall suit the surrounding trim, finishes and/or construction.

1.8 QUALITY OF WORK

All work shall be executed as required by this specification and the accompanying drawings and shall be done by skilled mechanics, and shall present a neat, trim, and mechanical appearance when completed. All work shall be performed as required by the progress of the job.

1.9 SUPERVISION

A. The Contractor shall personally, or through an authorized and competent representative, constantly supervise the work from the beginning to completion and final acceptance. So far as possible, the Contractor shall keep the same foreman and mechanics throughout the project duration.

B. During the progress of the work it shall be subject to inspection by representatives of the Engineer, the Owner, and local inspection authorities, at which time the Contractor shall furnish such required information and data on the project as requested.

C. The Electrical Contractor shall coordinate the electrical work with other Contractors and cooperate in the preparation and maintenance of a master schedule for the completion of the project.

1.10 EXCAVATION, TRENCHING AND BACKFILLING
A. The Electrical Contractor shall do all excavating, trenching and backfilling in connection with this contract. All such excavation shall be done in a manner as not to endanger or damage existing utility lines and other structures. If damage occurs, the Contractor shall pay for and repair damage to the satisfaction of the Engineer.

B. It shall be the responsibility of the Contractor to investigate conditions before excavation and to exercise care during the excavation to avoid any utilities or other objects which may not be shown. Whether or not utilities, etc., are shown on the drawings shall not relieve the Contractor from the responsibility to repair any damage caused by this work. Location of all ditching shall be laid out at grade and shall be approved by the Engineer before excavating and no work shall be done until such approval has been obtained.

C. All surplus earth shall be removed by the Contractor from the site and disposed of at the Contractor’s expense.

D. All excavation, trenching and shoring shall be in accordance with rules and regulations set forth in Article XXI, Bulletin 1 “Trenching” as published in a separate bulletin by the North Carolina Department of Labor, Division of Standards and Inspection Construction Bureau.

E. Backfilling shall be in 6” layers with each layer tamped. No boulders or debris shall be used for backfill material. Where trenching passes through areas designated as streets, driveways, walkways, or parking areas, backfill shall be tamped with power tamps to 95 percent compaction.

F. Excavation shall be bid unclassified with no extra payment for removal of rock.

1.11 CLOSING IN WORK

Work shall not be covered up or enclosed until it has been inspected, tested and approved by the authorities having jurisdiction over this work. Should any of the work be enclosed or covered up before such inspection and test, the Contractor shall uncover the work at the Contractor’s expense; after it has been inspected, tested and approved, the Contractor shall restore the work to its original condition. The electrical contractor is responsible for notifying the Electrical Inspector to schedule required inspections including rough-in, above ceiling and final inspections.

1.12 REFERENCE STANDARDS

A. All electrical equipment, materials, and installation shall be in accordance with the latest edition of the following codes and standards:

1. American Association of Edison Illuminating Companies (AEIC)
2. American National Standards Institute (ANSI)
3. American Society for Testing and Materials (ASTM)
4. Building Officials Code Administrators (BOCA)
5. Energy Code 90.1 (ASHRAE/IES)
6. Institute of Electrical and Electronic Engineers (IEEE)
7. Insulated Cable Engineers Association (ICEA)
8. International Code Council (ICC)
9. International Conference of Building Officials (ICBO)
B. All electrical equipment and material shall be listed by Underwriters Laboratories, Inc., and shall bear the appropriate U.L. listing mark or classification marking. Equipment, materials, etc. utilized not bearing a U.L. certification shall be field or factory U.L. certified prior to equipment acceptance and use.

C. Where reference is made to one of the above standards, the revision in effect at the time of the bid opening shall apply.

1.13 ENCLOSURE TYPES

Unless otherwise specified herein or shown on the Drawings, electrical enclosures shall have the following ratings:

1. NEMA 1 for dry, indoor locations.
2. NEMA 3R for outdoor locations, rooms below grade (including basements and buried vaults), “DAMP” and “WET” locations.
3. NEMA 4X for locations subject to corrosion when specifically noted.

1.14 CORROSION PROTECTION

All equipment and hardware subject to exposure to the elements and/or not installed in a conditioned space shall be fabricated of non-metallic materials, hot dip galvanized after fabrication or stainless steel. The requirements of preceding section entitled “Delivery and Storage” shall be strictly followed. Touch up any scratched metallic surfaces immediately to prevent corrosion. Apply cold galvanizing compound to all galvanized surfaces damaged during installation, i.e., cutting, etc. Ferrous, rusted or corroded materials shall be replaced before final acceptance of the work.

1.15 CODES, INSPECTION AND FEES

A. All equipment, materials and installation shall be in accordance with the requirements of the local authority having jurisdiction.

B. The Electrical Contractor shall obtain all necessary permits and pay all fees required for permits and inspections of electrical work.
C. The Electrical Contractor shall contact Code Officials to schedule any and all required inspections.

1.16 TESTS AND SETTINGS

A. Test all systems furnished under Division 26 and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the Owner’s personnel in the proper operation of the systems.

B. Make the following minimum tests and checks prior to energizing electrical equipment:
   1. Mechanical inspection, testing and settings of all circuit breakers, disconnect switches, motor starters, control equipment, etc., for proper operation.
   2. Check all wire and cable terminations. Verify to the Engineer that connections meet the equipment torque requirements.
   3. Check rotation of motors, obtain permission from other contractors to start motor, and proceed to check for proper rotation. If the motor rotates in the wrong direction, correct it. Take all necessary precautions not to damage any equipment.
   4. Provide all instruments and equipment for the tests specified herein.

C. All testing shall be scheduled and coordinated by the Contractor. Notify the Owner at least two (2) weeks in advance of conducting tests. The Contractor shall have qualified personnel present during all testing.

D. All tests shall be completely documented with the time of day, date, temperature, and all other pertinent test information. All required documentation of readings indicated shall be submitted to the Engineer prior to, and as one of the prerequisites for, final acceptance of the project.

E. Electrical Distribution System Tests: All current carrying phase conductors and neutrals shall be tested as installed, and before load connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt megger. The following procedures shall be as follows:
   1. Minimum readings shall be one million (1,000,000) ohms or more for #6 AWG wire and smaller; 250,000 ohms or more for #4 AWG wire or larger. Measurement to be taken between conductors and between conductor and the grounded metal raceway.
   2. After all fixtures, devices and equipment are installed and all connections completed to each panel, the Contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and grounded enclosure. If this reading is less than 250,000 ohms, the Contractor shall disconnect the branch circuit neutral wires from this neutral bar. The Contractor shall then test each one separately to the panel until the low reading ones are found. The Contractor shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
   3. The Contractor shall send a letter to the Engineer certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.
4. At inspection, the Contractor shall furnish a megger and show Engineer’s representative that the panels comply with the above requirements. The Contractor shall also furnish a clamp type ammeter and a voltmeter and take current and voltage readings as directed by the representatives.

5. At inspection, the Contractor shall furnish ladders, required tools, and mechanics to open fixtures, boxes, panels, or any other equipment to enable the Engineer’s representatives to see into any parts of the installation that may be requested.

F. Electrical Grounding System Tests: Provide documentation showing values of earth ground impedance for the system ground. See Specifications Section 260526 for testing requirements.

1.17 SLEEVES AND FORMS FOR OPENINGS

A. Anchor bolts, sleeves, inserts, supports, etc., that may be required for electrical work shall be furnished, located and installed by the Electrical Contractor. The Electrical Contractor shall give sufficient information (marked and located) in time for proper placement in the construction schedule. Should the Electrical Contractor delay or fail to provide sufficient information in time, then the Electrical Contractor shall cut and patch construction as necessary and required to install electrical work. Such cutting and patching will be done by the Electrical Contractor.

B. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

C. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, request shop drawings, equipment location drawings, foundation drawings, and any other data required to locate the concealed conduit before the floor slab is poured.

D. Where such data is not available in time to avoid delay in scheduled floor slab pours, the Engineer may elect to allow the installations of such conduits to be exposed. No additional compensation for such change will be allowed and written approval must be obtained from the Engineer.

E. Seal all openings, sleeves, penetration, and slots as specified and as shown on the Contract Drawings.

1.18 CUTTING AND PATCHING

A. For the purposes of the Electrical Contract, “cutting and patching” shall be defined as that work required to introduce new electrical work into existing construction. Work required to install or fit electrical boxes, conduit, enclosures, equipment, etc. into new construction is not “cutting and patching”.

B. The Electrical Contractor shall perform all cutting and patching necessary to install all equipment as required under his contract and shall re-establish all finishes to their original condition where cutting and patching occur.

C. All cutting and patching shall be done in a thoroughly workmanlike manner.
D. Core drill holes in existing concrete floors and walls as required.

E. Install work at such time as to require the minimum amount of cutting and patching.

F. Do not cut joists, beams, girders, columns or any other structural members without first obtaining written permission from the Engineer.

G. Cut opening only large enough to allow easy installation of the conduit.

H. Patching is to be of the same kind of material as was removed.

I. The completed patching work shall restore the surface to its original appearance.

J. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed.

K. Remove rubble and excess patching materials from the premises.

L. Raceways and ducts penetrating rated floor, ceiling or wall assemblies shall be properly sealed in accordance with the corresponding Underwriters Laboratories approved method utilizing approved and listed materials.

1.19 INTERPRETATION OF DRAWINGS

A. The Electrical drawings and specifications are complementary each to the other and what may be called for by one shall be as binding as if called for by both. The drawings are diagrammatic and indicate generally the location of outlets, devices, equipment, wiring, etc. Drawings shall be followed as closely as possible; however, all work shall suit the finished surroundings and/or trim.

B. Do not scale electrical drawings. Field verify all dimensions.

C. Where the words “furnish and install” or “provide” are used, it is intended that this contractor shall purchase and install completely any and/or all material necessary and required for this particular item, system, equipment, etc.

D. Where the words “the Contractor” or “this Contractor” appear in either the Electrical Drawings or Division 26 Specifications, it shall mean the Electrical Contractor.

E. Any omission from either the drawings or these specifications are unintentional, and it shall be the responsibility of this Contractor to call to the attention of the Engineer any pertinent omissions before submitting a bid. Complete and working systems are required, whether every small item of material is shown and specified or not.

F. Where no specific material or equipment type is mentioned, a high quality product of a reputable manufacturer may be used provided it conforms to the requirements of these specifications. These materials shall be listed or labeled by a Third Party Testing Agency accredited by the NCBCC to label electrical equipment.
G. The electrical drawings show the general arrangement of raceways, equipment, fixtures, and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. Some adjustment of routings and installation of conduit, cable tray and devices should be expected. The electrical work shall conform to the requirements shown on all of the drawings. General and Structural drawings shall take precedence over Electrical Drawings. Because of small scale of the electrical drawings, it is not possible to indicate offsets, fittings and accessories which may be required. The Contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings and accessories as may be required to meet such conditions, without additional cost to the Owner and as directed by the Engineer.

H. Each 3-phase circuit shall be run in a separate conduit unless otherwise shown on the Drawings.

I. Unless otherwise approved by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.

J. Where circuits are shown as “home runs” all necessary fittings and boxes shall be provided for a complete raceway installation.

K. Verify with the Engineer the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

L. Any work installed contrary to or without approval by the Engineer shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.

M. The locations of equipment, fixtures, outlets, and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

N. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.

O. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of equipment.

P. All connections to the equipment shall be made as required, and in accordance with the approved shop and setting drawings.

Q. Redesign of electrical work, which is required due to the Contractor’s use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at the Contractor’s expense. Redesign and detailed plans shall be submitted to the Engineer for approval. No additional compensation will be provided for
changes in the work, either the Electrical Contractor’s or others, caused by such redesign.

R. All floor mounted electrical equipment shall be placed on 4-inch thick concrete housekeeping pads. Edges shall be chamfered.

1.20 SIZE OF EQUIPMENT

A. Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his materials in sections sized to permit passing through such restricted areas in the structure.

B. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to suitably brace the equipment, to insure that the tilting does not impair the functional integrity of the equipment.

1.21 RECORD DRAWINGS

A. As the work progresses, legibly record all field changes on one set of project contract drawings, herein after called the “record drawings”.

B. Record drawings shall accurately show the installed condition of the following items:
   1. Power distribution one-line diagram(s).
   2. Panel schedule(s).
   4. Plan view, sizes and locations of generator and load bank.

1.22 SEISMIC REQUIREMENTS

A. All equipment furnished under the electrical contract shall be installed in a manner to be fully compliant with the seismic restraint requirements of the North Carolina State Building Code (NCSBC). The Contractor shall provide any and all seismic restraint details and calculations that may be required by the NCSBC and/or the Authority Having Jurisdiction.

B. Requirements for restraints are detailed in the NCSBC. All tables and references shall conform to building’s location.

C. The Contractor shall retain the services of a Professional Engineer registered in the State of North Carolina to design seismic restraint elements required for this project. The Engineer’s calculations, bearing his professional seal, shall accompany shop drawings and shall demonstrate Code compliance including certification that the seismic system components comply with the testing requirements of NCSBC Section 1708.5. Calculations and shop drawings shall be submitted for review prior to the purchasing of materials, equipment, systems and assemblies. Internal seismic restraint elements of manufactured equipment shall be certified by a professional engineer retained by the manufacturer. Such certificate applies only to internal elements of the equipment. All equipment anchorage requirements shall be coordinated with the building structure and...
shall be compatible thereto. All such anchorages shall be subject to the review and approval of the project’s structural engineer.

D. The Professional Engineer retained for seismic restraint calculations shall visit the job site upon completion of the seismic restraint installation to comply with the Special Inspections requirement of the Code. This engineer shall provide written verification of compliance of the installation with the approved seismic submittal. This verification shall be submitted as a Special Inspections Report and shall bear the Engineer’s professional seal. Job site inspections by other than this engineer are not acceptable.

E. Review of the seismic design computations and shop drawings by the Engineer or his agent shall not relieve the Contractor of his responsibility to comply with the seismic or any other requirements of the North Carolina State Building Code.

1.23 GUARANTEE

The Contractor shall guarantee the materials and workmanship covered by these drawings and specifications for a period of one year from the date of acceptance by the Owner. The Contractor shall repair and/or replace any parts of any system that may prove to be defective at no additional cost to the Owner within the guarantee period. All equipment warranties shall be as specified and included in the Contract Documents.

1.24 PHASING OF THE WORK

The Electrical Contractor shall schedule his work as described in the relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.

1.25 ALTERNATE BIDS

Alternate bid items are described in relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.

PART 2 PRODUCTS Not used.

PART 3 EXECUTION Not used.

END OF SECTION 260500
SECTION 6
NHC EMERGENCY MANAGEMENT BLAIR ELEMENTARY GENERATOR

SECTION 260519 - BUILDING WIRE AND CABLE

PART 1  GENERAL

1.1 SECTION INCLUDES
   A. Building wire and cable.
   B. Wiring connectors and connections.

1.2 RELATED SECTIONS
   A. Section 260533 - Conduit.
   B. Section 260534 - Boxes.
   C. Section 260553 - Identification.

1.3 REFERENCES
   B. NECA Standard of Installation (National Electrical Contractors Association).

1.4 SUBMITTALS
   A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
   B. Product Data: Provide manufacturer’s catalog information showing dimensions, ratings, colors, and configurations.
   C. Test Reports: Indicate procedures and values obtained.
   D. Manufacturer’s Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

1.5 QUALIFICATIONS
   A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS
   A. Conform to requirements of ANSI/NFPA 70.
   B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.
1.7 PROJECT CONDITIONS

A. All wire and cable shall be installed in conduit. This includes all power wiring; fire alarm, sound and communications wire and cable (unless noted otherwise); HVAC control cable; etc.

B. Verify that field measurements are as shown on Drawings.

C. Conductor sizes are based on 75° C. copper.

D. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.

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

1.8 COORDINATION

A. Coordinate Work under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

PART 2 PRODUCTS

2.1 BUILDING WIRE AND CABLE

A. Description: Single conductor insulated building wire.

B. Conductor: Copper. Solid and stranded as specified below. Minimum #12 AWG, maximum 500 KCMil.

C. Insulation/Voltage Rating: 600 volts.

D. Insulation: Dual-rated THHN/THWN or XHHW.

E. Color Coding:

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<th>Volts</th>
<th>Phase A</th>
<th>Phase B</th>
<th>Phase C</th>
<th>Neutral</th>
<th>Ground</th>
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<td>Red</td>
<td>Blue</td>
<td>White</td>
<td>Green</td>
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<tr>
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<td>Brown</td>
<td>Orange</td>
<td>Yellow</td>
<td>Gray</td>
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<td></td>
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</tr>
</tbody>
</table>

2.2 WIRING CONNECTORS AND CONNECTIONS

A. Conductors shall be installed continuous from outlet to outlet with no splicing except within outlet or junction boxes, troughs and gutters. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
B. Use mechanical connectors for copper conductor splices and taps, 8 AWG and larger, except main grounding conductors, which shall be terminated with compression lugs. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor or use UL-approved insulating covers.

C. Use insulated spring wire connectors with plastic caps for copper conductors, 10 AWG and smaller, splices and taps in junction boxes, outlet boxes and lighting fixtures, Ideal “wirenuts” or 3M Company “Scotchlock”. “Push wire” type connectors are not acceptable.

D. “Sta-Kon” or other permanent type crimp connectors shall not be used for branch circuit connections.

E. Joints in stranded conductors shall be spliced by approved mechanical connectors and gum rubber tape or friction tape. Solderless mechanical connectors for splices and taps, provided with U.L approved insulating covers, may be used instead of mechanical connectors plus tape.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire has been completed.

C. Verify that raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 WIRING METHODS

A. Concealed Dry Interior Locations: Use only building wire in raceway.

B. Exposed Dry Interior Locations: Use only building wire in raceway.

C. Above Accessible Ceilings: Use only building wire in raceway.

D. Wet or Damp Interior Locations: Use only building wire in raceway.

E. Exterior Locations: Use only building wire in raceway.

F. Underground Installations: Use only building wire in raceway.

3.4 INSTALLATION

A. Install products in accordance with manufacturer’s instructions.
B. Route wire and cable as required to meet Project Conditions.

C. Install cable in accordance with the NECA “Standard of Installation”.

D. Use solid conductor for feeders and branch circuits 10 AWG and smaller, and Class B stranded for larger conductors.

E. Use conductor not smaller than 12 AWG for power and lighting circuits.

F. Use conductor not smaller than 14 AWG for fire alarm and control circuits.

G. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet (23 m) or branch circuit homeruns longer than 50 feet.

H. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet or branch circuit homeruns longer than 125 feet.

I. Pull all conductors into raceway at same time.

J. Use suitable wire pulling lubricant for building wire 4 AWG and larger.

K. Neatly train and lace wiring inside boxes, equipment, and panelboards.

L. Clean conductor surfaces before installing lugs and connectors.

M. Identify wire and cable under provisions of Section 260553.

N. Identify each conductor with its circuit number or other designation indicated on Drawings.

O. Common neutral multiwire receptacle branch circuits are not permitted. Provide separate, individual neutral conductors for receptacle circuits.

3.5 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Inspect wire for physical damage and proper connection.

C. Measure tightness of bolted connections and compare torque measurements with manufacturer’s recommended values.

D. Verify continuity of each branch circuit conductor.

E. Prior to energizing, feeders, sub-feeders and service conductor cables shall be tested for electrical continuity and short circuits. A copy of these tests shall be sent to the North Carolina State Construction Office through the Architect.

END OF SECTION 260519
SECTION 260526 - GROUNDING AND BONDING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding electrodes and conductors.

B. Equipment grounding conductors.

1.2 REFERENCES

A. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.


C. NFPA 70 - National Electrical Code.

1.3 GROUNDING SYSTEM DESCRIPTION

A. The neutral of each secondary electrical distribution system shall be grounded at one point only which shall be at the main disconnecting device. From the main disconnecting device, a copper grounding conductor sized in accordance with the NEC shall be extended to the earth electrode. Main grounding conductors #8 AWG through and including #4 AWG shall be insulated and identified by a green colored insulation. All grounding conductors shall be installed in conduit sized in accordance with the NEC. Conduit carrying a grounding conductor shall also be grounded at the earth electrode.

B. The earth electrode shall be:

1. The metallic domestic water piping system of the building. Connection of the grounding conductor shall be made by an approved grounding clamp. The point of connection to the water system shall be within 6 inches of the entrance of the pipe inside the building or structure. Where dielectric unions are used in the water piping system, the grounding connection shall be made on the “street side” of the first such union in the system. A bonding jumper the same wire size as the grounding conductor shall be installed across the water piping connection such that the water meter may be removed without interrupting the grounding system continuity. Where no metallic domestic water piping system exists, the earth electrode shall be a ground rod with supplemental ground electrodes as defined below.

2. Ground Rods: Size as specified below driven 11 feet into the earth where shown on the contract drawings or as required. The rods shall be connected to the system ground point on the water pipe by an insulated, green copper jumper in conduit. The jumper shall be sized in accordance with the NEC and the connection at the rod shall be brazed or exothermically welded. The points of connection to the earth electrode system shall be visible and accessible upon completion of construction. Sectional rods of the same size and length shall be used in multiple rod installations, if required by soil conditions.
3. The building steel and slab reinforcing steel as shown and as required by the NEC. Connection points shall be as directed by the Architect/Engineer.

1.4 PERFORMANCE REQUIREMENTS

The ground resistance of the earth electrode shall not exceed 25 ohms. The Electrical Contractor shall test the earth electrode using a standard three point ground resistance tester and shall advise the Architect/Engineer of the results of such tests in writing. Where tests show the resistance to ground exceeds 5 ohms, appropriate action shall be taken to reduce the resistance to 25 ohms, or less, by driving additional ground rods or other approved methods. Compliance shall be demonstrated by retesting.

1.5 SUBMITTALS FOR REVIEW

A. Submittals: Procedures for submittals. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Product Data: Provide for grounding electrodes and connections.

1.6 SUBMITTALS FOR INFORMATION

A. Submittals: Submittals for information. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Test Reports: Indicates overall resistance to ground and resistance of each electrode.

C. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.7 SUBMITTALS FOR CLOSEOUT

A. Contract Closeout: Procedures for submittals as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Project Record Documents: Record actual locations of components and grounding electrodes.

C. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.8 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.
1.9 REGULATORY REQUIREMENTS
   A. Conform to requirements of NFPA 70.
   B. Products: Listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 ROD ELECTRODES
   A. Material: Copper-clad steel.
   B. Diameter: 3/4 inch (19mm)
   C. Length: 10 feet (3000 mm).

2.2 MECHANICAL CONNECTORS
   A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
   B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
   C. Retain one of two "Bus Bar Connectors" paragraphs below.
   D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
   E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
   F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
   G. Cable Tray Ground Clamp: Mechanical type, zinc-plated malleable iron.
   H. Conduit Hubs: Mechanical type, terminal with threaded hub.
   I. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
   J. Material: Cast bronze, brass, or plain malleable iron. Ground clamps shall not be fabricated from aluminum or any aluminum alloy.

2.3 WIRE
   Material: Stranded copper sized per NEC requirements.

PART 3 EXECUTION
3.1 EXAMINATION

Coordination and Meetings: Verify existing conditions prior to beginning work as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

3.2 INSTALLATION

A. Quality Control: Manufacturer’s instructions shall be followed as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Provide bonding to meet Regulatory Requirements.

C. Provide separate, insulated conductor within each feeder and branch circuit raceway.

D. Equipment Grounding Conductor: The raceway system shall not be relied on for ground continuity. A green grounding conductor, properly sized per the NEC (Table 250-122) shall be run in all raceways. Terminate each end on suitable lug, bus, or bushing. Exceptions are as follows:
   1. Raceways for telecommunications.
   2. Raceways for data.
   3. Raceways for audio conductors.
   4. Services.

E. Equipment grounding continuity shall be maintained through flexible conduit as required in previous sections.

F. Grounding conductors shall be installed as to permit the shortest and most direct path from equipment to ground. All connections to ground conductors shall be accessible for inspection and made with approved solderless connectors, brazed or bolted to the equipment or structure to be grounded. All contact surfaces shall be thoroughly cleaned before connections are made to insure good metal to metal contact.

G. All equipment housings and/or enclosures, and all non-current carrying metallic parts of electrical equipment, raceway systems, etc., shall be effectively and adequately bonded to ground.

H. Boxes with concentric, eccentric or over-sized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per the NEC and lugged to the box.

I. All metallic raceways entering or leaving panelboards (branch circuits less than 30 amperes in lighting and appliance branch circuit panelboards excepted), switchboards, transfer switches, enclosed circuit breakers, safety switches, transformers, etc. shall be provided with insulated grounding and bonding bushings and each separate piece of raceway shall be individually bonded to the equipment ground bus or metallic enclosure, as applicable, by means of copper conductor sized in accordance with the National Electrical Code, Tables 250-66 for services and transformers and 250-122 for other circuits.
J. Bond the above ground portion of the gas piping system upstream from equipment shutoff valve to the building electrical service ground. The bonding jumper shall be sized per NEC Table 250-66.

K. An equipment ground bus shall be installed in each panelboard for terminating equipment grounding conductors.

L. All wiring devices equipped with grounding connections shall be permanently and securely connected to the enclosure in which they are mounted with a copper grounding jumper.

M. The frame of all lighting fixtures shall be securely grounded to the equipment ground system with grounding conductors.

N. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond reinforcing steel together.

O. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

3.3 FIELD QUALITY CONTROL

A. Quality Assurance: Field inspection, testing and adjusting as required under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Inspect and test in accordance with NETA ATS, except Section 4, or provide for qualified technicians to perform testing according to the manufacturer’s recommendations.
PART 1  GENERAL

1.1  SECTION INCLUDES
A. Conduit and equipment supports.
B. Anchors and fasteners.

1.2  REFERENCES
A. NECA - National Electrical Contractors Association.

1.3  SUBMITTALS
A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
B. Product Data: Provide manufacturer’s catalog data for fastening systems.
C. Manufacturer’s Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4  REGULATORY REQUIREMENTS
A. Conform to requirements of ANSI/NFPA 70.
B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2  PRODUCTS

2.1  PRODUCT REQUIREMENTS
A. Materials and Finishes: Provide adequate corrosion resistance. See Specifications Section 260500, Para. 1.14 for additional hardware corrosion resistance requirements.
B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
C. Anchors and Fasteners:
1. Concrete Structural Elements: Use expansion anchors.
2. Steel Structural Elements: Use beam clamps.
5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws or bolts

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer’s instructions.
B. Provide anchors, fasteners, and supports in accordance with NECA “Standard of Installation”.
C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
D. Do not use powder-actuated anchors.
E. Obtain permission from Architect/Engineer before drilling or cutting structural members.
F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
G. Install surface-mounted cabinets and panelboards with minimum of four anchors.
H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch (25 mm) off wall.
I. Conduits installed on the interior of exterior building walls shall be spaced away from the wall surface a minimum of 1/4 inch (65mm) using “clamp-backs” or struts.
J. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION 260529
PART 1  GENERAL

1.1  SECTION INCLUDES
   A. Pull and junction boxes.

1.2  RELATED SECTIONS
   A. Section 260529 – Supporting Devices.

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

1.4  SUBMITTALS FOR REVIEW
   A. Submittals: Procedures for submittals. Submit under provisions of the General and Suplemental General Conditions and Division 1 Specifications Sections.
   B. Product Data: Provide manufacturer’s catalog information showing dimensions and configurations.

1.5  SUBMITTALS FOR CLOSEOUT
   A. Contract Closeout: Submittals for Project closeout. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
   B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.6  REGULATORY REQUIREMENTS
   A. Conform to requirements of NFPA 70.
   B. Provide Products listed and classified by testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2  PRODUCTS
2.1 PULL AND JUNCTION BOXES

Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 EXECUTION

3.1 EXAMINATION

Verify locations of outlets prior to rough-in.

3.2 INSTALLATION

A. Install boxes in accordance with NECA “Standard of Installation”.

B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

3.3 ADJUSTING

A. Contract Closeout: Adjust installed work under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

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

C. Install knockout closures in unused box openings.

3.4 CLEANING

A. Contract Closeout: Clean installed work under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.

B. Clean interior of boxes to remove dust, debris, and other material.

C. Clean exposed surfaces and restore finish.

END OF SECTION 260534
SECTION 260548.16 - SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Restriction channel bracings.
2. Restriction cables.
4. Mechanical anchor bolts.
5. Adhesive anchor bolts.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

   a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
   b. Annotate to indicate application of each product submitted and compliance with requirements.

B. Delegated-Design Submittal: For each seismic-restraint device.

1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Design Calculations: Calculate static and dynamic loading caused by equipment weight, operation, and seismic forces required to select seismic restraints.
   a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other Sections for equipment mounted outdoors.
3. Seismic-Restraint Details:
a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.

b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.

c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis. They shall bear anchorage preapproval from OSHPD in addition to preapproval, showing maximum seismic-restraint ratings, by ICC-ES or another agency acceptable to authorities having jurisdiction. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) that support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
   1. Refer to the building summary sheet and sheet S-001.

2.2 RESTRAINT CHANNEL BRACINGS

A. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end, with other matching components, and with corrosion-resistant coating; rated in tension, compression, and torsion forces.
2.3 RESTRAINT CABLES

A. Restraint Cables: ASTM A 603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.4 SEISMIC-RESTRAINT ACCESSORIES

A. Hanger-Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

B. Hinged and Swivel Brace Attachments: Multifunctional steel connectors for attaching hangers to rigid channel bracings.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.5 MECHANICAL ANCHOR BOLTS

A. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.6 ADHESIVE ANCHOR BOLTS

A. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods caused by seismic forces.
C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:
   1. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
   2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Install cables so they do not bend across edges of adjacent equipment or building structure.

C. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

D. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

E. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
   5. Set anchors to manufacturer's recommended torque using a torque wrench.
   6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.
3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   2. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
   3. Test to 90 percent of rated proof load of device.

B. Seismic controls will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 260548
SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1  GENERAL

1.1  SECTION INCLUDES

A. Nameplates and labels.
B. Wire and cable markers.
C. Conduit markers.
D. Wiring device plates marking.
E. Underground warning tape.

1.2  RELATED SECTIONS

Division 9: Painting.

1.3  REFERENCES

ANSI/NFPA 70 - National Electrical Code.

1.4  SUBMITTALS

A. Submit under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
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 specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.5  REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.
B. Furnish products listed and classified by testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

PART 2  PRODUCTS

2.1  NAMEPLATES AND LABELS

A. Nameplates: Engraved three-layer laminated plastic as follows:
Furnish and install engraved laminated phenolic nameplates for all electrical equipment supplied under this contract for identification of system, equipment controlled or served, phase, voltage, ampacity, etc. Nameplates shall be securely attached to equipment with stainless steel screws, and shall identify by name the equipment controlled, attached, etc. Embossed, self adhesive plastic tape is not acceptable for marking equipment. Nameplate material colors shall be:

1. Blue surface with white core for all 120/208 volt equipment.
2. Black surface with white core for 277/480 volt equipment.
3. Bright red surface with white core for all equipment related to fire alarm system.
4. Dark red (burgundy) surface with white core for all equipment related to Security.
5. Green surface with white core for all equipment related to “emergency” systems.
6. Orange surface with white core for all equipment related to telephone systems.
7. Brown surface with white core for all equipment related to data systems.
8. White surface with black core for all equipment related to paging systems.
9. Purple surface with white core for all equipment related to TV systems.

B. Locations:
1. Each electrical distribution and control equipment enclosure (safety switches, panelboards, transformers, etc.)
2. Communication cabinets.
3. Pull and splice boxes.

C. Letter Size: Letters shall be a minimum of 1/2 inch (13 mm) high.

2.2 WIRE MARKERS

A. Self-Adhesive Wraparound Labels: Write-on, (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
   1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
   2. Marker for Labels: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   3. Marker for Labels: Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.

C. Legend:
1. Power and Lighting Circuits: Branch circuit or feeder number as indicated on drawings.
2. Control Circuits: Control wire number as indicated on schematic and interconnection diagrams on drawings.

2.3 CONDUIT, RACEWAY AND BOX MARKING

Paint visible surfaces of exposed junction and outlet boxes and covers of raceway systems above
lay-in and other accessible ceilings. Paint all boxes and covers before installation. Mark conduits at junction boxes above accessible ceilings with the panelboard and circuit numbers of the circuits contained in the raceway using a permanent black marking pen.

2.4 WIRING DEVICE PLATES MARKING

A. Description:
   1. Adhesive backed, laminated plastic receptacle device plate labels identifying the circuit feeding the device. Labels shall be label machine printed, black lettering on a clear background, to indicate panel and circuit number and shall be Casio, Brother, T&B or approved equal.
   2. Print circuit number on flag type plastic cable tie with a permanent marker (Sharpie, etc.) and attach to conductors in outlet box. Flag shall be readily visible upon removal of device plate.

B. Locations: Each receptacle device plate. Apply centered on the lower portion below the receptacle, parallel to the lower surface.

C. Legend: Typed labels to indicate panel and circuit number feeding the device (i.e., RPA-24).

2.5 UNDERGROUND WARNING TAPE

6 inch (150 mm) wide, 4 mils thick, minimum, permanent plastic tape compounded for direct burial, detectable type, colored bright yellow with suitable continuous warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 PREPARATION

Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

A. Install nameplate parallel to equipment lines.

B. Secure nameplate to equipment front using self tapping stainless steel screws, lockwashers and acorn nuts as shown on the Drawings.

C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

D. Install receptacle identification labels at top of each device plate, parallel to upper surface.

E. Identify conduit using field painting under provisions of Division 9.

F. All empty conduit runs and conduit with conductors for future use shall be identified for
use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit or outlet.

G. Update all existing panelboard directories where changes are made. Provide new panel schedule cards as required to maintain legibility.

H. Identify underground conduits using one underground warning tape per trench at 6 - 8 inches below finished grade.

I. Install adhesive backed labels and nameplates only when ambient temperature and humidity conditions for adhesive use are within range recommended by manufacturer.

END OF SECTION 260553
SECTION 263213.13 - DIESEL ENGINE GENERATORS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes packaged diesel engine generators for emergency use with the following features:

1. Diesel engine.
2. Diesel fuel-oil system.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
7. Outdoor engine generator enclosure.
8. Vibration isolation devices.

1.2 DEFINITIONS

A. Operational Bandwidth: The total variation, from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Sizing report indicating generator and alternator starting KVA and running KW sizing for all loads indicated in generator panel schedule(s) and showing compliance with requirements of this specification, including voltage dip.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

3. Include thermal damage curve for generator.

4. Include time-current characteristic curves for generator protective device.

5. Include fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.

6. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.

7. Include airflow requirements for cooling and combustion air in cubic feet per minute at 0.8 power factor, with air-supply temperature of 95, 80, 70, and 50 deg F. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.

8. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.
B. Shop Drawings:

1. Include dimensioned plans and elevations for engine generator and other components specified. Indicate access requirements affected by height of subbase fuel tank.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for equipment and functional relationship between all electrical components.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Seismic Qualification Data: Certificates for engine generator, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight, including full fuel tank, supplied enclosure, external silencer, subbase-mounted fuel tank, skid-mounted load bank, and each piece of equipment not integral to the engine generator, and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Source Quality-Control Reports: Including, but not limited to, the following:

2. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
4. Report of exhaust emissions showing compliance with applicable regulations.

D. Field quality-control reports.

E. Warranty: For special warranty.
1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
   a. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
   b. Operating instructions laminated and mounted adjacent to generator location.
   c. Training plan.
   d. Provide three (3) bound copies, or as agreed to by architect/engineer.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.
4. Tools: Each tool listed by part number in operations and maintenance manual.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles (321 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Cummins Power Generation.
3. MTU Onsite Energy Corporation.

B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine generator housing, subbase fuel tank, engine generator, batteries, battery racks, silencers, sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces."
2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst-case normal levels.
3. Component Importance Factor: 1.0.

B. NFPA Compliance:

2. Comply with NFPA 70.
3. Comply with NFPA 110

C. UL Compliance: Comply with UL 2200.

D. Engine Exhaust Emissions: Comply with EPA requirements and applicable state and local government requirements.

E. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
1. Ambient Temperature: \textbf{5 to 104 deg F.}  
2. Relative Humidity: Zero to 95 percent.  
3. Altitude: Sea level to \textbf{1000 feet.}  

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION 

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.  

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.  

C. Overload Capacity: 110 percent of service load for 1 hour in 12 consecutive hours.  

D. Load Factor: 85 percent of service load in an Average of 24hrs. This must be available noted on publicly facing Spec documents  

E. Service Load: kVA or KW as indicated on the drawings.  

F. Power Factor: 0.8, lagging.  

G. Frequency: 60 Hz  

H. Voltage: \textbf{480 V ac.}  

I. Phase: Three-phase, \textbf{four-wire wye.}  

J. Induction Method:\textbf{ Naturally aspirated.}  

K. Governor: Adjustable isochronous, with speed sensing.  

L. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.  

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.  

M. Capabilities and Characteristics: 

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries.  
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.  

N. Engine Generator Performance:
1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage, from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency, from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Comply with NFPA 110, Type 10 system requirements.

2.4 DIESEL ENGINE

A. Fuel: ASTM D 975 diesel fuel oil, Grade 2-D S15.
B. Rated Engine Speed: 1800 rpm.
C. Lubrication System: Engine or skid mounted.
   1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
   2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
   3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.
D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system.
E. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.
   1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
   2. Size of Radiator: Adequate to contain expansion of total system coolant, from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant-system pressure for engine used. Equip with gage glass and petcock.

4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

   a. Rating: 50-psig maximum working pressure with coolant at 220 deg F, and noncollapsible under vacuum.
   b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.
   1. Minimum sound attenuation of 25 dB at 500 Hz.
   2. Sound level measured at a distance of 23 feet from exhaust discharge after installation is complete shall be 78 dBA or less.

G. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 24 V electric, with negative ground.
   1. Components: Sized so they are not damaged during a full engine-cranking cycle, with ambient temperature at maximum specified in "Performance Requirements" Article.
   2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
   3. Cranking Cycle: As required by NFPA 110 for system level specified.
   4. Battery: Adequate capacity within ambient temperature range of project to provide specified cranking cycle at least twice without recharging.
   5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
   7. Battery Charger: Current-limiting, automatic-equalizing, temperature compensating and float-. Unit shall comply with UL 1236 and include the following features:
      a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
      b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F to
140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures, remote temperature sensor shall be located within 12” of top of battery.

c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.


e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.

f. Enclosure and Mounting: NEMA 250, Type 1 wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 30.

B. Piping: Fuel-oil piping shall be Schedule 40 black steel.

C. Main Fuel Pump: Mounted on engine to provide primary fuel flow under starting and load conditions.

D. Fuel Filtering: Remove water and contaminants larger than 1 micron.

E. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Skid Mounted Sub-base Fuel Tank: Welded steel tank, with fill and vent, minimum capacity 72 hours engine-generator run time at 75% load, or 500 gallons minimum. The unit shall have the structural integrity to support the generator set and associated components. It shall include, but not be limited to, the following: heavy gauge steel double wall tank with all welded construction, prime coated and finished painted outside, secondary containment of fuel tank, lockable fuel filler cap, low fuel level alarm switch, fuel level gauge, inter-tank leak detection alarm switch, fuel line check valve, tank drain, threaded pipe connections and all other accessories required for proper operation. Shall have 3”W x 4”L x .25”T rubber isolator located at each bolt whole between the tank and concrete pad Provide 5 gallon fuel fill spill containment and Extended Vent and E-vent in in accordance with North Carolina Mechanical Code.

2.6 CONTROL AND MONITORING

A. Automatic-Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements
automatically shut down engine generator and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

B. Comply with NEC 700.10:
1. Engine start control and monitoring shall provide continuous monitoring of the entire remote start circuit.
2. Visual and audible annunciation of generator malfunction shall be initiated if the integrity of the start circuit is compromised.
3. There shall be minimum time delay (less than 5 seconds) in annunciation of any compromised condition such as an open or short circuit.
4. A system which annunciates compromised conditions only after a generator start signal is initiated via a redundant path does not meet the intent of this specification.

C. Manual-Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

D. Provide minimum run time control set for 15 minutes (30 minutes for NFPA 110 compliance), with override only by operation of a remote emergency-stop switch.

E. Comply with UL 508A.

F. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel shall be powered from the engine generator battery.

G. Control and Monitoring Panel:
1. Digital controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Instruments Display: Located on the control and monitoring panel and viewable during operation.
   a. Engine lubricating-oil pressure gage.
   b. Engine-coolant temperature gage.
   c. DC voltmeter (alternator battery charging).
   d. Running-time meter.
   e. AC voltmeter, for each phase.
   f. AC ammeter, for each phase.
   g. AC frequency meter.
   h. Generator-voltage-adjusting rheostat.
3. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication as required by NFPA 110, including the following:
a. Cranking control equipment.
c. Control switch not in automatic position alarm.
d. Overcrank alarm.
e. Overcrank shutdown device.
f. Low water temperature alarm.
g. High engine temperature pre-alarm.
h. High engine temperature.
i. High engine temperature shutdown device.
j. Overspeed alarm.
k. Overspeed shutdown device.
l. Low-fuel main tank.

1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for the duration required.

m. Coolant low-level alarm.
n. Load indicator.
o. Battery high-voltage alarm.
p. Low-cranking voltage alarm.
q. Battery-charger malfunction alarm.
r. Battery low-voltage alarm.
s. Lamp test.
t. Contacts for local and remote common alarm.

H. Connection to Datalink:

1. A separate terminal block, for 20 factory wired to Form C dry contacts, for each alarm and status indication.
2. Provide **BACNet (preferred) or Modbus RTU communications (Engineer/Owner will have to approve Modbus)** for datalink transmission of indications to New Hanover County owned telemetry system.

   a. The BACNet or Modbus communications shall provide the following information as a minimum to the telemetry system:

      1) On/off
      2) Faults, (warnings and shutdowns)
      3) Current fuel level and load
      4) Add Door Switches to show tampering.

   b. The BACNet or Modbus communications shall provide the following information if available to the telemetry system:

      1) When fuel is delivered, report on quantity delivered.
      2) Predict refuel rate when on, based on load


J. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator unless otherwise indicated.
2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and generator as the voltage source.

B. Generator Circuit Breaker: Molded-case, LISA electronic-trip type; 100 percent rated; complying with UL 489. Controller based breaker control shall not be permitted.
   2. Trip Settings: Selected to coordinate with generator thermal damage curve.
   3. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
   4. Mounting: Adjacent to or integrated with control and monitoring panel.

C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System” signals for ground fault.
   1. Indicate ground fault with other engine generator alarm indications.
   2. Trip generator protective device on ground fault.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide 12-lead alternator.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Enclosure: Dripproof.

G. Instrument Transformers: Mounted within generator enclosure.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.
   1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.

I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

K. Subtransient Reactance: 12 percent, maximum.

2.9 LOAD BANK

A. Description: Permanent, NEMA 3R outdoor, weatherproof, remote-controlled, forced-air-cooled, resistive unit capable of providing a balanced three-phase, delta-connected load to engine generator at 50 percent rated-system capacity, at 100 percent power factor. Unit shall be capable of selective control of load in 25 percent steps and with minimum step changes of approximately 5 and 10 percent available.

B. Manufactures Accepted, no others will be approved:
   1. ASCO
   2. Load Banks Direct (LBD)
   3. Simplex

C. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and stainless-steel supports. Elements shall be double insulated and designed for repetitive on-off cycling. Elements shall be mounted in removable aluminized-steel heater cases. Galvanized steel is prohibited. Element's maximum resistance shall be between 100 and 105 percent of rated resistance.

D. Reactive Load Elements: Epoxy-encapsulated reactor coils.

E. Load-Bank Heat Dissipation: Integral fan with totally enclosed motor shall provide uniform cooling airflow through load elements. Airflow and coil operating current shall be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50 percent of maximum continuous temperature rating of resistance elements.

F. Load-Element Switching: Remote-controlled contactors switch groups of load elements. Contactor coils are rated 120 V. Contactors shall be located in a separate NEMA 250, Type 3R enclosure within load-bank enclosure, accessible from exterior through hinged doors with tumbler locks.

G. Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.

H. Load-Bank Enclosures: NEMA 250, Type 3R aluminized steel complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings shall prevent entry of rain and snow. Openings for airflow shall be screened with 1/2-inch square, galvanized-steel mesh. Reactive load bank shall include automatic shutters at air intake and discharge. Components other than resistive elements shall receive exterior epoxy coating with compatible primer.

I. Protective Devices: Power input circuits to load banks shall be fused, and fuses shall be selected to coordinate with generator circuit breaker. Fuse blocks shall be located in contactor enclosure. Cooling airflow and overtemperature sensors shall automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels
and doors shall disconnect load power, control, and heater circuits. Fan motor shall be separately protected by overload and short-circuit devices. Short-circuit devices shall be noninterchangeable fuses with 200,000-A interrupting capacity.

J. Load-Bank Remote-Control Panel: Separate from load bank in NEMA 250, Type 1 enclosure with a control power switch and pilot light, and switches controlling groups of load elements.

K. Control Sequence: Control panel may be preset for adjustable single-step loading of generator during automatic exercising.

2.10 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Description: Vandal-resistant, sound-attenuating, weatherproof aluminum housing, wind resistant up to 130 mph. Multiple panels shall be lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control shall be mounted within enclosure.

B. Sound Level: The enclosure shall meet 75 dBA at 23 feet.

C. Thermal Insulation: Manufacturer's standard materials and thickness selected maintain winter interior temperature within operating limits required by engine generator components.

D. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

1. Louvers: Fixed-engine, cooling-air inlet and discharge. Storm-proof and drainable louvers prevent entry of rain and snow.

E. Interior Lights with Switch: Provide weather-resistant DC & AC powered LED lighting with 30 fc (330 lx) average maintained. They shall be Factory-wired, vapor-proof luminaires within housing; arranged to illuminate controls and accessible interior. Arrange for external electrical connection.

1. AC lighting system and connection point for operation when remote source is available.
2. DC lighting system for operation when remote source and generator are both unavailable.

F. Generator Breaker Panel: provide AC Breaker panel with single main pre-wired from factory to power all AC powered items inside the generator enclosure.

2.11 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates
of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: Neoprene separated by steel shims.
2. Minimum Deflection: 1”, verify with structural or seismic engineer.

B. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.12 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

2.13 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.


B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full-load run.
4. Maximum power.
5. Voltage regulation.
6. Transient and steady-state governing.
8. Safety shutdown.
9. At owner’s discretion, provide 14 days’ advance notice of tests and opportunity for observation of tests by Owner's representative.
10. Report factory test results within 10 days of completion of test.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Owner no fewer than two working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

3.3 INSTALLATION

A. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete base.
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

C. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

D. Exhaust System: Install Schedule 40 black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.

E. Fuel Piping:

1. Copper and galvanized steel shall not be used in the fuel-oil piping system.

F. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow space for service and maintenance.

C. Connect cooling-system water piping to engine generator with flexible connectors.

D. Connect engine exhaust pipe to engine with flexible connector.
E. Connect fuel piping to engines with a gate valve and union and flexible connector.

F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

H. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.5 IDENTIFICATION

A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

B. Install a sign indicating the generator neutral is bonded to the main service neutral at the main service location, if generator is not installed as a separately derived system.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:
   1. Load Bank Test:
   2. Provide a full load test utilizing a portable test bank for four hours minimum for each engine-generator set. Each test shall be performed at the job site in the presence of the Owner and Architect. Each test shall include one hour at 50% load, one hour at 75% load and two hours at 100% load. Upon completion of the load test, the generators shall be shut down after the cool down period. The generators shall then be started and immediately upon reaching rated rpm, 100% load shall be applied to demonstrate one step full load capability. The capability of the system to pick up full standby service load within 10 seconds of power outage shall also be demonstrated. After testing is complete:
      a. A copy of the generators test report shall be submitted to the Engineer of Record and the Owner.
      b. Test results shall record the following parameters in 20 minute intervals during four hour test:
         1) Kilowatts.
         2) Amperes.
         3) Voltage.
         4) Coolant temperature.
         5) Room temperature.
         6) Frequency.
         7) Oil pressure.
         8) Fuel flow.
3. Building Loads Test: Following the load bank test, start the buildings load test. Simulate power outage, including operation of the switchgear, automatic starting cycle, and automatic shutdown and return to normal, by interrupting normal source, and demonstrate that system operates with actual building loads to provide standby power. Test all alarm and shutdown circuits by simulating conditions. Test duration shall be one hour minimum.

4. The contractor shall coordinate demonstration and training with the switchgear vendor to provide comprehensive system demonstration and training.

5. A full tank of fuel shall be provided, replacing any fuel used for testing. Diesel fuel shall be treated with and alcohol-free additive to disperse water and clean injectors.

6. Perform tests recommended by manufacturer and in "Visual and Mechanical Inspection" and "Electrical and Mechanical Tests" subparagraphs below, as specified in the NETA ATS. Certify compliance with test parameters.
   a. Visual and Mechanical Inspection:
      1) Compare equipment nameplate data with Drawings and the Specifications.
      2) Inspect physical and mechanical condition.
      3) Inspect anchorage, alignment, and grounding.
      4) Verify that the unit is clean.
   b. Electrical and Mechanical Tests:
      1) Perform insulation-resistance tests according to IEEE 43.
         a) Machines Larger Than 200 hp, 150 kW: Test duration shall be 10 minutes. Calculate polarization index.
      2) Test protective relay devices.
      3) Verify phase rotation, phasing, and synchronized operation as required by the application.
      4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
      5) Conduct performance test according to NFPA 110.
      6) Verify correct functioning of the governor and regulator.
   7. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
      c. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
      d. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
      e. Verify acceptance of charge for each element of the battery after discharge.
      f. Verify that measurements are within manufacturer's specifications.
   8. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
9. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

10. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.

11. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.

12. Retain "Noise-Level Tests" Subparagraph below for projects subject to unwanted or illegal engine generator noise intrusion into adjacent properties or activities. Coordinate with Drawings and with requirements in "Action Submittals," "Quality Assurance," and "Engine Generator Assembly Description" articles. Note that some noise, such as muffler noise, is directional, and siting the generator can have a large impact on the measured noise in some directions. See the Evaluations for additional discussion of noise concerns.

C. Coordinate tests with tests for transfer switches, and run them concurrently.

D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component, indicating satisfactory completion of tests.

K. Infrared Scanning: After Substantial Completion, but not more than 60 days after final acceptance, perform an infrared scan of each power wiring termination and each bus connection while running with maximum load. Remove all access panels, so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7 TRAINING

A. Prior to final acceptance, the manufacturer's authorized representative shall provide comprehensive training and thoroughly and competently instruct the Owner's designated personnel in proper operation of the system and in all required periodic maintenance. Training shall include, but not be limited to, operation (all aspects including normal and emergency modes), maintenance and troubleshooting of the equipment. A minimum of eight (8) hours on site time, in addition to load bank testing, shall be allocated for this purpose.

3.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of manufacturer's authorized service representative. Include quarterly preventive maintenance and exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Parts shall be manufacturer's authorized replacement parts and supplies.

3.9 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213.13