ALABAMA PORT AUTHORITY
PORT OF MOBILE

Project Name ITC Generator- Electrical Equipment *Specification Booklet*

Location Mobile, AL

Project # 11210 **TASK #** 4 **March 2024**

SPECIFICATIONS AND CONTRACT DOCUMENT

PORT OF MOBILE
ALABAMA PORT AUTHORITY

ISSUED BY

Engineering Department

ALABAMA STATE PORT AUTHORITY

John C. Driscoll, Director & CEO

Kay Ivey, Governor of Alabama

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INVITATION TO BID

Sealed bid proposals will be received via courier to the Alabama State Port Authority, 1400 Alabama State Docks Blvd., Room 216, Administration Building, Mobile, AL 36602 by **9:00 a.m., on Monday April 1, 2024**. Sealed bid proposals can also be hand delivered from **9:45 A.M. to 10:00 A.M., on Monday April 1, 2024** to the Alabama State Port Authority in the International Trade Center Building, 250 North Water Street, Killian Room, Mobile, AL. Faxed or electronic submitted bids will not be accepted.

The work consists principally of providing bonds, labor, materials, equipment, and supervision necessary to provide and install electrical equipment on an existing platform as indicated in the attached plans and specifications. The construction site is located at the Alabama Port Authority Main Docks complex in Mobile, AL. The Contractor will be required to complete the work under the Contract within 180 calendar days of the effective date of "Notice to Proceed".

All Contractors submitting bids are to carefully examine the site of the proposed work by appointment only and thoroughly review the contract requirements prior to submission of a bid proposal. Each Bidder shall satisfy oneself as to the character, quality, and quantities of work to be performed, and as to the requirements of the proposed Contract. The submission of a proposal shall be proof that the bidding Contractor has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed Contract. All bidding Contractors must hold the proper license from the State Licensing Board of General Contractors, Montgomery, Alabama with the classification being one or more of the following: (MU) Municipal and Utility; (BC) Building Construction; (BCU4) Building; Specialty Construction (E) Electrical, or (H/RR) Heavy/Railroad.

Specifications, proposal forms, bond forms, and plans will be available on the Alabama Port Authority website under bid notices at the following address: https://www.alports.com/procurement . All questions regarding retrieval of the contract documents or project inquiries should be directed to the ASPA Project Manager, Pete Olivero, P.E. at (251) 622-2688 or pete.olivero@alports.com .

A mandatory Pre-Bid Meeting is scheduled for 10:00 A.M. Monday, March 18, 2024 at the Alabama Port Authority International Trade Center, Killian Room, 250 North Water Street, Mobile, AL.

A Guarantee will be required with each bid as follows: At least five (5%) percent of the amount bid, but in no event more than Ten Thousand ($10,000) Dollars, shall be furnished in the form of a certified check or bid bond payable to the Alabama State Port Authority. Performance and Payment bonds will be required at the signing of the contract in an amount not less than One Hundred (100%) percent of the contract price.

No bid will be considered unless the bidder, whether resident or non-resident of Alabama, is properly qualified to submit a proposal for this work in accordance with all applicable laws of the State of Alabama. This shall include evidence of holding a current license as required from the State Licensing Board for General Contractors, Montgomery, Alabama with the classification being appropriate for this type of work. In addition, non-residents of the State must show evidence of having qualified with the Secretary of State to do business in AL.

Bids will be publicly opened at 10:00 A.M. on **Monday April 1, 2024** in the International Trade Center Building, 250 North Water Street, Killian Room, Mobile, AL. The right is reserved, as the interest of the Alabama State Port Authority may require, to reject any and all bids and to waive informalities in bids received.

INSTRUCTIONS TO BIDDERS

1.0 ADDENDA AND INTERPRETATIONS

All questions about the meaning or intent of the Contract Documents shall be submitted to the ASPA Project Manager in writing. Replies will be issued by Addenda posted to the website and delivered to all parties recorded as having received the bidding documents. All addenda so issued shall become part of the Contract Documents. Only questions answered by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. Deadline for submitting questions is 3:00pm on Thursday, November 23, 2022.

2.0 APPENDICES

Not applicable

3.0 PREQUALIFICATION OF BIDDERS

No proposal will be considered from any Contractor unless he is licensed to do work in the State of Alabama and has complied with the requirements of and Paragraph SP-04 of DIVISION III

4.0 SUBMISSION OF PROPOSALS

Before submitting his proposal, the Contractor shall comply with the following:

(a) The Proposals, including the acknowledgement of addenda, shall be filled in ink on the form provided herein and all blank spaces in the form shall be fully filled. The signature shall be in long hand and the complete form shall be without interlineations, alteration or erasure.

(b) If the Bidder is a corporation organized in a state other than Alabama, attach to the Proposal a certificate from the Secretary of State showing that the Corporation is qualified to transact business in Alabama.

(c) Attach a certified check or Bid Bond in the amount of 5% of the Proposal, but not more than $10,000 made payable to the Alabama State Port Authority.

(d) Non-resident (out of state) Contractors shall attach all items included by SP-6 of DIVISION III

(e) Attach a copy of the Contractor's State of Alabama General Contractor's License to Proposal.

(f) Certificate of Compliance with the Beason-Hammon Alabama Taxpayer and Citizen Protection Act (see page I-9)

One copy of Item (a) through (f) should be placed in a sealed envelope with the bidder's name, Contractor's License number, the project name and number, and the time and date of bid opening shown on the outside.

Proposal of:
Address:
Date:
To: STATE OF ALABAMA, Alabama State Port Authority, Mobile, Alabama

Gentlemen:
The undersigned, as Bidder, hereby declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the plans and specifications for the work and contractual documents relative thereto, and has read all Special Provisions and Specifications furnished; and that he has satisfied himself relative to all aspects of the work to be performed and especially to those factors affecting cost, progress, or performance.
The Bidder proposes and agrees, if this bid is accepted, to contract with the Owner in the form of contract specified, to furnish all necessary materials, equipment, tools, apparatus, means of transportation, labor and incidentals to perform in a satisfactory manner, the work described in the Contract Specifications and Drawings for the Alabama State Port Authority, for the prices listed below to complete:

ITC Generator- Electrical Equipment

In full and complete accordance with the shown, noted, described and reasonable intended requirements of the plans, specifications and contract documents to the full and entire satisfaction of the Owner with a definite understanding that no money will be allowed for extra work except as set forth in the attached contract documents.
It is agreed that the description under each item, being briefly stated, implies, although it does not mention, all incidentals and that the prices stated are intended to cover all such work materials and incidentals as constitute Bidder's obligation as described in the specifications and any details not specifically mentioned, but evidently included in the contract shall be compensated for the item which most logically includes it.
Bidder agrees that he will commence the work within the time allotted by the Contract Documents with an adequate force, plant, and equipment and that the work will be completed within time schedules outlined in Special Provisions Article SP-3. Bidder accepts the provisions of the Contract Documents as to liquidated damages in the event of failure to complete the work on time.

The Bidder further agrees that, in case of failure on his part to execute the Contract and required bonds within ten (10) calendar days from the date written notice of award if mailed or otherwise delivered to the Bidder, the certified check or bid bond accompanying this bid and the monies payable thereon shall be paid into the funds of the Owner not as penalty, but as a liquidation of a reasonable portion of the damages incurred by the Owner due to the Bidder's failure to execute the Contract.

Each of the following items within the Schedule of Prices shall be completed in accordance with the Specifications. Contractor shall provide and install all necessary materials in accordance with manufacturer's instructions.

Project Name ITC Generator- Electrical Equipment

Location Mobile, AL

Project # 11210 **TASK#** 4 **March 2024**

ITEM	DESCRIPTION	QUANTITY	DOLLAR AMOUNT
1	Mobilization (Including Bonds, Insurance, and Port Credentials)	Lump Sum	$ _____
2	Install Owner provided generator on electrical equipment platform	Lump Sum	$ _____
3	Provide electrical equipment as specified herein	Lump Sum	$ _____
4	Provide all hardware, cables, fittings, conduit, connectors necessary to complete work specified herein.	Lump Sum	$ _____
5	Install all equipment in accordance with the plans and specifications herein.	Lump Sum	$ _____
6	Provide backup power for International Trade center, sewer lift station and security cameras during electrical outages.		
6	Energize and test electrical equipment	Lump Sum	$ _____
6	Demobilization	Lump Sum	$ _____
		TOTAL BID	$ _____

_____ Dollars

(In Words)

I, the undersigned bidder, hereby acknowledge receipt of the following addenda:

ADDENDUM NO._____
ADDENDUM NO._____
ADDENDUM NO._____
ADDENDUM NO._____

Contractor's Signature: _____

Contractor Company_____

_____	_____	_____
Name	**Title**	**Date**

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, undersigned, _____
_____ as Principal, and _____ as Surety, are hereby held and bound unto The Alabama State Port Authority as **OWNER** in the Penal sum of _____ for the payment of which will and truly be made, we hereby jointly and severally bind ourselves, successors and assigns. Signed, the _____ day of _____, 2024.

The Condition of the above obligation is such that whereas the Principal has submitted to the Alabama State Port Authority a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the

ITC Generator- Electrical Equipment

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the form of Contract attached hereto (Properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the panel amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its **BOND** shall in no way be impaired or affected by any extension of time within which the **OWNER** may accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal	
By	
Surety	
By	

State of _____

County of _____

CERTIFICATE OF COMPLIANCE WITH THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT (ACT 2011-535, as amended by Act 2012-491)

DATE: _____

RE Contract/Grant/Incentive (describe by number or subject):
_____ by and between
_____(Contractor/Grantee) and
_____(State Agency, Department or Public Entity)

The undersigned hereby certifies to the State of Alabama as follows:

1. The undersigned holds the position of _____ with the Contractor/Grantee named above, and is authorized to provide representations set out in this Certificate as the official and binding act of that entity, and has knowledge of the provisions of THE BEASON-HAMMON ALABAMA TAXPAYER AND CITIZEN PROTECTION ACT (ACT 2011-535 of the Alabama Legislature, as amended by Act 2012-491) which is described herein as "the Act".
2. Using the following definitions from Section 3 of the Act, select and initial either (a) or (b), below, to describe the Contractor/Grantee's business structure.

   BUSINESS ENTITY. Any person or group of persons employing one or more persons performing or engaging in any activity, enterprise, profession, or occupation for gain, benefit, advantage, or livelihood, whether for profit or not for profit. "Business entity" shall include, but not be limited to the following:

   a. Self-employed individuals, business entities filing articles of incorporation, partnerships, limited partnerships, limited liability companies, foreign corporations, foreign limited partnerships, foreign limited liability companies authorized to transact business in this state, business trusts, and any business entity that registers with the Secretary of State.

   b. Any business entity that possesses a business license, permit, certificate, approval, registration, charter, or similar form of authorization issued by the state, any business entity that is exempt by law from obtaining such a business license and any business entity that is operating unlawfully without a business license.

   EMPLOYER. Any person, firm, corporation, partnership, joint stock association, agent, manager, representative, foreman, or other person having control or custody of any employment, place of employment, or of any employee, including any person or entity employing any person for hire within the State of Alabama, including a public employer. This term shall not include the occupant of a household contracting with another person to perform casual domestic labor within the household.

   ____ *(a)* The Contractor/Grantee is a business entity or employer as those terms are defined in Section 3 of the Act.
   ____ *(b)* The Contractor/Grantee is not a business entity or employer as those terms are defined in Section 3 of the Act.

3. As of the date of this Certificate, Contractor/Grantee does not knowingly employ an unauthorized alien within the State of Alabama and hereafter it will not knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama;

4. Contractor/Grantee is enrolled in E-Verify unless it is not eligible to enroll because of the rules of that program or other factors beyond its control.

Certified this _____day of _____2024

_____
Name of Contractor/Grantee/Recipient

By: _____

Its _____

The above Certification was signed in my presence by the person whose name appears above, on

this _____ day of _____ , 2024

WITNESS: _____

_____

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PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That: _____
(Name of Contractor)

_____
(Address of Contractor)

_____
(City, State, Zip)

I, a(n) _____ corporation, hereinafter called Principal, and
(state of domicile)

_____
(Name of Surety)

_____
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto the Alabama State Port Authority hereinafter called OWNER, in the penal sum of _____ DOLLARS, ($ _____) (100% of the Contract Amount) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 2024, a copy of which is hereto attached and made a part hereof for the construction of:

ITC Generator- Electrical Equipment

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during the guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the OWNER may insure in making good any default, then this obligation shall be void, otherwise to remain in full force and effect.

PROVIDED FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract of the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed this _____ day of _____, 2024.

ATTEST:

_____
Principal

_____ _____(s)
(Principal) Secretary
(SEAL)

_____ _____
(Witness as to Principal) (Address)

_____ _____
Surety

ATTEST:

_____
(Surety) Secretary
(SEAL)

_____ BY: _____
Witness as to Surety Attorney-in-fact

_____ _____
(Address) (Address)

_____ _____

NOTE: Date of BOND must not be prior to date of CONTRACT.
If CONTRACTOR is Partnership, all partners should execute BOND.

LABOR AND MATERIAL BOND

KNOW ALL MEN BY THESE PRESENTS:

That: _____
(Name of Contractor)

_____
(Address of Contractor)

_____
(City, State, Zip)

I, a(n) _____ corporation, hereinafter called Principal, and
(state of domicile)

_____
(Name of Surety)

_____
(Address of Surety)

_____
(City, State, Zip)

hereinafter called Surety, are held and firmly bound unto the Alabama State Port Authority hereinafter called OWNER, in the penal sum of _____ DOLLARS, ($ _____) (100% of the Contract Amount) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that, the Principal entered into a certain contract with the OWNER, dated the _____ day of _____, 2024, a copy of which is hereto attached and made a part hereof for the construction of:

ITC Generator- Electrical Equipment

NOW, THEREFORE, if the Principal shall promptly make payments to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, fuel, repairs on machinery, equipment and tools, consumer or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor performed in such WORK whether by SUBCONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract of the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any way affect its obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed this _____ day of _____, 2024.

ATTEST:

_____
Principal

_____
(Principal) Secretary

BY: _____(s)

(SEAL)

_____
Witness as to Surety Principal

_____
(Address)

_____
(Address)

_____

_____

_____

_____
Surety

ATTEST:

_____
Witness as to Surety

BY: _____
Attorney-In-Fact

_____
(Address)

_____
(Address)

_____

_____

NOTE: Date of BOND must not be prior to date of CONTRACT.
If CONTRACTOR is Partnership, all partners should execute BOND.

ACKNOWLEDGEMENT FOR CHANGE ORDERS

TO: ALABAMA STATE PORT AUTHORITY

RE: ITC Generator- Electrical Equipment

Gentlemen:

In order to avoid the necessity of extensive amendment to the referenced Contract, the undersigned hereby acknowledges that the following conditions are those for which change orders are allowed under the Bid law:

1. Unusual and difficult circumstances which arise during the course of the execution of the Contract which could not have been reasonably foreseen.

2. Where competitive bidding for the new work will be to the serious detriment of the Owner.

3. Emergencies arising during the course of work.

4. Changes or alterations provided for in the original bid and original Contract.

5. The Contractor also acknowledges that he has read paragraph 50-04 (EXTRA WORK) and 60-17 (CLAIMS FOR ADJUSTMENT AND DISPUTES) of the General Provisions and agrees that "If for any reason the Contractor deems that additional compensation is due him for work or materials not clearly provided in the Contract, plans, or specifications or previously authorized as extra work, he shall notify the Engineer in writing of his intention to claim such additional compensation before he begins the work on which he bases his claim."

_____ BY: _____

CONTRACTOR

_____ _____

DATE TITLE

CONTRACT

THIS AGREEMENT, made and executed on this _____ day of the month of _____, Two Thousand and Twenty-four (2024), by and between The Alabama State Port Authority, and _____, Contractor, domiciled in the state of _____, Party of the Second Part, and hereinafter designated as "CONTRACTOR," WITNESSETH, that in consideration of the covenants and agreements herein contained, to be performed by the parties hereto and of the payments hereinafter agreed to be made, it is mutually agreed as follows:

The CONTRACTOR shall and will provide and furnish all equipment and labor, and perform the work required to build, construct, and complete in a thorough and workmanlike manner, to the satisfaction of the Alabama State Port Authority:

Project Name: **ITC Generator- Electrical Equipment**
Project # 11210 TASK # 4

Hereinafter called the project, for the base Contract price of _____ _____ DOLLARS, ($_____) and all extra work in connection therewith, and in accordance with plans, specifications, and Proposal, which are made a part thereof as fully as is set out herein, and hereby becomes a part of this Contract.

It is agreed and understood that the Alabama State Port Authority shall pay, and the Contractor shall receive, the full compensation for the work performed in accordance with the Specifications.

The project shall commence and will be completed in accordance with Paragraph SP-03 of the Special Provisions.

This contract shall become effective immediately upon, and as of the date all necessary parties hereto have approached and signed the same.

By signing this contract, the contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom.

IN WITNESS WHEREOF, the parties of these presents have executed this Agreement in the year and day first above written.

_____ BY: _____
WITNESS Alabama State Port Authority

_____ BY: _____
WITNESS Contractor Party of the Second Part

SPECIAL PROVISIONS

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SP-01 DESCRIPTION OF WORK

The work consists principally of providing bonds, labor, materials, equipment, and supervision necessary to provide and install electrical equipment on an existing platform as indicated in the attached plans and specifications. Said existing platform is located at the Alabama Port Authority Main Docks complex in Mobile, AL. The Contractor will be required to complete the work under the Contract within 180 calendar days of the effective date of "Notice to Proceed".

SP-02 OWNER PURCHASE OF MATERIALS

The Alabama State Port Authority will authorize the Contractor to utilize its sales tax exemption status on this project. The Contractor will be responsible for the purchase of all materials and will be required to apply for a sales and use tax certificate of exemption upon contract award. The following items within Division IV are hereby deleted in their entirety:

- Division IV Section 20-14.2, Purchase of Materials or Equipment
- Division IV Section 20-14.3, Payment of Materials or Equipment
- Division IV Section 20-14.4, Accounting Procedures
- Division IV Section 20-14.5, Procedures
- Division IV Section 20-14.7, Project Close-Out

SP-03 COMMENCEMENT AND COMPLETION

The Contractor will be required to commence work under this contract in accordance with DIVISION IV GENERAL PROVISIONS Article 90-02 (NOTICE TO PROCEED), to prosecute said work with faithfulness and energy, and to complete the entire project within 180 calendar days after effective date of Notice to Proceed. The time stated for final completion shall include final clean-up of the premises. Failure to complete work on schedule shall initiate liquidated damages, which will be assessed in accordance with the provisions of Paragraph 20-13 (LIQUIDATED DAMAGES) of DIVISION IV, GENERAL PROVISIONS.

SP-04 QUALIFICATION OF BIDDERS

In addition to the requirements of Article 20-01 and 20-03 of Division IV - GENERAL PROVISIONS and the requirements of Section 1.7, Part 1, Division V – Construction Specifications, the Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein.

SP-05 ACCEPTANCE OR REJECTION OF BIDS

The Alabama State Port Authority reserves the right to accept or reject any or all bids and to waive informalities. All bidders must be licensed to operate as contractors in the State of Alabama. Attention of bidders is directed to Chapter 8 of Title 23 of the Code of Alabama, 1975, and Amendments thereto, relating to the licensing of General Contractors. No bid will be accepted from anyone except a qualified Contractor, licensed by the State Licensing Board for General Contractors, with the classification being appropriate for this type of work. In addition, non-residents of the State must show evidence of having qualified with the Secretary of State to do business in Alabama.

SP-06 NON-RESIDENT (OUT-OF-STATE) CONTRACTORS

Preference shall be given to resident contractors, and non-resident bidders domiciled in a state having laws granting preference to local contractors shall be awarded Alabama public contracts the same as Alabama contractors bidding under similar circumstances; and resident contractors in Alabama are to be granted preference over non-residents in awarding of contracts in the same manner and to the same extent as provided by the laws of the state of domicile of the non-resident.

Non-resident bidders must accompany any written bid documents with a written opinion of any attorney at law licensed to practice law in such non-resident bidders' state of domicile, as to the preferences, if any or none, granted by the law of that state to its own business entities whose principal places of business are in that State in the letting of any or all public contracts.

SP-07 INDEMNIFICATION

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, the Engineer, and their agents and employees from and against all claims, damages, losses, and expenses, including, but not limited to, attorney's fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss, or expense (1) is attributed to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity that would otherwise exist as to any party or person described in this Paragraph SP-07.

In any and all claims against the Owner, the Engineer or any of their agents or employees by any employee of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification under this Paragraph SP-07, shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any subcontractor under workers' or workmen's compensation acts, or other employee benefits acts.

SP-08 INTENT OF PLANS AND SPECIFICATIONS

The following is in addition to Article 60-03 of DIVISION IV, GENERAL PROVISIONS:
Any detail which may be incomplete or lacking in the plans and specifications shall not constitute claim for extra compensation. Such detail shall be supplied by the Contractor and submitted to the Engineer in advance of its requirement on the job. The true intent of the plans and specifications is to produce a complete working facility and incomplete detail will not abrogate this intent.

SP-09 SUPERVISION

The Contractor shall place a competent superintendent on the Project who shall have experience in the type of work being performed under this Contract. The Contractor shall also submit an organizational chart, which shall clearly show the Contractor's personnel assigned to the Project and the position that they hold. The chart shall also define the persons of contact with the Owner and the Engineer.

The Owner reserves the right to request changes in supervision for incompetent actions or other reasons of due cause. Once the Contractor is notified in writing of a request to replace the superintendent, he shall do so within five (5) calendar days of such request.

The Contractor's assigned superintendent shall have responsibility for the day-to-day operations of the work and shall be the on-site safety officer responsible for implementation of the Contractor's safety program unless another named person is so assigned.

The assigned superintendent shall remain on the Project site while work under the Contract is being performed. In the superintendent's absence from the site, another named person shall be responsible for all aspects of the work. Notification of the name of the individual shall be filed with the Owner and Engineer. The Contractor shall not reassign a superintendent without the acknowledgement and approval of the Owner.

SP-10 CONTRACTOR'S REPRESENTATIVE

A representative of the Contractor shall be on the site while work is being conducted as required by paragraph 90-01 (SUBLETTING OF CONTRACT) of DIVISION IV. A telephone number should be given to the Engineer where he might contact the Representative after working hours in case of an emergency.

SP-11 METHOD OF PAYMENT

Payment will be made in accordance with the provisions of Paragraph 100-06 (PARTIAL PAYMENT) of DIVISION IV except that there will be no payment for materials on hand. Paragraph 100-07 (PAYMENT FOR MATERIALS ON HAND) is to be deleted in its entirety.

SP–12 INSURANCE

Section 40 (INDEMNIFICATION AND INSURANCE REQUIREMENTS) of DIVISION IV shall apply, except as otherwise noted below:

1) Section 40-02 (CONTRACTOR COVERAGE) of DIVISION IV – In addition to the provisions of stated, which shall remain applicable, the following additional requirements shall also apply:

   "All policies of insurance must be written with companies acceptable to Owner. The Contractor shall furnish to Owner certificates of insurance, signed by the licensed agent evidencing required coverages. Owner reserves the right to require certified copies of any and all policies. Each policy of insurance shall provide, either in body of the policy or by endorsement, that such policy cannot be substantially altered or cancelled without thirty (30) days' written notice to Owner and to the insured. Except for Workers Compensation, said policies will identify Alabama State Port Authority, its officers, officials, agents, servants and employees as Primary and Non-contributory Additional Insureds in connection with work performed for, on behalf of, or on the property of Owner.

2) Section 40-03 (COMMERCIAL GENERAL LIABILITY) of DIVISION IV – All provisions stated in this section shall be applicable with the exception of the coverage amount, which shall be no less than $3,000,000.

3) Section 40-04 (OWNER'S AND CONTRACTOR'S PROTECTIVE LIABILITY) of DIVISION IV – Omit this section; it is not required for this project.

4) Section 40-10 (PROFESSIONAL LIABILITY COVERAGE) of DIVISION IV – Omit this section; it is not required for this project.

SP-13 TEMPORARY WATER AND ELECTRICAL POWER

The responsibility shall be upon the Contractor to provide and maintain at his own expense an adequate supply of water of a quality suitable for his use for construction and domestic consumption. At his own expense, he shall install and maintain any necessary water supply connections and piping. However, he shall do so only at such locations and in such workmanship manner as may be authorized by the OWNER. Before final acceptance, temporary connections and piping installations by the Contractor shall be removed in a workmanship manner to the satisfaction of the OWNER.

All electrical current required by the Contractor shall be furnished by the Contractor at his own expense. All temporary connections for electricity shall be subject to the approval of the ENGINEER. The Contractor shall at his own expense, install a meter to determine the amount of current used by him/her and will pay for such electricity at prevailing rates.

SP-14 GUARANTEE

The Contractor shall furnish to the Alabama State Port Authority a **TWO (2) YEAR** written guarantee issued from the date of final acceptance. This guarantee shall be issued from the date of final acceptance and shall cover any defective material or workmanship on the entire project.

SP-15 PROJECT SCHEDULE

The Contractor shall prepare a project schedule showing all items of work necessary to bring the project to completion. The Contractor shall submit the initial schedule with the executed contract documents and submit monthly updates to reflect the status of the work. These updates shall be submitted in conjunction with the monthly progress payment request and shall be a requisite for the payment request to be processed.

SP-16 PORT ACCESS CREDENTIALS

Transportation Worker Identification Credential (TWIC) Card, ASPA Badge, and ASPA Vehicle Decals are required for work on this project. ALL individuals doing any work on this project, including operators, supervisors, maintenance personnel, deliveries, truck drivers, etc., must have a TWIC Card, ASPA Badge, and an ASPA Vehicle Decal with no exceptions. ASPA's access policy is provided on the ASPA website at the link below:

https://www.alports.com/port-access/

SP-17 IMPORTANT NOTICE TO BIDDERS REGARDING EMPLOYMENT PRACTICES:

Effective October 1, 2011, the Beason-Hammon Alabama Taxpayer and Citizen Protection Act ("the Act") requires that any business entity contracting with or providing any grant or incentives to the state, including the Alabama State Port Authority, certify compliance with the Act. All Bidders must certify such compliance by executing the enclosed Certificate of Compliance (see Section I) and returning it to the Alabama State Port Authority with your bid package as well as proof of the company's enrollment in the e-verify program. The Affidavit must be notarized. The following E-Verify website link is provided for convenience:

https://www.e-verify.gov/

GENERAL PROVISIONS, CLAUSES, REQUIREMENTS AND COVENANTS

DIVISION IV
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SECTION 10 DEFINITIONS OF TERMS

Whenever the following terms are used in these specifications, in the Contract, in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be interpreted as follows:

10-01 AASHTO. The American Association of State Highway and Transportation Officials, the successor association of AASHO.

10-02 ACCESS ROAD. The right-of-way, the roadway and all improvements constructed thereon connecting the site of work to a public highway.

10-03 ADVERTISEMENT. A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.

10-04 ALDOT SPECS. The State of Alabama Department of Transportation Standard Specifications for Roads and Bridges, latest edition.

10-05 AISC. The American Institute of Steel Construction.

10-06 AREA. American Railway Engineering Association.

10-07 ASA. American Standards Association.

10-08 ASTM. The American Society for Testing and Materials.

10-09 AWARD. The acceptance, by the OWNER, of the successful bidder's proposal.

10-10 AWPI. American Wood Preservers Institute.

10-11 BIDDER. Any individual, partnership, firm or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.

10-12 CALENDAR DAY. Every day shown on the calendar.

10-13 CHANGE ORDER. A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and Contract time adjustment, if any, for the work affected by such changes. The work, covered by a change order, shall be within the scope of the Contract.

10-14 COMMERCE. The prime business of the OWNER, consisting of the transshipping and storage of goods and materials by highway, rail, barge, and ship.

10-15 CONSTRUCTION MANAGER. The individual, partnership, firm or corporation duly authorized by the OWNER to be responsible for construction management supervision of the Contract work and acting directly or through an authorized representative.

10-16 CONTRACT. The written agreement covering the work to be performed. The awarded Contract shall include, but is not limited to: The Advertisement; The Contract Form; The Proposal; The Performance Bond; The Payment Bond; any required insurance certificates; The Specifications; The Plans; Change Orders and any addenda issued to bidders.

10-17 CONTRACT ITEM (PAY ITEM). A specific unit of work for which a price is provided in the Contract.

10-18 CONTRACT TIME. The number of calendar days or working days, stated in the special provisions, allowed for completion of the Contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the Contract shall be completed by that date.

10-19 CONTRACTOR. The individual, partnership, firm or corporation primarily liable for the acceptable performance of the work Contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the Contract work.

10-20 DEPARTMENT. The Alabama State Port Authority.

10-21 DIRECTOR. The Director of the Alabama State Port Authority, as constituted under the laws of Alabama.

10-22 ENGINEER. The individual, partnership, firm or corporation duly authorized by the OWNER to be responsible for Engineering supervision of the Contract work and acting directly or through an authorized representative.

10-23 EQUIPMENT. All machinery, together with the necessary supplies for upkeep and maintenance, and also all tools and apparatus necessary for the proper construction and acceptable completion of the work.

10-24 EXTRA WORK. An item of work not provided for in the awarded Contract is previously modified by change order or supplemental agreement, but which is found by the Engineer to be necessary to complete the work within the intended scope of the Contract as previously modified.

10-25 FEDERAL SPECIFICATIONS. The Federal Specifications and Standards, and supplements, amendments and indices thereto are prepared and issued by the General Services Administration of the Federal Government. They may be obtained from the Specifications Activity, Printed Materials Supply Division, Building 197, Naval Weapons Plant, Washington D.C. 20407.

10-26 FORCE ACCOUNT. The term used to describe a method of accounting which may be employed as a basis of payment to the Contractor for Extra Work.

10-27 INSPECTOR. An authorized representative of the Engineer assigned to make all necessary reviews of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.

10-28 INTENTION OF TERMS. Whenever, in these specifications or on the plans, the words “directed”, “required”, “permitted”, “ordered”, “designated”, “prescribed”, or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer is intended; and similarly, the words “approved”, “acceptable” “satisfactory”, or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer, subject to each case to the final determination of the OWNER.

Any reference to a specific requirement of a numbered paragraph of the Contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.

10-29 LABORATORY. The official testing laboratories of the OWNER or such other laboratories as may be designated by the Engineer.

10-30 MAJOR AND MINOR CONTRACT ITEMS. A major Contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 10 percent of the total amount of the awarded Contract. All other items shall be considered minor Contract items.

10-31 MATERIALS. Any substance specified for use in the construction of the Contract work.

10-32 NOTICE TO PROCEED. A written notice to the Contractor to begin the actual work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the Contract time begins.

10-33 OWNER. The term OWNER shall mean the State of Alabama acting by and through the Alabama State Port Authority.

10-34 PAYMENT BOND. The approved form of security furnished by the Contractor and his surety as a guaranty that he will pay in full all bills and accounts for materials and labor used in the construction of the work.

10-35 PERFORMANCE BOND. The approved form of security furnished by the Contractor and his surety as a guaranty that the Contractor will complete the work in accordance with the terms of the Contract.

10-36 PLANS. The official drawings or exact reproductions, approved by the Engineer, which show the location, character, dimensions and details of the work to be done and which are to be considered as a part of the Contract, supplementary to the specifications.

10-37 PROJECT. The agreed scope of work for accomplishing specific development.

10-38 PROPOSAL. The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.

10-39 PROPOSAL FORM. The approved, prepared form on which the OWNER requires that formal bids be submitted for the work contemplated.

10-40 PROPOSAL GUARANTY. The security furnished with a proposal to guarantee that the bidder will enter into a Contract if his proposal is accepted by the OWNER.

10-41 SPECIAL PROVISIONS. Specific directions and provisions additional to these GENERAL PROVISIONS and to any CONSTRUCTION SPECIFICATIONS setting forth conditions or requirements of construction which are not satisfactorily covered by these GENERAL PROVISIONS or the CONSTRUCTION SPECIFICATIONS. SPECIAL PROVISIONS shall prevail over the GENERAL PROVISIONS and CONSTRUCTION SPECIFICATIONS because they set forth the final Contractual intent as to the matter involved.

10-42 SPECIFICATIONS. A part of the Contract containing the written directions and requirements for completing the Contract work. Standards for specifying materials or testing which are cited in the Contract specifications by reference shall have the same force and effect as if included in the Contract physically.

10-43 STATE. The State of Alabama, the Party of the First Part to the Contract, acting by and through the Alabama State Port Authority.

10-44 STRUCTURES. Port facilities such as wharves, piers, dolphins, bridges, culverts, catch basins, inlets, retaining walls, cribbing, storm and sanitary sewer lines, water lines, under drains, electrical ducts, manholes, handholes, lighting fixtures and bases, transformers, flexible and rigid pavements, buildings, vaults, and other man-made features of the port that may be encountered in the work and not otherwise classified herein.

10-45 SUBCONTRACTOR. Any properly qualified individual undertaking the performance of any part of the work under the terms of the Contract, by virtue of an agreement between himself and the Contractor, with the approval of the OWNER.

10-46 SUBGRADE. The soil which forms the pavement foundation.

10-47 SUPERINTENDENT. The Contractor's executive representative who is present on the work site during progress, authorized to receive and fulfill instructions from the Engineer, and who shall supervise and direct the construction.

10-48 SUPPLEMENTAL AGREEMENT. A written agreement between the Contractor and the OWNER covering: (1) work that would increase or decrease the total amount of the awarded Contract by not more than 10 percent; or any major Contract item, by more than 25 percent, such increased or decreased work being within the scope of the originally awarded Contract, or (2) work that is not within the scope of the originally awarded Contract.

10-49 SURETY. The corporate body, licensed under the laws of Alabama, bound with and for the Contractor for the acceptable performance of the Contract and also for the payment of all claims recoverable under the Contract Bonds.

10-50 WORK. The furnishing of all labor, materials, tools, equipment and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the Contract, plans and specifications.

10-51 WORKING DAY. A working day shall be any day other than a national legal holiday, Saturday, or Sunday, on which the normal working forces of the Contractor may proceed with regular work for at least 6 hours toward completion of the Contract. Unless work is suspended for causes beyond the Contractor's control, Saturdays, Sundays and national holidays on which the Contractor's forces engage in regular work, requiring the presence of an inspector, will be considered as working days.

SECTION 20 PROPOSAL REQUIREMENTS AND CONDITIONS

20-01 PREQUALIFICATION OF BIDDERS

Proposal forms will be issued only to prospective Bidders who are licensed under the terms of the existing State laws. If the applicant is a corporation organized in a state other than Alabama, it shall furnish a certificate from the Secretary of State showing that it is qualified to transact business in Alabama.

20-02 CONTENTS OF PROPOSAL FORMS

The OWNER shall furnish bidders with proposal forms. All papers bound with or attached to the proposal forms are necessary parts and must not be detached.
The plans, specifications, and other documents designated in the proposal form shall be considered a part of the proposal whether attached or not.

20-03 ISSUANCE OF PROPOSAL FORMS

The OWNER reserves the right to refuse to issue a proposal form to a prospective bidder should such bidder be in default for any of the following reasons:

(a) Failure to pay, or satisfactorily settle, all bills due for labor and materials on former Contracts in force with the OWNER.
(b) Contractor default under previous Contracts with the OWNER.
(c) Proposal withdrawal or Bid Bond forfeiture on previous project with the OWNER.
(d) Unsatisfactory work on previous Contract with the OWNER.
(e) Performance failure of manufacturer's product or materials.

20-04 INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES

An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the Contract. The OWNER does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as hereinafter provided in the subsection titled 50-02 ALTERATION OF WORK AND QUANTITIES of Division IV, without in any way invalidating the unit bid prices.

20-05 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE

The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and Contract forms. He shall satisfy himself as to the character, quality, and quantities of work to be performed, materials to be furnished, and as to the requirements of the proposed Contract. The submission of a proposal shall be prima facie evidence that the bidder

has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the proposed Contract, plans, and specifications.

Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the OWNER's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which he may make or obtain from his examination of the boring logs and other records of subsurface investigations and tests that are furnished by the OWNER.

20-06 PREPARATION OF PROPOSAL

The bidder shall submit his proposal on the forms furnished by the OWNER. All blank spaces in the proposal forms must be correctly filled in where indicated for each and every item for which a quantity is given. The bidder shall state the price (written in ink or typed) both in words and numerals for which he proposed to do each pay item furnished in the proposal. The Department will check the gross sum given in the proposal and in case of error or discrepancy, the gross sum obtained by adding the products of the unit prices and the various estimated quantities listed in the proposal shall prevail and this shall be the Contract Bid Price. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall sign his proposal correctly and in ink. If the proposal is made by an individual, his name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation the person signing the proposal shall give the name of the State under the laws of which the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of his authority to do so and that the signature is binding upon the firm or corporation.

20-07 IRREGULAR PROPOSALS

Proposals shall be considered irregular for the following reasons:

(a) If the proposal is on a form other than that furnished by the OWNER, if the OWNER's form is altered, or if any part of the proposal form is detached.

(b) If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind which make the proposal incomplete, indefinite, or otherwise ambiguous.

(c) If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.

(d) If the proposal contains unit prices that are obviously unbalanced.

(e) If the proposal is not accompanied by the bid bond specified by the OWNER.

The OWNER reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the OWNER and conforms to laws and ordinances pertaining to the letting of construction Contracts.

20-08 PROPOSAL GUARANTY

Each separate proposal shall be accompanied by a certified check, or other specified acceptable collateral, in the amount of 5% of the bid price, but not more than $10,000. Such check, or collateral, shall be made payable to the Alabama State Port Authority.

20-09 DELIVERY OF PROPOSAL

Each proposal submitted shall be placed in a sealed envelope plainly marked on the outside with the project description, Bidder's name and address, Contractor's License number, Contractor's Classification of License, and the time and date of bid opening. When sent by mail, preferably registered, the sealed proposal, marked as indicated above, should be enclosed in an additional envelope. No proposal will be considered unless received at the place specified in the advertisement before the time specified for opening all bids.

Proposals received after the bid opening time shall be returned to the bidder unopened.

20-10 WITHDRAWAL OR REVISION OF PROPOSALS

A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the OWNER in writing or by telegram before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-11 PUBLIC OPENING OF PROPOSALS

Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend.

Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-12 DISQUALIFICATION OF BIDDERS

A bidder shall be considered disqualified for any of the following reasons:

(a) Submitting more than one proposal from the same partnership, firm or corporation under the same or different name.

(b) Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the OWNER.

(c) If the bidder is considered to be in “default” for any reason specified in the paragraph titled ISSUANCE OF PROPOSAL FORMS of this subsection.

(d) If the bidder has not complied with the provisions of the Laws of the State of Alabama concerning licensing of Contractors.

(e) If an out-of-state bidder has not qualified with the Secretary of State to do business in Alabama.

20-13 LIQUIDATED DAMAGES

Time is an essential element in the Contract. As the prosecution of the Work will inconvenience the public, obstruct traffic, and interfere with business, it is important that the work be pressed vigorously to completion. Also, the cost to the Department of the administration of the Contract, supervision, inspection, engineering, and in some cases maintenance of detours around or over the work under construction will be increased or decreased as the time occupied in the Work is lengthened or shortened. Therefore, exclusive of Sundays, national holidays, and other exceptions and extensions as detailed elsewhere in these Specifications for each day that the Work remains incomplete after the time specified in the Contract, or additional time that may be allowed by the Engineer for the completion of the work when extra or additional work is ordered by the Engineer, the amount specified in the following schedule shall be paid by the Contractor to the Department as liquidated damages for the loss sustained by the State because of failure of the Contractor to complete the work within the specified time.

SCHEDULE OF LIQUIDATED DAMAGES

Contract Bid Price	Amount of Liquidated Damages per Day
$100,000 and less	$ 100.00
More than $100,000 and less than $250,000	150.00
$250,000 and less than $600,000	200.00
$600,000 or more	0.033% of Contract amount

20-14 OWNER PURCHASE OF MATERIALS

Section 20-14 is deleted in it's entirety

SECTION 30 AWARD AND EXECUTION OF CONTRACT

30-01 CONSIDERATION OF PROPOSALS

After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit price written in words shall govern.

Until the award of the Contract is made, the OWNER reserves the right to reject a bidder's proposal for any of the following reasons:

a) If the proposal is irregular as specified in the subsection titled IRREGULAR PROPOSALS of Subsection 20.

b) If the bidder is disqualified for any of the reasons specified in the subsection titled DISQUALIFICATION OF BIDDERS of Subsection 20.

In addition, until the award of a Contract is made, the OWNER reserves the right to reject any or all proposals; waive technicalities, if such waiver is in the best interest of the OWNER and is in conformance with applicable laws or regulations pertaining to the letting of construction Contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the OWNER's best interests.

30-02 AWARD OF CONTRACT

The award of a Contract, if it is to be awarded, shall be made within 60 calendar days of the date specified for publicly opening proposals.

Award of the Contract shall be made by the OWNER to the lowest qualified bidder whose proposal conforms to the cited requirements of the OWNER.

30-03 CANCELLATION OF AWARD

The OWNER reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a Contract has been fully executed by all parties and is approved by the OWNER in accordance with the paragraph titled APPROVAL OF CONTRACT of this subsection.

30-04 RETURN OF PROPOSAL GUARANTY

All proposal guaranties, except those of the three lowest bidders, will be returned immediately after the OWNER has made a comparison of bids as hereinbefore specified in the paragraph titled CONSIDERATION OF PROPOSALS of this subsection. Proposal guaranties of the two lowest bidders will be retained by the OWNER until such time as an award is made, at which time, the unsuccessful bidders' proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the OWNER receives the contract bonds as specified in the paragraph titled “REQUIREMENTS OF CONTRACT BONDS” of the subsection.

30-05 REQUIREMENTS OF CONTRACT BONDS

In order to insure the faithful performance of each and every condition, stipulation, and requirement of the Contract and to indemnify and save harmless the OWNER from any and all damages, either directly or indirectly, (arising out of any failure to perform same), the successful Bidder to whom the Contract is awarded shall, within ten (10) days from the date of award, furnish at his expense and file with the OWNER an acceptable Surety Bond in an amount equal to one hundred percent (100%) of the Contract Bid Price of the Contract as awarded. Said Bond shall be made on the approved bond form, shall be furnished by a reputable surety company authorized to do business in the State of Alabama, shall be counter-signed by an authorized agent resident in the State who is qualified for the execution of such instruments, and shall be attached thereto power of attorney of the signing agent.

In case of default on the part of the Contractor, all expenses incident to ascertaining and collecting losses suffered by the OWNER under the Bond, including both Engineering and legal services, shall lie against the Contract Bond for Performance of the Work.

In addition thereto, the successful Bidder to whom the Contract is awarded shall, within ten (10) days, furnish at his expense and file with the OWNER an acceptable Surety Bond for Payment of Labor, Materials, and Supplies payable to the OWNER in an amount not less than one hundred percent (100%) of the Contract price with the obligation that the Contractor shall promptly make payment to all persons furnishing him or them with labor, materials, foodstuffs, or supplies for, or in, prosecution of the work including the payment of reasonable attorney's fees, incurred by successful claimants or plaintiffs in suits on said bond.

No surety bonds from any insurance company or bonding company which has a lower rating, in the Best Key Rating Guide, than A will be accepted.

30-06 EXECUTION OF CONTRACT

The successful bidder shall sign (execute) the necessary agreements for entering into the Contract and return such signed Contract to the OWNER, along with the fully executed surety bond or bonds specified in the paragraph titled REQUIREMENT OF CONTRACT BONDS of this subsection, within 10 calendar days from the date mailed or otherwise delivered to the successful bidder.

30-07 APPROVAL OF CONTRACT

Upon receipt of the Contract and Contract bond or bonds that have been executed by the successful bidder, the OWNER shall complete the execution of the Contract and return the fully executed Contract to the Contractor. Delivery of the fully executed Contract to the Contractor shall constitute the OWNER's approval to be bound by the successful bidder's proposal and the terms of the Contract.

30-08 FAILURE TO EXECUTE CONTRACT

Failure of the successful bidder to execute the Contract and furnish an acceptable surety bond or bonds within the 10 calendar day period specified in the paragraph titled “REQUIREMENTS OF CONTRACT BONDS” of this subsection shall be just cause for cancellation of the award

and forfeiture of the proposal guaranty, not as a penalty, but as liquidation of damages to the OWNER. Award may then be made to the next lowest qualified Bidder or the work may be re-advertised, or otherwise contracted as the Director may decide.

SECTION 40 INDEMNIFICATION AND INSURANCE REQUIREMENTS

40-01 INDEMNIFICATION

The Contractor shall assume all liability for and shall indemnify and save harmless the State of Alabama, the Alabama State Port Authority and its officers and employees, and Engineer from all damages and liability for injury to any person or persons, and injury to or destruction of property, including the loss of use thereof, by reason of an accident or occurrence arising from operations under the Contract, whether such operations are performed by himself or by any subcontractor or by anyone directly or indirectly employed by either of them, occurring on or about the premises, or the ways and means adjacent, during the term of the Contract, or any extension thereof, and shall also assume the liability for injury and/or damages to adjacent or neighboring property by reason of work done under the Contract.

40-02 CONTRACTOR COVERAGE

The Contractor shall not commence work under the Contract until he has obtained all insurance required under the following paragraphs and until such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar applicable insurance required of the subcontractor has been obtained and approved. If the subcontractor does not take out insurance in his own name, then the principal Contractor shall provide such insurance protection for subcontractor and his employees by endorsement to the Contractor's policies or by taking out separate policies in the name of the subcontractor.

40-03 COMMERCIAL GENERAL LIABILITY

The Contractor shall take out and maintain during the life of the Contract Commercial General Liability insurance, including Blanket Contractual and Completed Operations coverage, in an amount not less than $2,000,000 for any one occurrence for bodily injury, including death, and property damage liability. Policy shall include endorsement identifying the Owner and Engineer as Primary and Non-contributory Additional Insureds as respects the Contractor's work for the Owner, to the extent required by written Contract, including a waiver of all rights of subrogation.

40-04 OWNER'S AND CONTRACTOR'S PROTECTIVE LIABILITY

The Contractor shall take out and maintain during the life of the Contract a separate Owner's and Contractor's Protective Liability policy in the names of the Owner and Engineer in an amount not less than $2,000,000. Policy shall be delivered to the Owner.

40-05 BUSINESS AUTOMOBILE LIABILITY

The Contractor shall take out and maintain during the life of the Contract Business Automobile Liability insurance covering owned, non-owned and hired vehicles in an amount not less than $1,000,000 for any one occurrence for bodily injury, including death, and property damage liability. The Owner and Engineer shall be identified as Additional Insureds, to the extent required by written Contract.

40-06 WORKERS COMPENSATION

The Contractor shall take out and maintain during the life of the Contract Workers Compensation and Employers Liability insurance providing coverage under the Alabama

Workers Compensation Act in an amount not less than that required by Alabama Law.

Where applicable, Contractor shall take out and maintain during the life of the Contract insurance providing coverage as required by Federal statute, including but not limited to U.S. Longshoremen and Harbor Workers Act (USL&H), Jones Act, and Railroad Federal Employers Liability Act (FELA).

40-07 OCEAN MARINE COVERAGE

In the event work involves the use of watercraft in the completion of the Contract, the Contractor shall provide Protection and Indemnity coverage, including crew, in an amount not less than $2,000,000 for each loss.

Only the Contractor and/or Subcontractor using watercraft in the completion of its work shall be required to provide evidence of this coverage. In the event the Contractor subcontracts for this portion of the work, the Contractor shall not allow the subcontractor to commence work until such coverage has first been obtained by the subcontractor and approved by the Owner.

40-08 RAILROAD PROTECTIVE LIABILITY

In any case where the Contract involves work within 50 feet of an operating railroad track, the Contractor shall provide a Railroad Protective Liability policy in the name of the railroad whose right of way is involved. The limits of the policy shall be not less than $2,000,000 per occurrence with $6,000,000 aggregate.

NOTE #1: With the written approval of the Owner, in lieu of the Railroad Protective Liability policy, the Contractor may cause to be attached to its Commercial General Liability policy standard ISO endorsement, “Contractual Liability – Railroads” (CG 24 17). The railroad must be identified as an Additional Insured.

NOTE #2: *Only the Contractor and/or Subcontractor performing the work within 50 feet of the railroad track shall be required to provide evidence of this coverage. In the event the Contractor subcontracts for this portion of the work, the Contractor shall not allow the subcontractor to commence work until such coverage has first been obtained by the subcontractor and approved by the Owner.*

40-09 BUILDER’S RISK or INSTALLATION FLOATER

The Contractor shall take out and maintain during the life of the Contract Builder’s Risk insurance or Installation Floater, written on an “All Risk” basis, insuring the work included in the Contract against all physical loss. The amount of insurance shall at all times be at least equal to the amount of the Contract. The policy shall be in the names of the Owner, Engineer, Contractor, and “all Subcontractors,” as their interests appear. Policy shall be provided to the Owner prior to commencement of work.

When changes in scope of work by written Change Order or aggregate Change Orders equal 15 percent of the total Contract, the amount of coverage provided in the Builder’s Risk/Installation Floater policy shall be increased accordingly and evidence of increased coverage delivered to the Owner.

40-10 PROFESSIONAL LIABILITY COVERAGE

The Contractor shall take out and maintain during the life of the contract Professional Liability insurance including design with limits not less than $2,000,000 per occurrence.

40-11 PROOF OF CARRIAGE OF INSURANCE

The Contractor shall furnish to the Owner, in triplicate, Certificates of Insurance, signed by the licensed agent, evidencing the required coverage, along with letter of transmittal giving date of delivery. A copy of this letter shall also be delivered to the Engineer. The Owner reserves the right to require certified copies of any and all policies.

All coverage and bonds shall be provided by companies acceptable to the Owner. Each policy of insurance shall provide, either in body of the policy or by endorsement, that such policy cannot be substantially altered or cancelled without thirty (30) days' written notice to the Owner and insured.

SECTION 50 SCOPE OF WORK

50-01 INTENT OF CONTRACT

The intent of the Contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, drawings, specifications, and terms of the Contract.

50-02 ALTERATION OF WORK AND QUANTITIES

The OWNER reserves and shall have the right to make such alterations in the work as may be necessary or desirable to complete the work originally intended in an acceptable manner. Unless otherwise specified herein, the Engineer shall be and is hereby authorized to make such alterations in the work as may increase or decrease the originally awarded Contract quantities, provided that the aggregate of such alterations does not change the total Contract cost by more than 10% or the total cost of any major Contract item by more than 25 percent (total cost being based on the unit prices and estimated quantities in the awarded Contract). Alterations which do not exceed the 25 percent limitation shall not invalidate the Contract nor release the surety, and the Contractor agrees to accept payment for such alteration as if the altered work had been a part of the original Contract. These alterations, which are for work within the general scope of the Contract shall be covered by “Change Orders” issued by the Engineer. Change orders for altered work shall include extensions of Contract time where, in the Engineer's opinion, such extensions are commensurate with the amount and difficulty of added work.

Should the aggregate amount of altered work exceed the 25 percent limitation hereinbefore specified, such excess altered work shall be covered by supplemental agreement. If the OWNER and the Contractor are unable to agree on a unit adjustment for any Contract item that requires a supplemental agreement, the OWNER reserves the right to terminate the Contract with respect to the item and make other arrangement for its completion.

All supplemental agreements shall require consent of the Contractor's surety and separate performance and payment bonds.

50-03 OMITTED ITEMS

The Engineer may, in the OWNER's best interest, omit from the work any Contract item, except major Contract items. Major Contract items may be omitted by a supplemental agreement. Such omission of Contract items shall not invalidate any other Contract provision or requirement.

Should a Contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with the paragraph titled PAYMENT FOR OMITTED ITEMS of Subsection 100.

50-04 EXTRA WORK

Should acceptable completion of the Contract require the Contractor to perform an item of work for which no basis of payment has been provided in the original Contract or previously issued

change orders or supplemental agreements, the same shall be called Extra Work. Extra work that is within the general scope of the Contract shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the Contract time that, in the Engineer's opinion, is necessary for completion of such extra work.

When determined by the Engineer to be in the OWNER's best interest, he may order the Contractor to proceed with extra work by force account as provided in the paragraph titled PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK of Subsection 100.

Extra work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original Contract shall be covered by a Supplemental Agreement as hereinbefore defined in the paragraph titled SUPPLEMENTAL AGREEMENT of Subsection 10.

Any claim for payment of extra work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the OWNER.

50-05 MAINTENANCE OF COMMERCE

It is the explicit intention of the Contract that the safety of workers and vessels, as well as the Contractor's equipment and personnel, is the most important consideration.

It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of vessels in the waterfront areas of the port with respect to his own operations and the operations of all his Subcontractors as specified in the paragraph titled LIMITATION OF OPERATIONS of Subsection 90.

With respect to his own operations and the operations of all his Subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying: personnel; equipment; vehicles; storage areas; and any work area or condition that may be hazardous to the operation of fire rescue equipment, or maintenance vehicles at the port.

When the Contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the Contract, plans, and specifications, the Contractor shall keep such road, street, or highway open to all traffic and shall provide such maintenance as may be required to accommodate traffic. The Contractor shall furnish, erect, and maintain barricades, warning signs, flagmen, and other traffic control devices in reasonable conformity with the manual of Uniform Traffic Control Devices for Streets and Highway (published by the United States Government Printing Office), unless otherwise specified herein. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways.

The Contractor shall make his own estimate of all labor, materials, equipment, and incidentals necessary for providing the maintenance of commerce and vehicular traffic as specified in this subsection.

The cost of maintaining the commerce and vehicular traffic specified in this subsection shall not be measured or paid for directly, but shall be included in the various Contract items.

50-06 REMOVAL OF EXISTING STRUCTURES

All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various Contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plan, the Engineer shall be notified prior to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the Engineer in accordance with the provisions of the Contract.

Except as provided in the subsection titled RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK of this subsection, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be utilized in the work as otherwise provided for in the Contract and shall remain the property of the OWNER when so utilized in the work.

50-07 RIGHTS IN AND USE OF MATERIALS FOUND IN THE WORK

Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the Contract to be either embankment or waste, he may at his option either:

(a) Use such material in another Contract item, providing such use is approved by the OWNER and Engineer and is in conformance with the Contract specifications applicable to such use; or

(b) Remove such material from the site, upon written approval of the Engineer; or

(c) Use such material for his own temporary construction on site; or

(d) Use such material as intended by the terms of the Contract.

Should the Engineer approve the Contractor's wish to exercise option (a), (b), or (c), the Contractor shall be paid for the excavation or removal of such material at the applicable Contract price. The Contractor shall replace, at his own expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the Contract work. The Contractor shall not be charged for his use of such material so used in the work or removed from the site.

Should the Engineer approve the Contractor's exercise of option (a), the Contractor shall be paid, at the applicable contact price, for furnishing and installing such material in accordance with requirements of the Contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of his exercise of option (a), (b), or (c).

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the Contract, plans, or specifications.

50-08 FINAL CLEANING UP

Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. He shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of such property OWNER.

SECTION 60 CONTROL OF WORK

60-01 AUTHORITY OF THE ENGINEER

The Engineer shall decide any and all questions which may arise as to the quality and acceptability of materials furnished, work performed, and as to the manner of performance and rate of progress of the work. He shall decide all questions which may arise as to the interpretation of the specifications or plans relating to the work, the fulfillment of the Contract on the part of the Contractor, and the rights of different Contractors on the project. The Engineer shall determine the amount and quality of the several kinds of work performed and materials furnished which are to be paid for under the Contract.

60-02 CONFORMITY WITH PLANS AND SPECIFICATIONS

All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the Contract, plans, or specifications.

If the Engineer finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications but that the portion of the work affected will, in his opinion, result in a finished product having a level of economy, durability, and workmanship acceptable to the OWNER, he will advise the OWNER of his determination that the affected work be accepted and remain in place.

In this event, the Engineer will document his determination and recommend to the OWNER a basis of acceptance which will provide for an adjustment in the Contract price for the affected portion of the work. The Engineer's determination and recommended Contract price adjustments will be based on good Engineering judgment and such tests or retests of the affected work as are, in his opinion, needed. Changes in the Contract price shall be covered by Contract modifications (change order or supplemental agreement) as applicable.

If the Engineer finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by any at the expense of the Contractor in accordance with the Engineer's written orders.

For the purpose of this subsection, the term “reasonably close conformity” shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the Contract, plans and specifications. The term shall not be construed as waiving the Engineer's right to insist on strict compliance with the requirements of the Contract, plans, and specifications during the Contractor's prosecution of the work, when, in the Engineer's opinion, such compliance is essential to provide an acceptable finished portion of the work.

For the purpose of this subsection, the term “reasonably close conformity” is also intended to provide the Engineer with the authority to use good Engineering judgment in his determinations as to acceptance of work that is not in strict conformity but will provide a finished product equal to or better than that intended by the requirements of the Contract, plans and specifications.

60-03 COORDINATION OF CONTRACT, PLANS AND SPECIFICATIONS

The Contract, plans, specifications, and all referenced standards cited are essential parts of the Contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; special provisions shall govern over plans, Contract construction specifications, Contract general provisions, cited specifications, and cited testing standards; plans shall govern over Contract construction specifications, Contract general provisions, and cited testing standards; Contract construction specification shall govern over Contract general provisions, and cited testing standards; Contract general provisions shall govern over cited testing standards. The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, he shall immediately call upon the Engineer for his interpretation and decision, and such decision shall be final.

60-04 COOPERATION OF THE CONTRACTOR

The Contractor will be supplied with five (5) copies each of the plans and specifications. He shall have available on the work at all times, one copy each of the plans and specifications. Additional copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor will give constant attention to the work to facilitate the progress thereof, and he shall cooperate with the Engineer and his inspectors and with other Contractors in every way possible. The Engineer shall allocate the work and designate the sequence of construction in case of controversy between Contractors. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as his agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the Engineer or his authorized representative.

60-05 COOPERATION BETWEEN CONTRACTORS

The OWNER reserves the right to Contract for and perform other or additional work on or near the work covered by this Contract.

When separate Contracts are let within the limits of any one project, Each Contractor shall conduct his work so as not to interfere with or hinder the progress or completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with his Contract and shall protect and save harmless the OWNER from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced by him because of the presence and operations or other Contractors working within the limits of the same project.

The Contractor shall arrange his work and shall place and dispose of the materials being used so as not to interfere with the operations of the other Contractors within the limits of the same

project. He shall join his work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

60-06 CONSTRUCTION LAYOUT AND STAKES

The Engineer will establish horizontal and vertical control only and the Contractor must furnish all additional stakes for the layout and construction of the work. The Engineer will also furnish any additional information, upon request of the Contractor, needed to layout and construct the work. The Contractor shall satisfy himself as to the accuracy of all measurements before constructing any permanent structure and shall not take advantage of any errors which may have been made in laying out the work. Such stakes and markings as the Engineer may set for either his own or the Contractor's guidance shall be scrupulously preserved by the Contractor. In case of negligence on the part of the Contractor, or his employees, resulting in the destruction of such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due to the Contractor at the discretion of the OWNER.

60-07 AUTOMATICALLY CONTROLLED EQUIPMENT

Whenever batching or mixing plant equipment is required to be operated automatically under the Contract and a breakdown or malfunction of the automatic controls occurs, the equipment may be operated manually or by other methods for a period of 48 hours following the breakdown or malfunction, provided this method of operations will produce results which conform to all other requirements of the Contract.

60-08 AUTHORITY AND DUTIES OF INSPECTORS

Inspectors employed by the OWNER shall be authorized to inspect work done and all materials furnished. Such inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to revoke, alter, or waive any provision of the Contract. Inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

Inspectors employed by the OWNER are authorized to notify the Contractor or his representatives of any failure of the work or materials to conform to the requirements of the Contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the Engineer for his decision.

60-09 INSPECTION OF THE WORK

All materials and each part or detail of the work shall be subject to review by the Engineer. The Engineer shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed.

After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized representative of the OWNER may be ordered removed and replaced at the Contractor's expense unless the OWNER's representative failed to inspect after having been given reasonable notice in writing that the work was to be performed.

Should the Contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (Contract) OWNER, authorized representatives of the owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the Contract, and shall in no way interfere with the rights of the parties to this Contract.

60-10 REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK

All work which does not conform to the requirements of the Contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the OWNER as provided in the paragraph titled CONFORMITY WITH PLANS AND SPECIFICATIONS of this subsection.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of the paragraph titled CONTRACTOR'S RESPONSIBILITY FOR WORK of Subsection 80.

No work shall be done without lines and grades having been established by the Contractor and subsequently approved by the Engineer. Work done contrary to the instructions of the Engineer, work done beyond the lines shown on the plans or as given, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the Contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply forthwith with any order of the Engineer made under the provisions of this subsection, the Engineer will have authority to cause unacceptable work to be remedied, or removed and replaced, and unauthorized work to be removed, and to deduct the costs (incurred by the OWNER) from any monies due or to become due the Contractor.

60-11 LOAD RESTRICTIONS

The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage which may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor shall be responsible for all damage done by his hauling equipment and shall correct such damage at his own expense.

60-12 MAINTENANCE DURING CONSTRUCTION

The Contractor shall maintain the work during construction and until the work is accepted. This maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various Contract items, and the Contractor will not be paid an additional amount for such work.

60-13 FAILURE TO MAINTAIN THE WORK

Should the Contractor at any time fail to maintain the work as provided in the paragraph titled MAINTENANCE DURING CONSTRUCTION of this subsection, the Engineer shall immediately notify the Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the urgency that exists.

Should the Contractor fail to respond to the OWNER's notification, the OWNER may suspend any work necessary for the OWNER to correct such unsatisfactory maintenance condition, depending on the urgency that exists. Any maintenance cost incurred by the OWNER, shall be deducted from monies due or to become due the Contractor.

60-14 PARTIAL ACCEPTANCE

If at any time during the prosecution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the OWNER, he may request the Engineer to make final inspection of that unit. If the Engineer finds upon inspection that the unit has been satisfactorily completed in compliance with the Contract, he may accept it as being completed, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the OWNER shall not void or alter any provision of the Contract or warranty.

60-15 FINAL CONSTRUCTION INSPECTION

Whenever the Engineer considers the work provided and contemplated by the Contract is nearing completion, or within ten (10) days after being notified by the Contractor that the work is completed, the Engineer will inspect all the work included in the Contract. If the Engineer finds that the work has not been satisfactorily completed at the time of such inspection, he shall inform the Contractor in writing as to the work to be done or the particular defects to be remedied to place the work in condition satisfactory for Final Construction Inspection. After the work has been satisfactorily completed the Engineer shall make the Final Construction Inspection.

60-16 FINAL ACCEPTANCE

Upon due notice from the Contractor of presumptive completion of the entire project, the Engineer and OWNER will make an inspection. If all construction provided for and contemplated by the Contract is found to be completed in accordance with the Contract, plans and specifications, such inspection shall constitute the final inspection. The Engineer shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of same, and the Contractor shall immediately comply with and execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the OWNER will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

60-17 CLAIMS FOR ADJUSTMENT AND DISPUTES

If for any reason the Contractor deems that additional compensation is due him for work or materials not clearly provided for in the Contract, plans, or specifications or previously authorized as extra work, he shall notify the Engineer in writing of his intention to claim such additional compensation before he begins the work on which he bases the claim. If such notification is not given or the Engineer is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the OWNER has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit his written claim to the Engineer, who will present it to the OWNER for consideration.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute the final payment based on differences in measurements or computations.

SECTION 70 CONTROL OF MATERIALS

70-01 SOURCE OF SUPPLY AND QUALITY REQUIREMENTS

The materials used on the work shall conform to the requirements of the Contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish complete statements to the OWNER as to the origin, composition, and manufacture of all materials to be used in the work. Such statements shall be furnished promptly after execution of the Contract, but, in all cases, prior to delivery of such materials.

At the OWNER's option, materials may be approved at the source of supply before delivery is started. If it is found after trial sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

70-02 SAMPLES, TESTS, AND CITED SPECIFICATIONS

All materials used in the work shall be inspected, tested, and approved by the Engineer before incorporation in the work. Any work in which untested materials are used without approval or written permission of the Engineer shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the Engineer, shall be removed at the Contractor's expense. Unless otherwise designated, tests in accordance with the cited standard methods of AASHTO or ASTM which are current on the date of advertisement for bids will be made by and at the expense of the OWNER. Samples will be taken by a qualified representative of the OWNER. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at his request.

70-03 CERTIFICATION OF COMPLIANCE

The Engineer may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's certificates of compliance stating that such materials or assemblies fully comply with the requirements of the Contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the work must be accompanied by a certificate of compliance in which the lot is clearly identified.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with Contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the Engineer.

When a material or assembly is specified by “brand name or equal” and the Contractor elects to furnish the specified “brand name”, the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify Each lot delivered and shall certify as to:

(a) Conformance to the specified performance, testing, quality or dimensional requirements; and

(b) Suitability of the material or assembly for the use intended in the Contract work.

Should the Contractor propose to furnish an “or equal” material or assembly, he shall furnish the manufacturer's certificates of compliance as hereinbefore described for the specified brand name material or assembly. However, the Engineer shall be the sole judge as to whether the proposed “or equal” is suitable for use in the work.

70-04 PLANT INSPECTION

The Engineer or his authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for his acceptance of the material or assembly.

Should the Engineer conduct plant inspections, the following conditions shall exist:

(a) The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted the materials.

(b) The Engineer shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

(c) If required by the Engineer, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Office or working space should be conveniently located with respect to the plant.

It is understood and agreed that the OWNER shall have the right to retest any material which has been tested and approved at the source of supply after it has been delivered to the site. The Engineer shall have the right to reject only material which, when retested, does not meet the requirements of the Contract, plans, or specifications.

70-05 ENGINEER'S FIELD OFFICE AND LABORATORY

When specified and provided for as a Contract item, the Contractor shall furnish a building for the exclusive use of the Engineer as a field office and field testing laboratory. The building shall be furnished and maintained by the Contractor, as specified herein, and shall become property of the Contractor when the Contract work is completed.

70-06 STORAGE OF MATERIALS

Materials shall be stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be located so as to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the Engineer. Materials to be stored on OWNER's property shall not create an obstruction to commerce nor shall they interfere with the free and unobstructed movement of traffic. Unless otherwise shown on the plans, the storage of materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the Engineer. Private property shall

not be used for storage purposes without written permission of the owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the Engineer a copy of the property owner's permission.

All storage sites on private or owner's property shall be restored to their original condition by the Contractor at his entire expense, except as otherwise agreed to (in writing) by the owner or lessee of the property.

70-07 UNACCEPTABLE MATERIALS

Any material or assembly that does not conform to the requirements of the Contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the Engineer.

No rejected material or assembly, the defects of which have been corrected by the Contractor, shall be returned to the site of the work until such time as the Engineer has approved its use in the work.

70-08 OWNER-FURNISHED MATERIAL

The Contractor shall furnish all materials required to complete the work, except those specified herein (if any) to be furnished by the OWNER. OWNER-furnished materials shall be made available to the Contractor at the location specified herein.

All cost of handling, transportation from the specified location to the site of work, storage, and installing OWNER-furnished materials shall be included in the unit price bid for the Contract item in which such OWNER-furnished material is used.

After any OWNER-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies which may occur during the Contractor's handling, storage, or use of such OWNER-furnished material. The OWNER will deduct from any monies due or to become due the Contractor any cost incurred by the OWNER in making good such loss due to the Contractor's handling, storage, or use of OWNER-furnished materials.

70-09 RECEIVING MATERIALS AND EQUIPMENT

The Contractor shall be responsible for clerical salaries, office space and equipment rental, incidentals to receiving incoming shipments and deliveries of all materials and equipment. All material which must be protected from the elements will be properly and orderly stored in shelters provided by the Contractor. All goods and materials stored out of doors will be properly and orderly supported. The Contractor will be responsible for safeguarding all such goods and materials against loss due to damage and theft.

SECTION 80 LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

80-01 LAWS TO BE OBSERVED

The Contractor shall keep fully informed of all Federal and State laws, and local ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the OWNER and all his officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or his employees.

80-02 PERMITS, LICENSES, AND TAXES

The Contractor shall procure all permits and licenses, pay all charges, fees and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the work.

80-03 PATENTED DEVICES, MATERIALS AND PROCESSES

If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, he shall provide for such use by suitable legal agreement with the patentee or owner, or a third party, from any and all claims for infringement by reason of the use of any such patented design, device, materials or process, or any trademark or copyright, and shall indemnify the OWNER for such costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the prosecution or after the completion of the work.

80-04 RESTORATION OF SURFACES DISTURBED BY OTHERS

The OWNER reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, or a utility service of another government agency at any time during the process of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the OWNER, such authorized work (by others) is noted in the plans.

Except as noted on the plans, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the Engineer.

Should the owner of public or private utility service, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the process of the work, the Contractor shall cooperate with such owners by arranging and performing the work in this Contract so as to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is noted on the plans. When ordered as extra work by the Engineer, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the Contract, plans, or specifications. It is understood and agreed that the Contractor shall not be

entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

80-05 SANITARY, HEALTH, AND SAFETY PROVISIONS

The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his employees as may be necessary to comply with the requirements of the State and Local Board of Health, or of other bodies or tribunals having jurisdiction.

Attention is directed to Federal, State, and local laws, rules and regulations concerning construction safety and health standards. The Contractor shall not require any worker to work in surroundings or under conditions which are unsanitary, hazardous, or dangerous to his health or safety.

80-06 PUBLIC CONVENIENCE AND SAFETY

The Contractor shall control his operations and those of his Subcontractors and all suppliers, to assure the least inconvenience to the public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of commerce and vehicular traffic with respect to his own operations and those of his Subcontractors and all suppliers in accordance with the paragraph titled MAINTENANCE OF COMMERCE of subsection 50, hereinbefore specified and shall limit such operations for the convenience and safety of the public, as specified in the paragraph titled LIMITATION OF OPERATIONS of subsection 90, hereinafter.

80-07 BARRICADES, WARNING SIGNS, AND HAZARD MARKINGS

The Contractor shall furnish, erect, and maintain all barricades, warning signs, and markings for hazards necessary to protect the public and the work. When used during periods of darkness, such barricades, warning signs and hazard markings shall be suitably illuminated.

For vehicular and pedestrian traffic, the Contractor shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic Control Devices for Streets and Highways (published by the United States Government Printing Office).

The Contractor shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stockpiles, and his parked construction equipment that may be hazardous to the operation of emergency fire rescue or maintenance vehicles.

The Contractor shall furnish and erect all barricades, warning signs, and markings for hazards prior to commencing work which requires such erection and shall maintain the barricades, warning signs, and markings for hazards until their dismantling is directed by the Engineer.

Open-flame type lights shall not be permitted.

80-08 USE OF EXPLOSIVES – (USE OF EXPLOSIVES IS PROHIBITED ON THIS PROJECT)

When the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property, including new work. The Contractor shall be responsible for all damage resulting from the use of explosives.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be clearly marked. Where no local laws or ordinances apply, storage shall be provided satisfactory to the Engineer and, in general, not closer than 1,000 feet from the work or from any building, road, or other place of human occupancy.

The Contractor shall notify Each property owner and public utility company having structures or facilities in proximity to the site of the work of his intention to use explosives. Such notice shall be given sufficiently in advance to enable them to take such steps as they may deem necessary to protect their property from injury.

80-09 PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE

The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property marks until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work or in consequence of the nonexecution thereof by the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or he shall make good such damage or injury in any acceptable manner.

80-10 RESPONSIBILITY FOR DAMAGE CLAIMS

The Contractor shall indemnify and save harmless the Engineer and the OWNER and their officers, and employees from all suits, actions, or claims of any character brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any neglect in safeguarding the work; or because of any act or through use of unacceptable materials in constructing the work; or because of any claims or amount recovered from any infringements of patent, trademark, or copyright; or from any claims or amount arising or recovered under the “Workman's Compensation Act” or any other law, ordinance, order or decree.

Money due the Contractor under and by virtue of his Contract as may be considered necessary by the OWNER for such purpose may be retained for the use of the OWNER or, in case no money is due, his surety may be held until such suit or suits, action or actions, claim or claims

for injuries or damages as aforesaid shall have been settled and suitable evidence to that effect furnished to the OWNER, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he is adequately protected by public liability and property damage insurance.

80-11 THIRD PARTY BENEFICIARY CLAUSE

It is specifically agreed between the parties executing the Contract that it is not intended by any of the provisions of any part of the Contract to create the public or any member thereof a third party beneficiary or to authorize anyone not a party to the Contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the Contract.

80-12 OPENING SECTIONS OF THE WORK FOR OCCUPANCY

Should it be necessary for the Contractor to complete portions of the Contract work for the beneficial occupancy of the OWNER prior to completion of the entire Contract, such “phasing” of the work shall be as specified herein, and indicated on the plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified. The Contractor shall make his own estimate of the difficulties involved in arranging his work to permit such beneficial occupancy by the OWNER as described elsewhere in these specifications.

Upon completion of any portion of the work so described, such portion shall be accepted by the OWNER in accordance with the paragraph titled PARTIAL ACCEPTANCE of Subsection 60-14.

No portion of the work may be opened by the Contractor for use until ordered by the Engineer in writing. Should it become necessary to open a portion of the work to Docks traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the Engineer, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the Contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the OWNER shall be repaired by the Contractor at his expense.

The Contractor shall make his own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the Contract work.

80-13 CONTRACTOR’S RESPONSIBILITY FOR WORK

Until the Engineer's final written acceptance of the entire completed work excepting only those portions of the work accepted in accordance with the paragraph titled PARTIAL ACCEPTANCE of Subsection 60-14, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the nonexecution of the work. The Contractor shall rebuild, repair, store, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at his expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seedings, and sodding, furnished under his Contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

80-14 CONTRACTOR'S RESPONSIBILITY FOR UTILITY SERVICE AND FACILITIES OF OTHERS

As provided in the paragraph titled RESTORATION OF SURFACES DISTURBED BY OTHERS of this subsection, the Contractor shall cooperate with the owner of any public or private utility service, or a utility service of another government agency that may be authorized by the OWNER to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control his operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, or utility services of another governmental agency are known to exist within the limits of the Contract work, the approximate locations have been indicated on the plans.

It is understood and agreed that the OWNER does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of his responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the Contract, notify the owners of all utility services or other facilities of his plan of operations. Such notification shall be in writing. In addition to the general written notifications hereinbefore provided, it shall be the responsibility of the Contractor to keep such individual owners advised of changes in his plan of operations that would affect such owners.

Prior to commencing the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify Each such owner of his plan or operation. If, in the Contractor's opinion, the owner's assistance is needed to locate the utility service or facility or the presence of a representative of the owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the Engineer.

The Contractor's failure to give the two day's notice hereinabove provided shall be cause for the Engineer to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use excavation methods acceptable to the Engineer within three (3) feet of such outside limits at such points as may be required to insure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operations of a utility service or facility by accident or otherwise, he shall immediately notify the proper authority and the Engineer and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events, shall cooperate with the utility service or facility owner and the Engineer continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to his operations whether or not due to negligence or accident. The OWNER reserves the right to deduct such costs from any monies due or which may become due the Contractor, or his surety.

80-15 FURNISHING RIGHTS-OF-WAY

The OWNER will be responsible for furnishing all right-of-ways upon which the work is to be constructed in advance of the Contractor's operations.

80-16 PERSONAL LIABILITY OF PUBLIC OFFICIALS

In carrying out any of the Contract provisions or in exercising any power or authority granted to him by this Contract, there shall be no liability upon the Engineer, his authorized representatives, or any official of the OWNER either personally or as an official of the OWNER. It is understood that in such manner they act solely as agents and representatives of the OWNER.

80-17 NO WAIVER OF LEGAL RIGHTS

Upon completion of the work, the OWNER will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the OWNER from correcting any measurement, estimate or certificate made before or after completion of the work, nor shall the OWNER be precluded or stopped from recovering from the Contractor or his surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill his obligations under the Contract. A waiver on the part of the OWNER of any breach of any part of the Contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the Contract, shall be liable to the OWNER for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the OWNER's rights under any warranty or guaranty.

80-18 ENVIRONMENTAL PROTECTION

The Contractor shall comply with all Federal, State and local laws and regulations controlling pollution of the environment. He shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with silt runoff, fuels, oils, bitumens, chemicals, or other

harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

80-19 ARCHAEOLOGICAL AND HISTORICAL FINDINGS

Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during his operations, any building, part of a building, structure, or object which is incongruous with its surroundings, he shall immediately cease operations in that location and notify the Engineer. The Engineer will immediately investigate the Contractor's finding and will direct the Contractor to either resume his operations or to suspend operations as directed.

Should the Engineer order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate Contract modification (change order or supplemental agreement) as provided in the paragraph titled PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK of Subsection 100-05. If appropriate, the Contract modification shall include an extension of Contract time in accordance with the paragraph titled DETERMINATION AND EXTENSION OF CONTRACT TIME of Subsection 90-07.

SECTION 90 PROSECUTION AND PROGRESS

90-01 SUBLETTING OF CONTRACT

The OWNER will not recognize any Subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Engineer.

Should the Contractor elect to assign his Contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the OWNER. In case of approval, the Contractor shall file copies of all Subcontractors with the Engineer.

90-02 NOTICE TO PROCEED

The notice to proceed shall state the date on which it is expected the Contractor will begin the construction and from which date Contract time will be charged. If no such date is stated in the notice to proceed, Contract time will start on the date the notice to proceed is issued. The Contractor shall begin the work to be performed under the Contract within ten (10) days of the date set by the Engineer in the written notice to proceed, but in any event the Contractor shall notify the Engineer at least 24 hours in advance of the time actual construction operations will begin.

90-03 PROSECUTION AND PROGRESS

Unless otherwise specified, the Contractor shall submit his progress schedule for the Engineer's approval within 10 days after the effective day of the notice to proceed. The Contractor's progress schedule, when approved by the Engineer, may be used to establish major construction operations and to check on the progress of the work. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the contract.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the Engineer's request, submit a revised schedule for completion of the work within the Contract time and modify his operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the prosecution of the work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations.

90-04 LIMITATION OF OPERATIONS

The Contractor shall control his operations and the operations of his Subcontractors and all suppliers so as to provide for the free and unobstructed movement of commerce in those areas adjacent to the work.

90-05 CHARACTER OF WORKERS, METHODS AND EQUIPMENT

The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the Contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any persons employed by the Contractor or by any Subcontractor who, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed forthwith by the Contractor or Subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer.

Should the Contractor fail to remove such person or persons or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may suspend the work by written notice until compliance with such orders is ascertained.

All equipment which is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet the requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall be such that no injury to previously completed work, adjacent property, or existing facilities will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the Contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the Contract, plans and specifications.

When the Contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the Contract, he may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing the work in conformity with Contract requirements. If, after trial use on the substituted methods or equipment, the Engineer determines that the work produced does not meet Contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the Contract items involved or in Contract time as a result of authorizing a change in methods or equipment under this subsection.

90-06 TEMPORARY SUSPENSION OF THE WORK

The Engineer shall have the authority to suspend the work wholly, or in part, for such period or periods as he may deem necessary, due to unsuitable weather, or such other conditions as are considered unfavorable for the prosecution of the work, or for such time as is necessary due to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the Contract.

In the event that the Contractor is ordered by the Engineer, in writing, to suspend work for some unforeseen cause not otherwise provided for in the Contract and over which the Contractor has

no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the Engineer's order to suspend work to the effective date of the Engineer's order to resume the work. Claims for such compensation shall be filed with the Engineer within the time period stated in the Engineer's order to resume work. The Contractor shall submit with his claim information substantiating the amount shown on the claim. The Engineer will forward the Contractor's claim to the OWNER for consideration. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspensions made at the request of the Contractor, or for any other delay provided for in the Contract, plans, or specifications.

If it should become necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. He shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the site.

90-07 DETERMINATION AND EXTENSION OF CONTRACT TIME

The number of calendar or working days allowed for completion of the work shall be stated in the proposal and Contract and shall be known as the CONTRACT TIME.

Should the CONTRACT TIME require extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

(a) CONTRACT TIME based on WORKING DAYS shall be calculated weekly by the Engineer. The Engineer will furnish the Contractor a copy of his weekly statement of the number of working days charged against the CONTRACT TIME during the week and the number of working days currently specified for completion of the Contract (the original CONTRACT TIME plus the number of working days, if any, that have been included in approved CHANGE ORDERS, or SUPPLEMENTAL AGREEMENTS covering EXTRA WORK).

The Engineer shall base his weekly statement of CONTRACT TIME charges on the following considerations:

(1) No time shall be charged for days on which the Contractor is unable to proceed with the principal item of work under construction at the time for at least 6 hours with the normal work force employed on such principal item. Should the normal work force be on a triple shift, 18 hours shall apply. Conditions beyond the Contractor's control such as strikes, lockouts, unusual delays in transportation, temporary suspension of the principal item of work under construction or temporary suspension of the entire work which have been ordered by the Engineer for reasons not the fault of the Contractor, shall not be charged against the CONTRACT TIME.

(2) The Engineer will not make charges against the CONTRACT TIME prior to the effective date of the notice to proceed.

(3) The Engineer will begin charges against the CONTRACT TIME on the first working day after the effective date of the notice to proceed.

(4) The Engineer will not make charges against the CONTRACT TIME after the date of final acceptance as defined in the paragraph titled FINAL ACCEPTANCE of Subsection 60-16.

(5) The Contractor will be allowed one week in which to file a written protest setting forth his objections to the Engineer's weekly statement. If no objection is filed within such specified time, the weekly statement shall be considered as acceptable to the Contractor.

(6) The CONTRACT TIME (state in the proposal) is based on the originally estimated quantities as described in the paragraph titled INTERPRETATION OF ESTIMATED PROPOSAL QUANTITIES of Subsection 20-04. Should the satisfactory completion of the Contract require performance of work in greater quantities than those estimated in the proposal, the CONTRACT TIME shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in CONTRACT TIME shall not consider either the cost of work or the extension of CONTRACT TIME that has been covered by change order or supplemental agreement and shall be made at the time of final payment.

(b) CONTRACT TIME based on CALENDAR DAYS shall consist of the number of calendar days stated in the Contract counting from the effective date of the notice to proceed and including all Saturdays, Sundays, holidays, and no work days. All calendar days elapsing between the effective dates of the Engineer's orders to suspend and resume all work, due to causes not the fault of the Contract, shall be excluded.

At the time of final payment, the CONTRACT TIME shall be increased in the same proportion as the cost that the actually completed quantities bear to the cost of the originally estimated quantities in the proposal. Such increase in the CONTRACT TIME shall not consider either the cost of work of the extension of CONTRACT TIME that has been covered by a change order or supplemental agreement. Charges against the CONTRACT TIME will cease as of the date of final agreement.

(c) When the CONTRACT TIME is a specified completion date, it shall be the date on which all Contract work shall be substantially completed.

If the Contractor finds it impossible for reasons beyond his control to complete the work within the Contract time as specified, or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the CONTRACT TIME as extended, make a written request to the Engineer for an extension of time setting forth the reasons which he believes will justify the granting of his request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may extend the time for completion in such amount as the conditions justify. The extended time for completion shall then be in full force and effect, the same as though it were the original time for completion.

90-08 FAILURE TO COMPLETE ON TIME

For Each calendar day or working day, as specified in the Contract, that any work remains incomplete after the CONTRACT TIME (including all extensions and adjustments as provided in the paragraph titled DETERMINATION AND EXTENSION OF CONTRACT TIME of this Subsection) the sum specified in the Contract and proposal as liquidated damages will be deducted from any money due or to become due the Contractor or his surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages that will be incurred by the OWNER should the Contractor fail to complete the work in the time provided in his Contract.

The Contractor will not be charged with liquidated damages when delay in completion of the work is due to acts of the public enemy, acts of the OWNER, acts of another Contractor in the performance of a Contract with the OWNER, fires, floods, epidemics, quarantine restrictions, strikes, or freight embargoes.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a waiver on the part of the OWNER of any rights under the Contract.

90-09 CONTRACT DEFAULT

The Contractor shall be considered in default of his Contract and such default will be considered as cause for the OWNER to terminate the Contract for any of the following reasons if the Contractor:

(a) Fails to begin the work under the Contract within the time specified in the “Notice to Proceed”; or

(b) Fails to perform the work or fails to provide sufficient workers, equipment or materials to assure completion of work in accordance with the terms of the Contract; or

(c) Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable; or

(d) Discontinues the prosecution of the work; or

(e) Fails to resume work which has been discontinued within a reasonable time after notice to do so; or

(f) Becomes insolvent or is declared bankrupt, or commits an act of bankruptcy or insolvency; or

(g) Allows any final judgment to stand against him unsatisfied for a period of 10 days; or

(h) Makes an assignment for the benefit of creditors; or

(i) For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Engineer consider the Contractor in default of the Contract for any reason hereinbefore, he shall immediately give written notice to the Contractor and the Contractor's

surety as to the reasons for considering the construction in default and the OWNER's intentions to terminate the Contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the OWNER will, upon written notification from the Engineer of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the Contract, to take the prosecution of the work out of the hands of the Contractor. The OWNER may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said Contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Engineer will be required for the completion of said Contract in an acceptable manner.

All costs and charges incurred by the OWNER, together with the cost of completing the work under Contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the Contract, then the Contractor and the surety shall be liable and shall pay to the OWNER the amount of such excess.

90-10 CONTRACT TERMINATION

The Owner may terminate the Contract, or any portion hereof, for just cause by written notice to the Contractor.

When the Contract, or any portion thereof, is terminated before completion of all items of work in the Contract, payment will be made for the actual number of units or items of work completed or started. No claims for loss of anticipated profits shall be considered.

Acceptable materials both in quantity and quality obtained or ordered by the Contractor that are not incorporated into the work shall, at the option of the Contractor, be purchased by the Owner at actual cost as shown by receipted bills and actual cost records. Delivery of the materials will be performed as designated by the Engineer.

Termination of the Contract, or a portion thereof, shall neither relieve the Contractor of his responsibilities for the completed work nor relieve his surety of its obligation for and concerning any just claim arising out of the work performed.

The costs incurred by the Contractor for mobilization, if applicable, shall be itemized and presented to the Owner. Rebates and refunds that are applicable shall be itemized, and the amount paid the Contractor shall be adjusted to reflect actual cost as shown by receipted bills and actual cost records.

The cost of demobilization of Contractor's equipment and other items pertaining to the expense of moving off the job site shall be itemized and supported by actual cost records and presented for payment. Demobilization as a percentage of the Contract amount, or portion thereof, shall not be paid.

Reimbursement for organization of the work and overhead expenses (when not otherwise included in the Contract) will be considered, the intent being that an equitable settlement will be made with the Contractor.

All of the above are subject to audit as specified by the Right to Audit, Paragraph 100-11.

SECTION 100 MEASUREMENT AND PAYMENT

100-01 MEASUREMENT OF QUANTITIES

All work completed under the Contract will be measured by the Engineer, or his authorized representatives, using United States Customary Units of Measurement.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the Contract will be those methods generally recognized as conforming to good Engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet or less. Unless otherwise specified, transverse measurements for area computations will be the near dimensions shown on the plans or ordered in writing by the Engineer.

Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.

Unless otherwise specified, all Contract items which are measured by the Linear Foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

In computing volumes of excavation the average end area method or other acceptable methods will be used. Acceptability of another method will be decided by the Engineer.

The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fractions of inches.

The term “ton” will mean the short ton consisting of 2,000 pounds avoirdupois. All materials which are measured or proportioned by weights shall be weighed on accurate, approved scales by competent, qualified personnel at locations designated by the Engineer. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for materials to be passed through mixing plants. Trucks used to haul materials being paid for by weight shall be weighed empty daily at such times as the Engineer directs, and each truck shall bear the plainly legible identification mark.

Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable to the Engineer, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity and all loads shall be leveled when the vehicles arrive at the point of delivery.

When requested by the Contractor and approved by the OWNER in writing, material specified to be measured by the Cubic Yard may be weighed and such weights will be converted to Cubic Yards for payment purposes. Factors for conversion from weight measurement to volume

measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Bituminous materials will be measured by the gallon or ton. When measured by volume, such volumes will be measured at 60 degrees F, or will be corrected to the volume at 60 degrees F using ASTM D 1250 for asphalt or ASTM D 633 for tars.

Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when bituminous material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work.

When bituminous materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, may be used for computing quantities.

Lumber will be measured by the thousand feet board measure (M.F.B.M.) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.

The term “Lump Sum” when used as an item of payment will mean complete payment for the work described in the Contract.

When a complete structure or structural unit (in effect, “Lump Sum” work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered by the Engineer in connection with force account work will be measured as agreed in the change order or supplemental agreement authorizing such force account work as provided in the paragraph titled PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK of this section.

When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gage, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.

Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or by certified permanently installed commercial scales.

Scales shall be accurate within one-half percent of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the inspector before beginning work and at such other times as requested. The intervals shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed one tenth of one percent of the nominal rated capacity of the scale, but not less than one pound. The use of spring balances will not be permitted.

Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and inspector can safely and conveniently view them.

Scale installation shall have available, ten standard fifty pound weights for testing the weighing equipment or suitable weights and devices for other approved equipment.

Scales must be tested for accuracy and serviced before use at a new site. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end.

Scales “overweighing” (indicating more than correct weight) will not be permitted to operate, and all materials received subsequent to the last previous correct weighing-accuracy-test will be reduced by the percentage of error in excess of one-half of one percent.

In the event inspection reveals the scales have been “underweighing” (indicating less than correct weight) they shall be adjusted and no additional payment to the Contractor will be allowed for materials previously weighed and recorded.

All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning, or payment, shall be included in the unit Contract prices for the various items of the project.

When the estimated quantities for a specific portion of the work are designated as the pay quantities in the Contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portion of the work shown on the plans are revised by the Engineer. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

100-02 SCOPE OF PAYMENT

The Contractor shall receive and accept compensation provided for in the Contract as full payment for furnishing all materials, for performing all work under the Contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof, subject to the provisions of the paragraph titled NO WAIVER OF LEGAL RIGHTS of Subsection 80-17.

When the “basis of payment” subsection of a technical specification requires that the Contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other Contract item which may appear elsewhere in the Contract, plans, or specifications.

100-03 COMPENSATION FOR ALTERED QUANTITIES

When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as Contract items are concerned, payment at the original Contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in the paragraph titled ALTERATION OF WORK AND QUANTITIES of Subsection 50 will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from his unbalanced allocation of overhead and profit among the Contract items, or from any other cause.

100-04 PAYMENT FOR OMITTED ITEMS

As specified in the paragraph titled OMITTED ITEMS of Subsection 50-03, the Engineer shall have the right to omit from the work (order nonperformance) any Contract item, except major Contract items, in the best interest of the OWNER.

Should the Engineer omit or order nonperformance of a Contract item or portion of such item from the work, the Contractor shall accept payment in full at the Contract prices for any work actually completed and acceptable prior to the Engineer's order to omit or not perform such Contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the OWNER's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the OWNER.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted Contract item prior to the date of the Engineer's order. Such additional costs incurred by the Contractor must be directly related to the deleted Contract item and shall be supported by certified statements by the Contractor as to the nature and amount of such costs.

100-05 PAYMENT FOR EXTRA AND FORCE ACCOUNT WORK

Extra work, performed in accordance with the paragraph titled EXTRA WORK of Subsection 50-04, will be paid for at the Contract prices or agreed prices specified in the change order or supplemental agreement authorizing such extra work. When the change order or supplemental agreement authorizing the extra work requires that it be done by force account, such force account shall be measured and paid for as follows:

(a) Labor: For all labor (skilled and unskilled) and foremen in direct charge of a specific force account item, the Contractor shall receive the rate of wage (or scale) for every hour that such laborer or foreman is actually engaged in the specified force account work. Such wage (or scale) shall be agreed upon in writing before beginning the work.

The Contractor shall receive the actual costs paid to, or in behalf of, workers by reason of subsistence and travel allowances, health and welfare benefits, pension funds benefits or other benefits, when such amounts are required by collective bargaining agreement or other employment Contract generally applicable to the classes of labor employed on the work.

An amount equal to fifteen percent (15%) of the sum of the above items will also be paid the Contractor.

(b) Insurance and Taxes: For property damage, liability, and workmen's compensation insurance premiums, unemployment insurance contributions, and social security taxes on the force account work, the Contractor shall receive the actual cost, and to this cost (sum) 5 percent will be added. The Contractor shall furnish satisfactory evidence of the rate or rates paid for such insurance and taxes.

(c) Materials: For materials accepted by the Engineer and used, the Contractor shall receive the actual cost of such materials delivered on the work, including transportation charges paid by him (exclusive of machinery rentals as hereinafter set forth), to which cost (sum) 10 percent will be added.

(d) Equipment: For any machinery or special equipment (other than small tools) including fuel and lubricants, plus transportation costs, the use of which has been authorized by the Engineer, the Contractor shall receive the rental rates agreed upon in writing before such work is begun for the actual time that such equipment is committed to the work.

(e) Miscellaneous: No additional allowance will be made for general superintendence, the use of small tools, or other costs for which no specific allowance is herein provided.

(f) Comparison of Records: The Contractor and the Engineer shall compare records of the cost of force account work at the end of each day. Agreement shall be indicated by signature of the Contractor and Engineer or their duly authorized representatives.

(g) Statements: No payment will be made for work performing on a force account basis until the Contractor has furnished the Engineer with the duplicate itemized statements of the cost of such force account work detailed as follows:

(1) Name, classification, date, daily hours, total hours, rate and extension for each laborer and foreman.

(2) Designation, dates, daily hours, total hours, rental rate, and extension for each unit of machinery and equipment.

(3) Quantities of materials, prices, and extensions.

(4) Transportation of materials.

(5) Cost of property damage, liability and workmen's compensation insurance premiums, unemployment insurance contributions, and social security tax.

Statements shall be accompanied and supported by receipted invoice for all materials used and transportation charges. However, if materials used on the force account work are not specifically purchased for such work but are taken from the Contractor's stock, then in lieu of the invoices the Contractor shall furnish an affidavit certifying that such materials were taken from his stock, that the quantity claimed, was actually used, and that the price and transportation claimed represent the actual cost provided above shall constitute full compensation for such work.

100-06 PARTIAL PAYMENT

Partial payments will be made once each month as the work progresses. Said payments will be based upon estimates prepared by the Engineer of the value of the work performed and materials complete in place in accordance with the Contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with the subsection titled PAYMENT FOR MATERIALS ON HAND of this subsection.

No partial payment will be made when the amount due the Contractor since the last estimate is less than five hundred dollars.

From the total of the amount determined to be payable on a partial payment, 10 percent of such total amount will be deducted and retained by the OWNER until the final payment is made. The balance (90 percent) of the amount payable, less all previous payments, shall be certified for payment.

When not less than 95% of the work has been completed the Engineer may, at his discretion and without the consent of the surety, prepare an estimate from which will be retained an amount not less than twice the Contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities or work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the Engineer to be a part of the final quantity for the item of work in question.

No partial payment shall bind the OWNER to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in the paragraph titled FINAL PAYMENT of this subsection.

100-07 PAYMENT FOR MATERIALS ON HAND

Partial payments, for projects which do not utilize the OWNER'S tax exempt status, may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the Contract, plans, and specifications and are delivered to acceptable sites on the OWNER's property or at other sites in the vicinity that are acceptable to the OWNER. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

(a) The material has been stored or stockpiled in a manner acceptable to the Engineer at or on an approved site.

(b) The Contractor has furnished the Engineer with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

(c) The Contractor has furnished the Engineer with satisfactory evidence that the material and transportation costs have been paid.

(d) The Contractor has furnished the OWNER legal title (free of liens or encumbrances of any kind) to the material so stored or stockpiled.

(e) The Contractor has furnished the OWNER evidence that the material so stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the OWNER's payment for such stored or stockpiled materials shall in no way relieve the Contractor of his responsibility for furnishing

and placing such materials in accordance with the requirements of the Contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the Contract price for such materials or the Contract price for the Contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this subsection.

100-08 CONTRACT CLOSE-OUT

Subsequent to the final acceptance of this project by the Engineer, the following requirements must be satisfied by the Contractor before final payment can be made.

(a) The Contractor must publicly advertise the NOTICE OF COMPLETION furnished by the Engineer in accordance with Title 39, Code of Alabama, 1975.

(b) The Contractor must execute copies of CONTRACTOR'S AFFIDAVIT OF PAYMENT OF CLAIMS AND DEBTS on the form furnished by the Engineer.

(c) The Contractor must have his surety execute copies of CONSENT OF SURETY TO FINAL PAYMENT on the form furnished by the Engineer.

(d) The Contractor must furnish a letter on his letterhead acknowledging that acceptance of final payment by the Contractor constitutes a waiver of all claims, present or future, in connection with this project.

(e) The Contractor must furnish a written guarantee on his letterhead covering all defects in material and workmanship for a period of one (1) year commencing on the date of final acceptance.

(f) If any purchased items have been incorporated in the work, the Contractor must furnish a letter on his letterhead assigning those warranties to the OWNER. Copies of said warranties shall be bound in one binder and submitted along with the letter assignment.

(g) The Contractor must keep track of “as built” information and at the contract closeout provide one complete set of reproducible “as builts” covering all earthwork, utility routing, structural, mechanical, and electrical aspects of the work, including wiring schematics.

100-09 WITHHOLDING FOR CLAIMS AND LITIGATION

If at the time of Contract close-out, the project is subject to a claim or the Contractor is involved in litigation concerning the project, the OWNER reserves the right to:

(a) Refuse to close out the Contract retaining all monies unpaid until such time as all claims are dropped and litigation is resolved, or

(b) Refuse to close out the Contract, retaining enough money to cover the total of all outstanding claims and amounts claimed by litigation until such time as all claims are dropped and litigation is resolved, or

(c) Require the Contractor to post a letter of credit to each individual claimant or litigant and satisfactory to the claimant or litigant. Once such letters of credit have been posted and the OWNER is in receipt of written agreement from each individual claimant or litigant, the OWNER will proceed with Contract close-out and release of retainage in the normal manner.

100-10 FINAL PAYMENT

When the Contract work has been accepted in accordance with the requirements of the paragraph titled FINAL ACCEPTANCE of Subsection 60-16, and the paragraph titled Contract CLOSE-OUT above, the Engineer will prepare the final estimate of the items of work actually performed. The Contractor shall approve the Engineer's final estimate or advise the Engineer of his objections to the final estimate, which are based on disputes in measurements or computations of the final quantities to be paid under the Contract, as amended by change order or supplemental agreement. The Contractor and Engineer shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the Engineer's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the Engineer's estimate under protest of the quantities in dispute and such disputed quantities shall be considered by the OWNER as a claim in accordance with the paragraph titled CLAIMS FOR ADJUSTMENT AND DISPUTES of Subsection 60-17.

After the Contractor has approved, or approved under protest, the Engineer's final estimate, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the Contract.

If the Contractor has filed a claim for additional compensation under the provisions of the paragraph titled CLAIMS FOR ADJUSTMENTS AND DISPUTES of Subsection 60-17 or under the provisions of this subsection, such claims will be considered by the OWNER in accordance with State laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

100-11 RIGHT OF AUDIT

Contractor's records which shall include but not be limited to accounting records (hard copy, as well as computer readable data if it can be made available), written policies and procedures; subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); original estimates; estimating work sheets; correspondence; change order files (including documentation covering negotiated settlements); backcharge logs and supporting documentation; general ledger entries detailing cash and trade discounts earned, insurance policies, rebates and dividends; and any other supporting evidence deemed necessary by the Owner to substantiate charges related to this Contract (all foregoing hereinafter referred to as “records”) shall be open to inspection and subject to audit and/or reproduction by Owner's agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of (a) Contractor compliance with Contract requirements, (b) compliance with

Owner's business ethics policies, and (c) compliance with provisions for pricing change orders, payment or claims submitted by the Contractor or any of their payees.

Such audits may require inspection and copying from time to time and at reasonable times and places of any and all information, materials and data of every kind and character, including without limitation, records, books, papers, documents, subscriptions, recordings, agreements, purchase orders, leases, Contracts, commitments, arrangements, notes, daily diaries, superintendent reports, drawings, receipts, vouchers and memoranda, and any and all other agreements, sources of information and matters that may in Owner's judgment have any bearing on or pertain to any matters, rights, duties or obligations under or covered by any Contract Document. Such records subject to audit shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs, (including overhead allocations) as they may apply to costs associated with this Contract.

The Owner or its designee shall be afforded access to all of the Contractor's records, and shall be allowed to interview any of the Contractor's employees, pursuant to the provisions of this article throughout the term of this Contract and for a period of three (3) years after final payment or longer if required by law.

Contractor shall require all subcontractors, insurance agents, and material suppliers (payees) to comply with the provisions of this article by insertion of the requirements hereof in a written Contract agreement between Contractor and payee. Such requirements will also apply to Subcontractors and Sub-Subcontractors, etc. Contractor will cooperate fully and will cause all Related Parties and all of Contractor's subcontractors (including those entering into Lump Sum subcontracts) to cooperate fully in furnishing or in making available to Owner from time to time, whenever requested, in an expeditious manner, any and all such information, materials and data.

Owner's agent or its authorized representative shall have access to the Contractor's facilities, shall have access to the Subcontractor's facilities, shall have access to all necessary records, and shall be provided adequate and appropriate work space, in order to conduct audits in compliance with this article.

If an audit inspection or examination in accordance with this article, discloses overcharges (of any nature) by the Contractor to the Owner in excess of one percent (1%) of the total Contract billings, the actual cost of the Owner's audit shall be reimbursed to the Owner by the Contractor. Any adjustments and/or payments which must be made as a result of any such audit or inspection of the Contractor's invoices and/or records shall be made within a reasonable amount of time (not to exceed 90 days) from presentation of Owner's findings to Contractor.

ALABAMA PORT AUTHORITY
PORT OF MOBILE

Specification Booklet

Project Name	**ITC Generator – Electrical Equipment**			
Location	**Mobile, AL**			
Project #	**11210**	**TASK#**	**4**	**March 2024**

DIVISION V

Construction Specifications
For

International Trade Center
Generator – Electrical Equipment

ALABAMA PORT AUTHORITY
PORT OF MOBILE

Specification Booklet

Project Name	**ITC Generator – Electrical Equipment**			
Location	**Mobile, AL**			
Project #	**11210**	**TASK#**	**4**	**March 2024**

Contractor:

1. Shall provide to ASPA product data sheets and product warranty information for all durable equipment..
2. Shall provide construction schedule within ten calendar days of the effective date of Notice to Proceed.
3. Shall coordinate work with ASPA project manager and shall not enter areas where not specifically authorized to do so.
4. Contractor shall not cause any power outages without prior written approval by ASPA Project Manager. Power outages shall not be scheduled during normal ASPA business hours of 7 a.m – 5 p.m. Monday – Friday. Power outages shall not exceed 60 minutes.

Bidding Information:

1. ASPA will exercise tax free purchasing of materials for this project. Sales and Use Tax Certificate of Exemption is attached herewith.
2. Information provided herein is not intended to be a substitute for an in person site visit.

Project Drawings and Specifications – attached herewith

International Trade Center Generator Replacement drawing set containing 9 sheets and sealed on 2/27/2024 is attached herewith. Contractor shall comply with the project notes and specification therein.

INTERNATIONAL TRADE CENTER
GENERATOR REPLACEMENT

IN

the City of
Mobile, Alabama

250 N Water St #129
Mobile, Alabama 36602

BY

dell consulting
Electrical Engineering
Alabama Certificate Number CA-4146-E
813 Downtowner Blvd., Suite D
Mobile, AL 36609
P: 251-316-0015 F: 850-453-6612
Dell Consulting project: 23-007

N

1 OVERALL SITE MAP
NOT TO SCALE

INDEX OF DRAWINGS

DRAWING #	DRAWING DESCRIPTION:
E1.1	ELECTRICAL LEGEND & SPECIFICATIONS
E2.1	ELECTRICAL OVERALL SITE PLAN
E3.1	ELECTRICAL ELECTRICAL SUBSTATION POWER PLAN
E3.2	ELECTRICAL ELECTRICAL ENLARGED POWER PLAN
E3.3	ELECTRICAL ELECTRICAL PLATFORM ELEVATION
E4.1	ELECTRICAL EXISTING RISER DIAGRAM
E5.1	ELECTRICAL NEW WORK RISER DIAGRAM
E5.2	ELECTRICAL NEW WORK SCHEDULES & DETAILS

SUMMARY OF WORK -
THE SCOPE OF THIS PROJECT CONSISTS OF:

THE EXISTING GENERATOR PROVIDING EMERGENCY STAND-BY POWER FOR THE INTERNATIONAL TRADE CENTER IS TO BE REPLACED NEW. THE GENERATOR WILL BE OWNER PROVIDED, CONTRACTOR INSTALLED. THE ELECTRICAL CONTRACTOR IS TO MODIFY THE EXISTING ELECTRICAL DISTRIBUTION AS SHOWN ON THESE PLAN DOCUMENTS; INCLUDING INSTALLING NEW DISTRIBUTION EQUIPMENT AND MODIFYING THE SERVICE FEEDERS.

dell consulting
MEP Engineering
Andrew W. Maurin 25105
Alabama Certificate Number CA-4146-E
813 Downtowner Blvd. Ste. D
Mobile, Alabama 36609
P: 251-316-0015 F: 850-332-6629
DELL CONSULTING PROJECT: 23-007

ALABAMA LICENSED No. 25105 PROFESSIONAL 2-27-2024 ENGINEER ANDREW W. MAURIN

NUMBER REVISION	REVISION DESCRIPTION

INTERNATIONAL TRADE CENTER
GENERATOR REPLACEMENT
MOBILE ALABAMA

DESIGNED BY: TMM
DRAWN BY: TMM
CHECKED BY: AWM
DATE: 01-30-2024

SHEET TITLE:
ELECTRICAL
TITLE SHEET

SHEET:
T1.1

ELECTRICAL SPECIFICATIONS

DISTRIBUTION & POWER EQUIPMENT:

- PANELBOARD. MOUNT AS INDICATED. SEE PANELBOARD SCHEDULES.
- T — TRANSFORMER. MOUNT AS INDICATED. SEE XFMR SCHEDULE FOR SIZE AND TYPE.
- AUTOMATIC TRANSFER SWITCH.
- DUPLEX RECEPTACLE NEMA 5-20R. MOUNT 18" AFF UNLESS NOTED OTHERWISE. VERIFY DUPLEX MOUNTING REQUIREMENTS WITH ARCHITECTURAL DRAWINGS PRIOR TO ROUGH-IN. SUBSCRIPT INDICATES AS FOLLOWS:
  - WP - GFI DEVICE WITH DIECAST WEATHERPROOF BACKBOX & DIECAST WEATHERPROOF (IN-USE) COVERPLATE. IN EXTERIOR LOCATIONS MOUNT 30" AFG. WEATHERPROOF OUTLET BOX HOODS ARE TO BE LISTED AND IDENTIFIED AS "EXTRA-DUTY".

OTHER:

- (1) SHEET NOTE TAG.
- (4LP1) PANELBOARD, SWITCHBOARD, TRANSFORMER & ELECTRICAL EQUIPMENT IDENTIFICATION TAG.
- LEADERS.

ABBREVIATIONS

A	AMPS
AC	ABOVE COUNTER
AF	AMP FRAME
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AL	ALUMINUM
ARCH	ARCHITECT OR ARCHITECTURAL
AT	AMP TRIP
ATS	AUTOMATIC TRANSFER SWITCH
ATU	AIR TERMINAL UNIT
AWG	AMERICAN WIRE GAUGE
BAS	BUILDING AUTOMATION SYSTEM
BFG	BELOW FINISHED GRADE
BJ	BONDING JUMPER
BKR	CIRCUIT BREAKER
BLDG	BUILDING
BOD	BASIS OF DESIGN
C	CONDUIT
C/B	CIRCUIT BREAKER
CL	CURRENT LIMITING
C/L	CENTERLINE
CLG	CEILING
CKT	CIRCUIT
CT	CURRENT TRANSFORMER
CU	COPPER
DDC	DIRECT DIGITAL CONTROL
DEMO	DEMOLISH
EC	ELECTRICAL CONTRACTOR
EGC	EQUIPMENT GROUNDING CONDUCTOR
ELEC	ELECTRICAL
EMGB	ELECTRICAL MAIN GROUNDING BUSBAR
EF	EXHAUST FAN
EX	EXISTING TO REMAIN
EXT	EXTERIOR
EWC	ELECTRIC WATER COOLER
EMT	ELECTRICAL METALLIC TUBING
EQUIP	EQUIPMENT
FMC	FLEXIBLE METAL CONDUIT
FACP	FIRE ALARM SYSTEM CONTROL PANEL
FU	FUSE
F/A	FIRE ALARM
FLA	FULL LOAD AMPS
FLR	FLOOR
FVNR	FULL VOLTAGE NON-REVERSING
GFI	GROUND FAULT INTERRUPTER
G	GROUND (OR GFI FOR RECEPTACLE SUBSCRIPT)
GC	GENERAL CONTRACTOR
GND	GROUND
GEC	GROUNDING ELECTRODE CONDUCTOR
HH	HANDHOLE
HOA	HAND-OFF-AUTOMATIC
HP	HEAT PUMP OR HORSEPOWER
HVAC	HEATING, VENTILATION & AIR-CONDITIONING
IG	ISOLATED GROUND
IMC	INTERMEDIATE METAL CONDUIT
JB	JUNCTION BOX
k	KILO
kAIC	KILO-AMPERE INTERRUPTING CAPABILITY
kCMIL	THOUSAND CIRCULAR MILS
LCP	LIGHTING CONTROL PANEL
LTG	LIGHTING
LFMC	LIQUID TIGHT FLEXIBLE METAL CONDUIT
LV	LOW VOLTAGE
MAX	MAXIMUM
MCA	MINIMUM CIRCUIT AMPACITY
MCC	MOTOR CONTROL CENTER
MCE	MAIN COMMUNICATIONS EQUIPMENT ROOM
MCM	THOUSAND CIRCULAR MILS
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MLO	MAIN LUGS ONLY
MNT	MOUNTING HEIGHT
MTG	MOUNTING
MTS	MANUAL TRANSFER SWITCH
MV	MEDIUM VOLTAGE
N1	NEMA 1
N3R	NEMA 3R
N/A	NOT APPLICABLE
NA	NOT APPLICABLE
NEC	NATIONAL ELECTRICAL CODE
NESC	NATIONAL ELECTRICAL SAFETY CODE
NEU	NEUTRAL
OCPD	OVERCURRENT PROTECTION DEVICE
OFOI	OWNER FURNISHED OWNER INSTALLED
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OH	OVERHEAD
OHE	OVERHEAD ELECTRIC
OHP	OVERHEAD PRIMARY
OHS	OVERHEAD SECONDARY
PBD	PANELBOARD
PF	POWER FACTOR
PNL	PANELBOARD
PT	POTENTIAL TRANSFORMER
PWR	POWER
REC	RECEPTACLE
REQD	REQUIRED
RM	ROOM
RGS	RIGID GALVANIZED STEEL CONDUIT
RNC	RIGID NON-METALLIC CONDUIT
RVSS	REDUCED VOLTAGE SOLID STATE
SA	SURGE ARRESTER
SCA	SHORT CIRCUIT AMPS
SF	SUPPLY FAN
SPEC	SPECIFICATION
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
TBB	TELECOMMUNICATIONS BONDING BACKBONE
TR	TELECOMMUNICATIONS ROOM
TGB	TELECOMMUNICATIONS GROUNDING BUSBAR
TMGB	TELECOMMUNICATIONS MAIN GROUNDING BUSBAR
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSION
TYP	TYPICAL
UFR	UNDERFLOOR RACEWAY
UG	UNDERGROUND
UGE	UNDERGROUND ELECTRIC
UGP	UNDERGROUND PRIMARY
UGS	UNDERGROUND SECONDARY
UL	UNDERWRITERS' LABORATORIES
UNO	UNLESS NOTED OTHERWISE
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLT
VA	VOLT-AMPERES
VAR	VOLT-AMPERES REACTIVE
VAV	VARIABLE AIR VOLUME UNIT
W	WATTS
WAO	WORK AREA OUTLET
WP	WEATHERPROOF
WSR	WITHSTAND RATING
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
ϕ	PHASE
72°	DEGREES
Δ	DELTA
Ω	OHMS

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DELL CONSULTING PROJECT: 23-007

ALABAMA LICENSED No. 25105 PROFESSIONAL 2-27-2024 ENGINEER ANDREW W. MAURIN

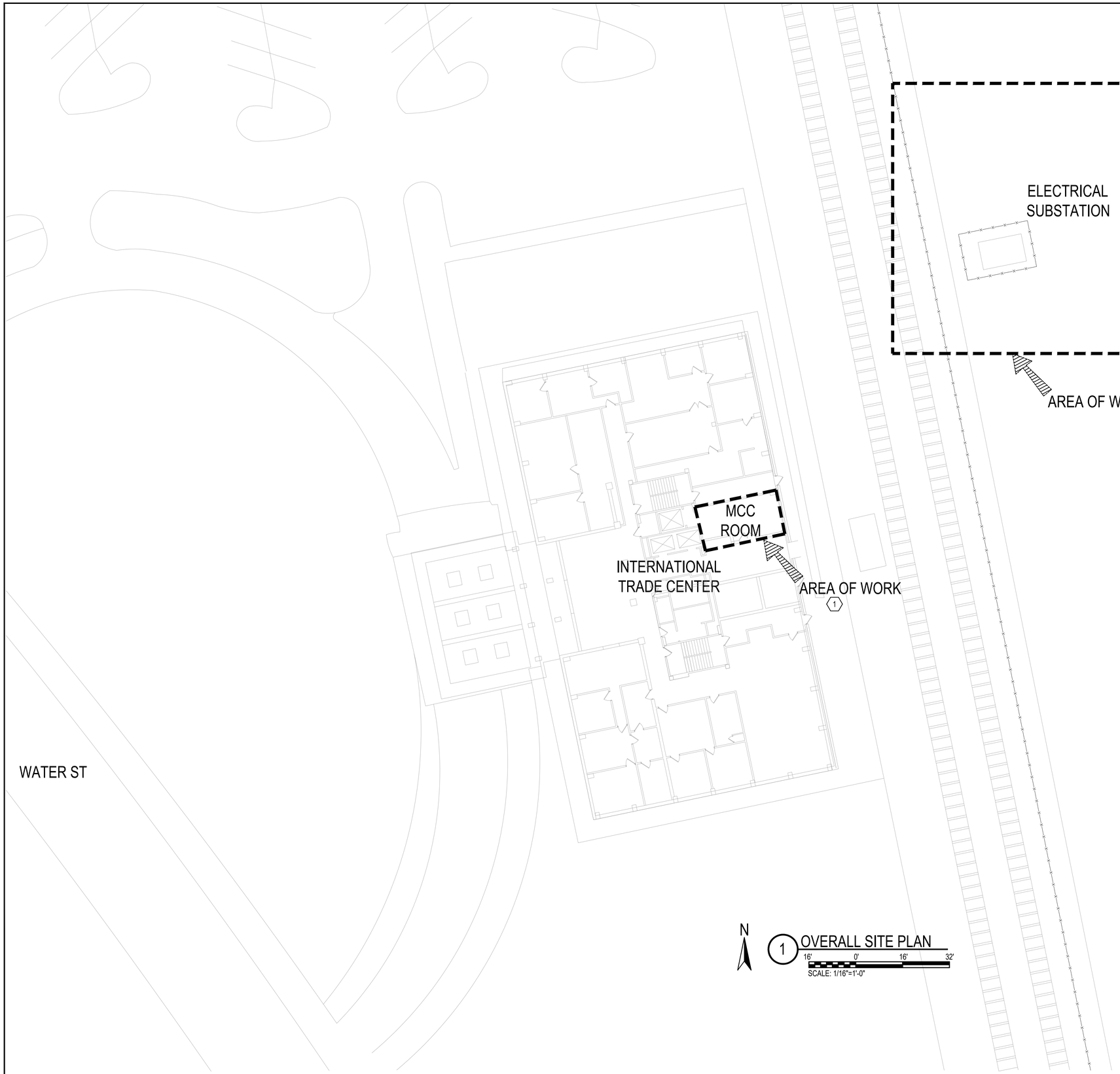
NUMBER	REVISION DESCRIPTION

INTERNATIONAL TRADE CENTER
GENERATOR REPLACEMENT
MOBILE ALABAMA

DESIGNED BY: TMM
DRAWN BY: TMM
CHECKED BY: AWM
DATE: 02-09-2024

SHEET TITLE: ELECTRICAL LEGEND & SPECIFICATIONS

SHEET: E1.1



SHEET NOTES

1. LOCATION OF THE INTERIOR ELECTRICAL ROOM. THE EXISTING 1200A BUILDING MOTOR CONTROL CENTER IS LOCATED IN THIS SPACE.

WORK SEQUENCE

PRE-OUTAGE:

1. INSTALL ALL ELECTRICAL EQUIPMENT ON THE NEW PLATFORM.
2. POSITION RENTAL GENERATOR (200kW 480Y/277V DIESEL GENERATOR) ON THE NORTH SIDE OF THE INTERNATIONAL TRADE CENTER AND PREPARE FOR TEMPORARY CONNECTION TO THE MAIN MOTOR CONTROL CENTER.

NOTE: ONCE THE TEMPORARY GENERATOR IS IN PLACE, DE-ENERGIZE AND DISCONNECT CONDUCTORS SERVING THE INTERNATIONAL TRADE CENTER MAIN MOTOR CONTROL CENTER IN THE EXISTING MAIN SWITCHBOARD. THE CONDUCTORS ARE TO BE COILED, SECURED, AND TAPED FOR RECONNECTION TO NEW EQUIPMENT. RE-ENERGIZE THE ITC MAIN MCC BY TERMINATING THE TEMPORARY GENERATOR CABLING ON THE MAIN BREAKER PRIMARY LUGS.

OUTAGE:

MEDIUM VOLTAGE:

1. DISCONNECT EXISTING MEDIUM VOLTAGE CABLING FROM THE EXISTING MEDIUM VOLTAGE SWITCH, PULL BACK CONDUCTORS THROUGH CONDUIT, AND TEMPORARILY SPLICE IN THE EXISTING ELECTRICAL MANHOLE.

LOW VOLTAGE:

1. DEMOLISH EXISTING ELECTRICAL EQUIPMENT AND ASSOCIATED CONCRETE PAD.
2. INSTALL NEW ELECTRICAL VAULT AND IN-GROUND JUNCTION BOX.
3. FORM NEW DUCTBANKS WITH CONDUITS AS SHOWN ON THE PLAN DRAWINGS.
4. INSTALL ALL CONDUIT AND WIRING REQUIRED TO RE-ENERGIZE THE INTERNATIONAL TRADE CENTER.

MEDIUM VOLTAGE:

1. REMOVE TEMPORARY SPLICES FROM MEDIUM VOLTAGE CABLING IN ELECTRICAL MANHOLE.
2. EXTEND, MODIFY, AND/OR RE-ROUTE CONDUCTORS TO THE NEW ELECTRICAL VAULT.
3. SPLICE MEDIUM VOLTAGE CONDUCTORS AND EXTEND THROUGH THE NEW DUCTBANK AND CONTINUE TO THE NEW MEDIUM VOLTAGE SWITCH ON THE NEW PLATFORM.

ENERGIZE ELECTRICAL SYSTEM:

NOTE: UPON INSTALLATION OF THE LOW VOLTAGE AND MEDIUM VOLTAGE SYSTEM COMPONENTS AND WIRING, THE ELECTRICAL DISCONNECT IS TO REMOVE THE INTERNATIONAL TRADE CENTER FROM GENERATOR POWER AND RETURN TO NORMAL OPERATION.

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DELL CONSULTING PROJECT: 23-007

ALABAMA LICENSED No. 25105 PROFESSIONAL ENGINEER ANDREW W. MAURIN
2-27-2024

NUMBER REVISION	REVISION DESCRIPTION

INTERNATIONAL TRADE CENTER GENERATOR REPLACEMENT

MOBILE ALABAMA

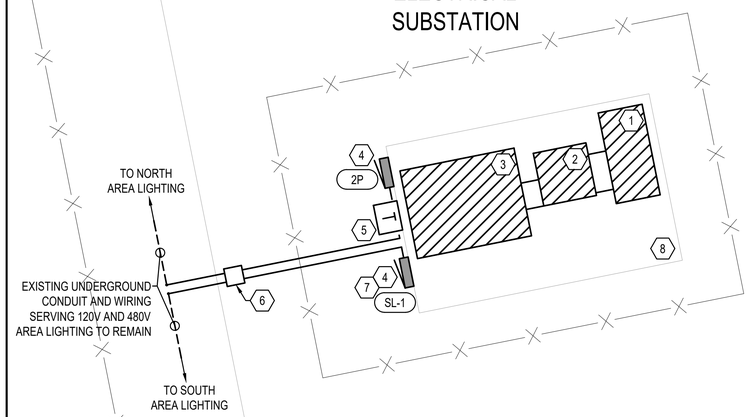
DESIGNED BY: TMM
DRAWN BY: TMM
CHECKED BY: AWM
DATE: 01-18-2023

SHEET TITLE: ELECTRICAL OVERALL SITE PLAN

SHEET: E2.1

DEMOLITION SHEET NOTES

1. THE APPROXIMATE LOCATION OF THE EXISTING MEDIUM VOLTAGE SWITCH CABINET TO BE DISCONNECTED AND REMOVED.
2. THE APPROXIMATE LOCATION OF THE EXISTING 4160-480Y/277V UTILITY TRANSFORMER TO BE DISCONNECTED AND REMOVED.
3. THE APPROXIMATE LOCATION OF THE EXISTING 1200A 480Y/277V SWITCHBOARD TO BE DISCONNECTED AND REMOVED. THE ELECTRICAL CONTRACTOR IS TO EXCAVATE TO A DEPTH OF 3' BELOW THE EXISTING GRADE TO ALLOW THE NEW IN-GROUND JUNCTION BOX WITH LID TO BE INSTALLED WITH THE TOP AT GRADE.
4. THE APPROXIMATE LOCATION OF THE EXISTING PANELBOARD TO BE DISCONNECTED AND COMPLETELY REMOVED. THE CONDUCTORS TO THE INTERNATIONAL TRADE CENTER AND SEWAGE LIFT STATION #5 ARE TO BE SECURED AND PREPARED FOR RE-CONNECTION TO THE NEW DISTRIBUTION AS SHOWN ON THE NEW WORK PLANS.
5. THE APPROXIMATE LOCATION OF THE EXISTING TRANSFORMER TO BE DISCONNECTED AND SECURED FOR RELOCATION TO THE PLATFORM IN THE NEW WORK PHASE.
6. THE APPROXIMATE LOCATION OF THE EXISTING 12"x12" PVC JUNCTION BOX TO REMAIN. THE ELECTRICAL CONTRACTOR IS TO DISCONNECT AND REMOVE THE CONDUIT AND WIRING FROM THIS JUNCTION BOX TO PANELS "2P" AND "SL-1". SECURE EXISTING CONDUIT AND WIRING ROUTED FROM THE JUNCTION BOX TO THE NORTH AND SOUTH AREA LIGHTING FOR CONNECTION TO NEW CIRCUITS IN THE NEW WORK PHASE.
7. THE ELECTRICAL CONTRACTOR IS TO INVESTIGATE ALL EXISTING CIRCUITS FED FROM PANEL "SL-1". THE CONDUIT AND WIRING TO EXISTING ELECTRICAL LOADS TO REMAIN ARE TO BE SECURED AND PROTECTED TO ALLOW FOR CONNECTION TO NEW ELECTRICAL EQUIPMENT IN THE NEW WORK PHASE.
8. THE ELECTRICAL CONTRACTOR IS TO DEMOLISH THE EXISTING FENCE AND SLAB COMPLETELY.



N

1 EXISTING ELECTRICAL SUBSTATION POWER PLAN

4' 0' 4' 8'

SCALE: 1/4"=1'-0"

ELECTRICAL EQUIPMENT

TO BE SUPPLIED BY THE ELECTRICAL CONTRACTOR:

NEMA 3R AUTOMATIC TRANSFER SWITCH (SERVICE ENTRANCE RATED):
(ASCO H-07ATS-0-3-1200-N-50-F OR APPROVED EQUAL)

NEMA 3R MEDIUM VOLTAGE SWITCH CABINET:
(SQUARE D: TYPE HVLcc 600A MAIN BUS 5kV MAX. METAL ENCLOSED SWITCHGEAR OR APPROVED EQUAL)

NEMA 3R UTILITY TRANSFORMER:
(GE: TYPE ONAN LIQUID-FILLED THREE PHASE PAD-MOUNTED TRANSFORMER 750kVA 4160-480Y/277V OR APPROVED EQUAL)

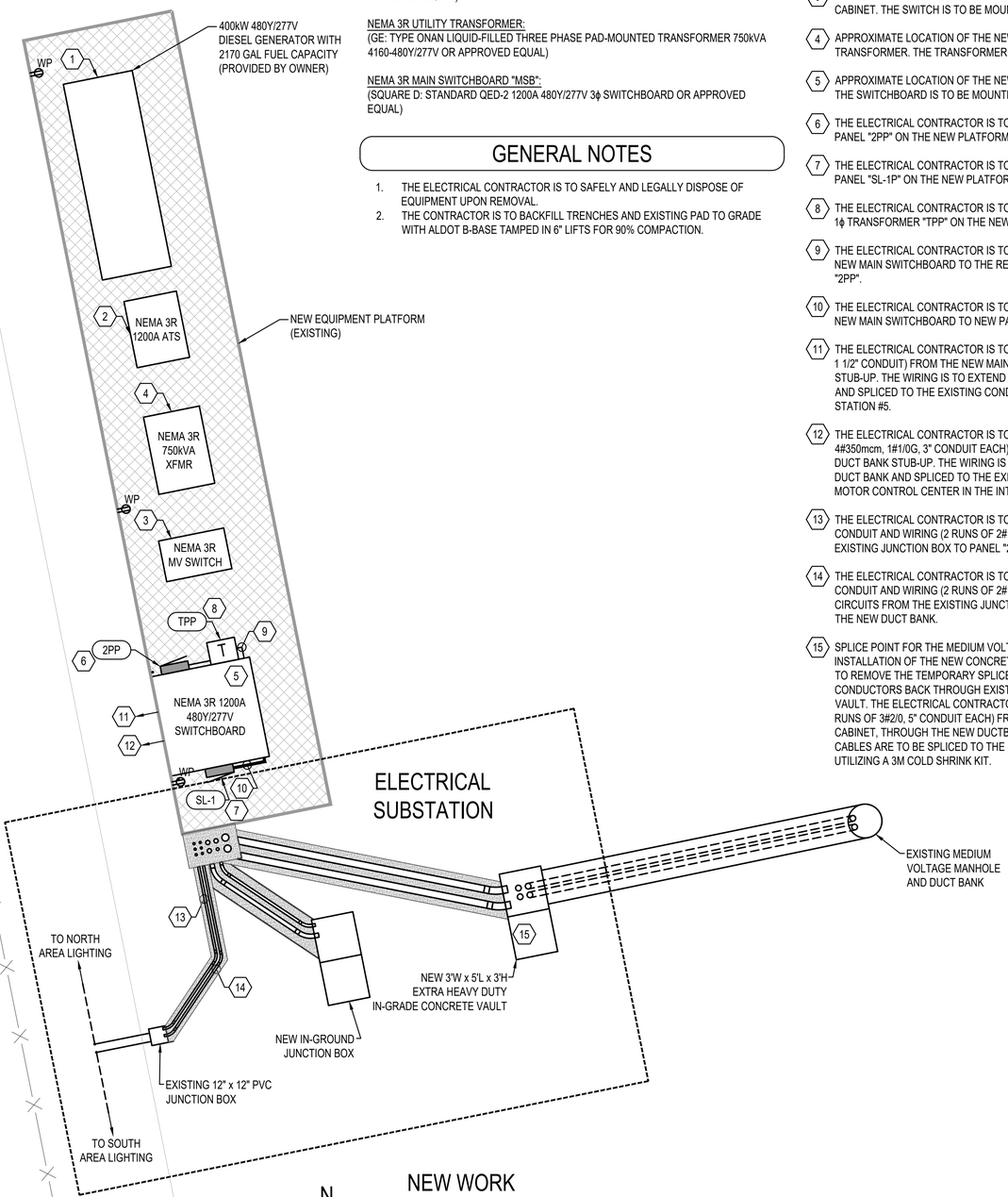
NEMA 3R MAIN SWITCHBOARD "MSB":
(SQUARE D: STANDARD QED-2 1200A 480Y/277V 3ϕ SWITCHBOARD OR APPROVED EQUAL)

GENERAL NOTES

1. THE ELECTRICAL CONTRACTOR IS TO SAFELY AND LEGALLY DISPOSE OF EQUIPMENT UPON REMOVAL.
2. THE CONTRACTOR IS TO BACKFILL TRENCHES AND EXISTING PAD TO GRADE WITH ALDOT B-BASE TAMPED IN 6" LIFTS FOR 90% COMPACTION.

NEW WORK SHEET NOTES

1. APPROXIMATE LOCATION OF THE OWNER-PROVIDED DIESEL GENERATOR. THE GENERATOR IS TO BE MOUNTED ON THE NEW PLATFORM.
2. APPROXIMATE LOCATION OF THE NEW NEMA 3R 1200A 480Y/277V 3ϕ SERVICE ENTRANCE RATED AUTOMATIC TRANSFER SWITCH. THE AUTOMATIC TRANSFER SWITCH IS TO BE MOUNTED ON THE NEW PLATFORM.
3. APPROXIMATE LOCATION OF THE NEW NEMA 3R 600A MEDIUM VOLTAGE SWITCH CABINET. THE SWITCH IS TO BE MOUNTED ON THE NEW PLATFORM.
4. APPROXIMATE LOCATION OF THE NEW NEMA 3R 750kVA 4160-480Y/277V UTILITY TRANSFORMER. THE TRANSFORMER IS TO BE MOUNTED ON THE NEW PLATFORM.
5. APPROXIMATE LOCATION OF THE NEW NEMA 3R 1200A 480Y/277V 3ϕ SWITCHBOARD. THE SWITCHBOARD IS TO BE MOUNTED ON THE NEW PLATFORM.
6. THE ELECTRICAL CONTRACTOR IS TO INSTALL A NEW NEMA 3R 60A 120/240V 1ϕ PANEL "2PP" ON THE NEW PLATFORM.
7. THE ELECTRICAL CONTRACTOR IS TO INSTALL A NEW NEMA 3R 100A 480Y/277V 3ϕ PANEL "SL-1P" ON THE NEW PLATFORM.
8. THE ELECTRICAL CONTRACTOR IS TO MOUNT THE RELOCATED 15kVA 480-120/240V 1ϕ TRANSFORMER "TPP" ON THE NEW PLATFORM.
9. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING FROM THE NEW MAIN SWITCHBOARD TO THE RELOCATED TRANSFORMER SERVING PANEL "2PP".
10. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING FROM THE NEW MAIN SWITCHBOARD TO NEW PANEL "SL-1P".
11. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (4#2, 1#6G, 1 1/2" CONDUIT) FROM THE NEW MAIN SWITCHBOARD TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS FEEDING THE EXISTING SEWAGE LIFT STATION #5.
12. THE ELECTRICAL CONTRACTOR IS TO ROUTE CONDUIT AND WIRING (3 RUNS OF 4#350mcm, 1#1/0G, 3" CONDUIT EACH) FROM THE MAIN SWITCHBOARD TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS FEEDING THE EXISTING MOTOR CONTROL CENTER IN THE INTERNATIONAL TRADE CENTER.
13. THE ELECTRICAL CONTRACTOR IS TO EXTEND, MODIFY, AND/OR RE-ROUTE CONDUIT AND WIRING (2 RUNS OF 2#10, 1#10G, 1 1/2" CONDUIT EACH) FROM THE EXISTING JUNCTION BOX TO PANEL "2PP" ROUTED THROUGH THE NEW DUCT BANK.
14. THE ELECTRICAL CONTRACTOR IS TO EXTEND, MODIFY, AND/OR RE-ROUTE CONDUIT AND WIRING (2 RUNS OF 2#10, 1#10G, 1 1/2" CONDUIT EACH) FOR LIGHTING CIRCUITS FROM THE EXISTING JUNCTION BOX TO PANEL "SL-1P" ROUTED THROUGH THE NEW DUCT BANK.
15. SPLICE POINT FOR THE MEDIUM VOLTAGE CABLING. UPON COMPLETION OF THE INSTALLATION OF THE NEW CONCRETE VAULT, THE ELECTRICAL CONTRACTOR IS TO REMOVE THE TEMPORARY SPLICES IN THE ELECTRICAL MANHOLE AND PULL CONDUCTORS BACK THROUGH EXISTING CONDUITS TO THE NEW ELECTRICAL VAULT. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2 RUNS OF 3#2/0, 5" CONDUIT EACH) FROM THE NEW MEDIUM VOLTAGE SWITCH CABINET, THROUGH THE NEW DUCTBANK TO THE IN-GRADE CONCRETE VAULT. THE CABLES ARE TO BE SPLICED TO THE EXISTING CONDUCTORS FROM THE MANHOLE UTILIZING A 3M COLD SHRINK KIT.



N

2 NEW WORK ELECTRICAL SUBSTATION POWER PLAN

4' 0' 4' 8'

SCALE: 1/4"=1'-0"

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DELL CONSULTING PROJECT: 23-007

ALABAMA LICENSED No. 25105 PROFESSIONAL 2-27-2024 ENGINEER ANDREW W. MAURIN

NUMBER REVISION	REVISION DESCRIPTION

INTERNATIONAL TRADE CENTER GENERATOR REPLACEMENT

MOBILE ALABAMA

DESIGNED BY: TMM

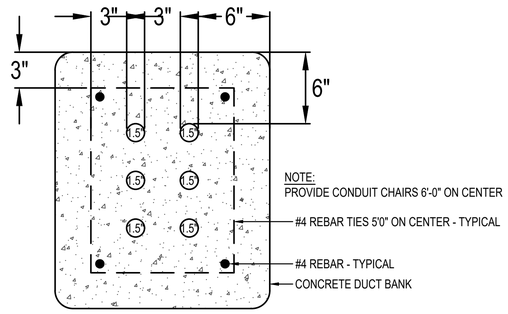
DRAWN BY: TMM

CHECKED BY: AWM

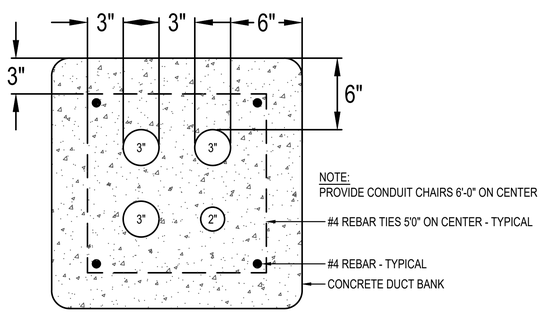
DATE: 01-18-2023

SHEET TITLE: ELECTRICAL EXISTING SUBSTATION POWER PLAN

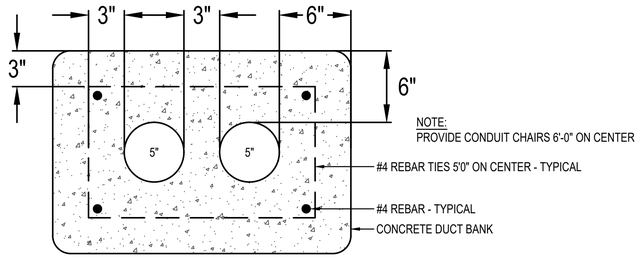
SHEET: E3.1



A LIGHTING DUCT BANK DETAIL
NOT TO SCALE



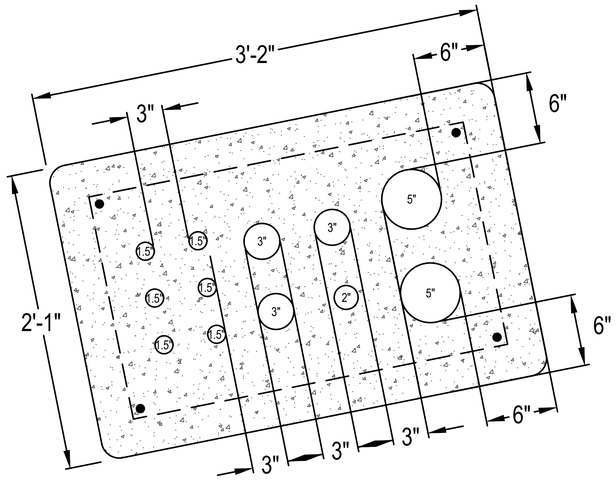
B ITC/LIFT STATION DUCT BANK DETAIL
NOT TO SCALE



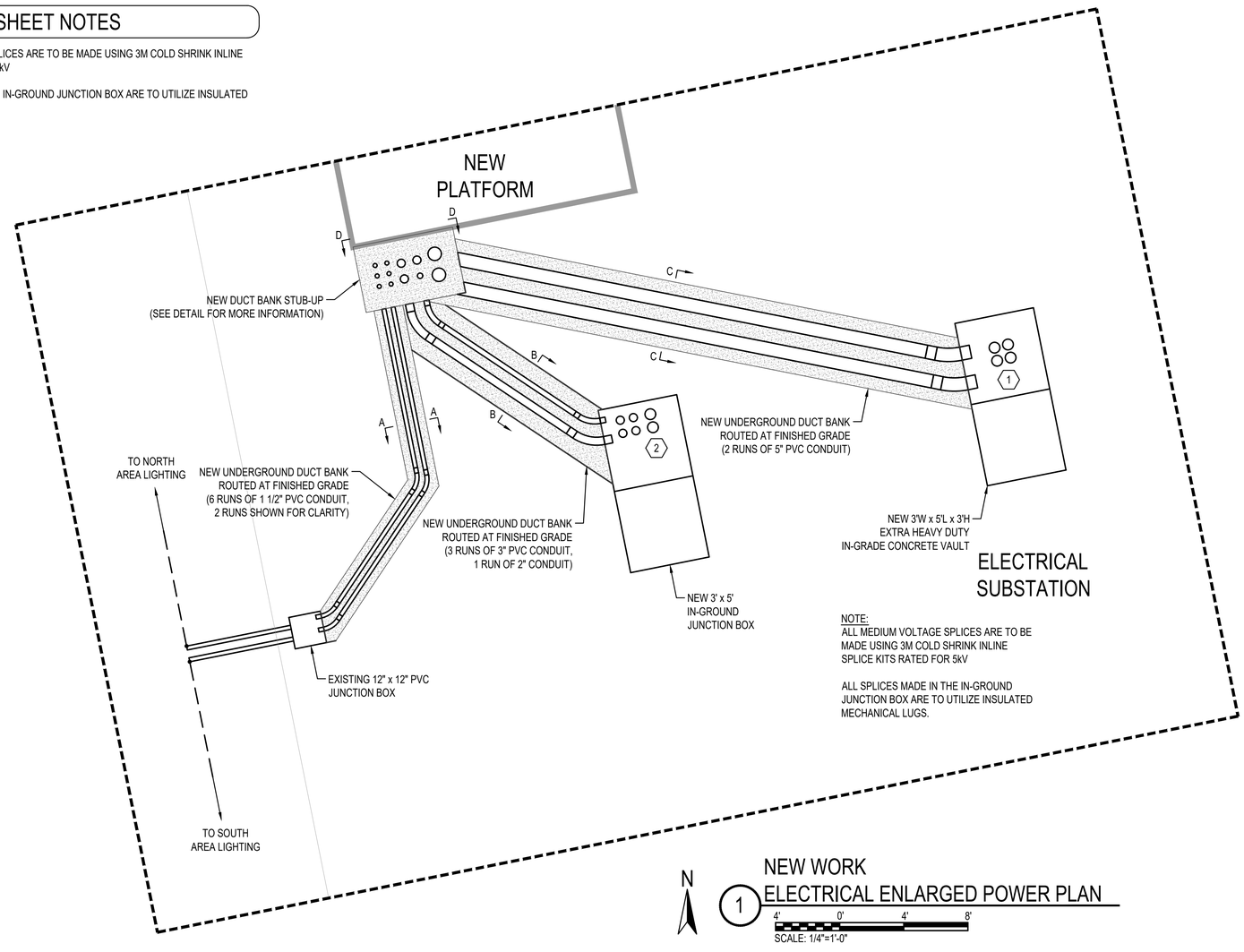
C MEDIUM VOLTAGE DUCT BANK DETAIL
NOT TO SCALE

SHEET NOTES

1. ALL MEDIUM VOLTAGE SPLICES ARE TO BE MADE USING 3M COLD SHRINK INLINE SPLICE KITS RATED FOR 5kV
2. ALL SPLICES MADE IN THE IN-GROUND JUNCTION BOX ARE TO UTILIZE INSULATED MECHANICAL LUGS.



D DUCT BANK STUB UP DETAIL
NOT TO SCALE



1 NEW WORK
ELECTRICAL ENLARGED POWER PLAN
SCALE: 1/4"=1'-0"

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DELL CONSULTING PROJECT: 23-007

ALABAMA LICENSED No. 25105 PROFESSIONAL ENGINEER ANDREW W. MAURIN
2-27-2024

NUMBER	REVISION DESCRIPTION

INTERNATIONAL TRADE CENTER GENERATOR REPLACEMENT
MOBILE ALABAMA

DESIGNED BY: TMM
DRAWN BY: TMM
CHECKED BY: AWM
DATE: 01-18-2023

SHEET TITLE: ELECTRICAL ENLARGED POWER PLAN

SHEET: E3.2

GENERAL NOTES

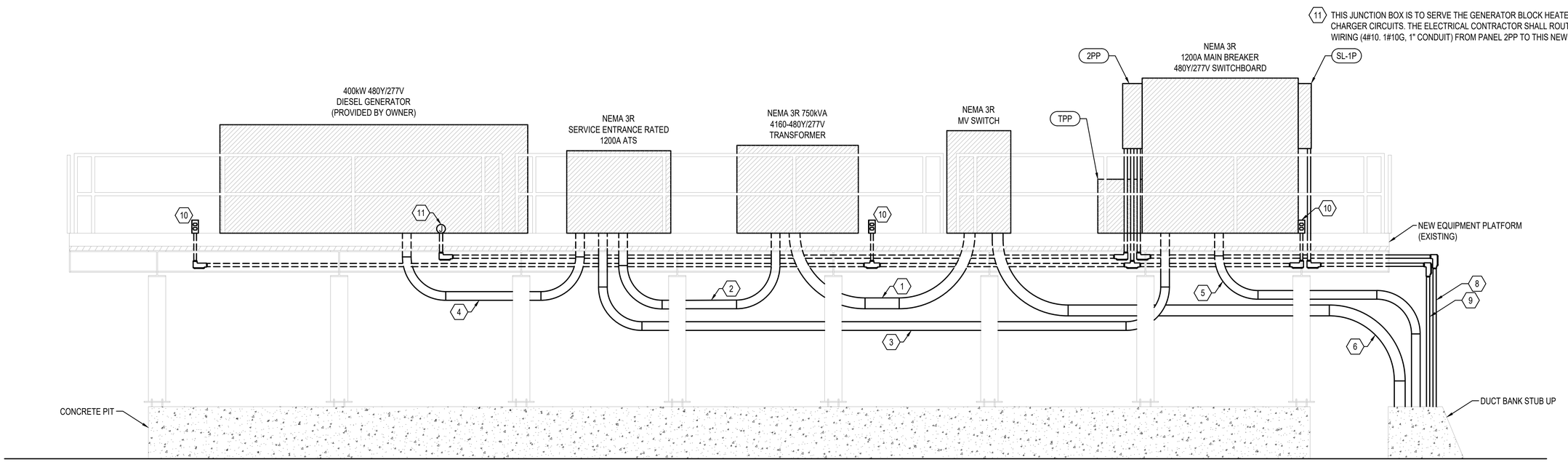
1. ALL CONDUIT AND CONDUIT FITTINGS ABOVE GROUND ARE TO BE PVC COATED AS INDICATED IN THE CABLE AND CONDUIT LEGEND.
2. ALL CONDUIT PENETRATIONS TO EQUIPMENT ON THE NEW PLATFORM ARE TO BE EQUIPPED WITH BONDING BUSHINGS.
3. ALL ELECTRICAL EQUIPMENT INSTALLED ON THE PLATFORM IS TO BE BONDED TO THE EXISTING PLATFORM GROUNDING ELECTRODE SYSTEM WITH #3/0 STRANDED BARE TINNED COPPER CONDUCTORS. CADWELD TO FRAME.

CABLE AND CONDUIT LEGEND

MV-105 CABLING:	#2/0 AWG PVC JACKET SHIELDED 133% INSULATION POWER CABLE 5kV (OKONITE OR APPROVED EQUAL)
CONDUIT:	PLASTIBOND X" PVC-COATED GALVANIZED RIGID CONDUIT (CATALOG#: PRHCONDUIT-X)
90° ELBOWS:	PLASTIBOND X" PVC-COATED GALVANIZED RIGID CONDUIT FITTINGS (CATALOG#: PRHELB-Xx90)
COUPLINGS	PLASTIBOND X" PVC-COATED GALVANIZED RIGID CONDUIT FITTINGS (CATALOG#: PRCPLG-X)
LB	PLASTIBOND 1" PVC-COATED GALVANIZED RIGID CONDUIT FITTINGS (CATALOG#: PRLB37)

SHEET NOTES

1. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (4 RUNS OF 3#2/0 MV-105, 5" CONDUIT EACH) FROM THE NEW MAIN SWITCH TO THE NEW UTILITY TRANSFORMER.
2. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (4 RUNS OF 4#350kcmil, 1#3/0G, 4" CONDUIT EACH) FROM THE NEW UTILITY TRANSFORMER TO THE NEW AUTOMATIC TRANSFER SWITCH.
3. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (4 RUNS OF 4#350kcmil, 1#3/0G, 4" CONDUIT EACH) FROM THE NEW MAIN SWITCHGEAR TO THE NEW AUTOMATIC TRANSFER SWITCH.
4. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2 RUNS OF 4#350kcmil, 1#3/0G, 4" CONDUIT EACH) FROM THE OWNER-PROVIDED DIESEL GENERATOR TO THE NEW AUTOMATIC TRANSFER SWITCH.
5. THE ELECTRICAL CONTRACTOR IS TO ROUTE CONDUIT AND WIRING (3 RUNS OF 4#350mcm, 1#1/0G, 3" CONDUIT EACH) FROM THE MAIN SWITCHBOARD TO THE DUCT BANK STUB UP. THE WIRING WILL EXTEND THROUGH THE NEW DUCT BANK TO INTERCEPT THE EXISTING CONDUIT AND WIRING TO THE MAIN MOTOR CONTROL CENTER IN THE INTERNATIONAL TRADE CENTER.
6. THE ELECTRICAL CONTRACTOR IS TO ROUTE CONDUIT AND WIRING (2 RUNS OF 3#2/0, 5" CONDUIT EACH) FROM THE DUCT BANK STUB UP TO THE NEW MAIN SWITCH.
7. THE ELECTRICAL CONTRACTOR IS TO CONNECT GROUNDING ROD ELECTRODE CONDUCTOR TO GENERATOR GROUND LUG. BOND NEUTRAL TO GROUND.
8. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2 RUNS OF 2#10, 1#10G, 1" CONDUIT EACH) FROM PANEL SL-1P TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS IN THE EXISTING 12" x 12" PVC JUNCTION BOX FEEDING THE NORTH AREA AND SOUTH AREA LIGHTING (ONLY ONE CONDUIT SHOWN FOR CLARITY).
9. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2 RUNS OF 2#10, 1#10G, 1" CONDUIT EACH) FROM PANEL 2PP TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS IN THE EXISTING 12" x 12" PVC JUNCTION BOX FEEDING THE NORTH AREA AND SOUTH AREA CAMERAS (ONLY ONE CONDUIT SHOWN FOR CLARITY).
10. THE APPROXIMATE LOCATION OF A NEW WEATHERPROOF MAINTENANCE RECEPTACLE. THE ELECTRICAL CONTRACTOR IS TO ROUTE CONDUIT AND WIRING (2#12, 1#12G, 1" CONDUIT) FROM THE NEW NEMA 3R PANEL 2PP TO THE NEW RECEPTACLE MOUNTED ON THE NEW PLATFORM.
11. THIS JUNCTION BOX IS TO SERVE THE GENERATOR BLOCK HEATER AND BATTERY CHARGER CIRCUITS. THE ELECTRICAL CONTRACTOR SHALL ROUTE CONDUIT AND WIRING (4#10. 1#10G, 1" CONDUIT) FROM PANEL 2PP TO THIS NEW JUNCTION BOX.



1 NEW WORK PLATFORM SERVICE ELEVATION
NOT TO SCALE

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DELL CONSULTING PROJECT: 23-007

ALABAMA LICENSED PROFESSIONAL ENGINEER
ANDREW W. MAURIN
No. 25105
2-27-2024

NUMBER REVISION	REVISION DESCRIPTION

INTERNATIONAL TRADE CENTER GENERATOR REPLACEMENT
MOBILE ALABAMA

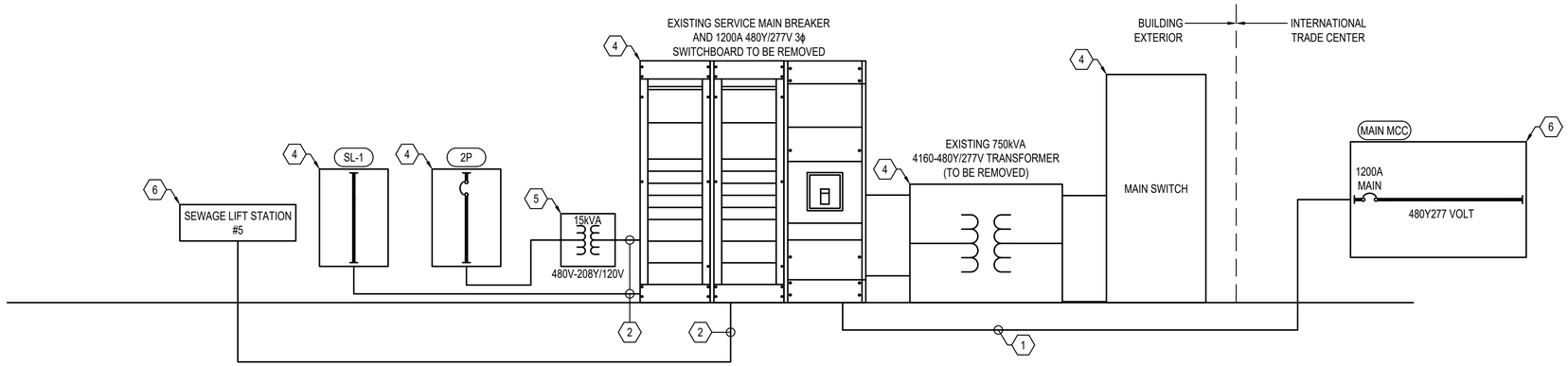
DESIGNED BY: TMM
DRAWN BY: TMM
CHECKED BY: AWM
DATE: 01-18-2023

SHEET TITLE: ELECTRICAL PLATFORM ELEVATION

SHEET: E3.3

EXISTING SINGLE LINE DIAGRAM NOTES

1. THE CONDUIT AND WIRING FROM THE EXISTING MAIN SWITCHBOARD TO THE MAIN MOTOR CONTROL CENTER LOCATED INSIDE THE INTERNATIONAL TRADE CENTER IS EXISTING TO REMAIN. THE ELECTRICAL CONTRACTOR IS TO DE-ENERGIZE AND DISCONNECT THE MAIN MCC. SECURE WIRING AND CONDUIT FOR MODIFICATION AND/OR EXTENSION IN THE NEW WORK PHASE.
2. THE ELECTRICAL CONTRACTOR IS TO DE-ENERGIZE AND DISCONNECT CONDUIT AND WIRING FOR BRANCH CIRCUITS FROM THE EXISTING MAIN SWITCHBOARD. THIS BRANCH CIRCUIT CONDUIT AND WIRING IS TO BE SECURED FOR CONNECTION TO NEW EQUIPMENT IN THE NEW WORK PHASE.
3. THIS EQUIPMENT IS EXISTING TO BE DISCONNECTED AND COMPLETELY REMOVED.
4. THIS ELECTRICAL EQUIPMENT IS TO BE DISCONNECTED, REMOVED, AND REPLACED NEW IN THE NEW WORK PHASE.
5. THIS TRANSFORMER IS TO BE DISCONNECTED AND SECURED FOR RELOCATION AND CONNECTION TO NEW EQUIPMENT IN THE NEW WORK PHASE.
6. THIS EQUIPMENT IS EXISTING TO REMAIN.



EXISTING SINGLE LINE DIAGRAM

1 NOT TO SCALE

EXISTING 4" CONDUITS AND WIRING ROUTED FROM THE EXISTING ELECTRICAL MANHOLE TO THE EXISTING MAIN MEDIUM VOLTAGE SWITCH. THE ELECTRICAL CONTRACTOR IS TO DISCONNECT ALL CONDUCTORS FROM THE EXISTING SWITCH. THESE CONDUCTORS ARE TO BE PULLED BACK TO THE EXISTING ELECTRICAL MANHOLE AND SPLICED TO ALLOW MEDIUM VOLTAGE LOOP TO REMAIN OPERATIONAL.

NOTE:
THE ELECTRICAL CONTRACTOR IS TO DISCONNECT AND REMOVE THIS SWITCH AND EXCAVATE THE AREA AROUND THESE CONDUITS TO ALLOW FOR THE INSTALLATION OF A NEW 3' W x 5' L x 2'-6"' D ELECTRICAL VAULT IN THE NEW WORK PHASE.

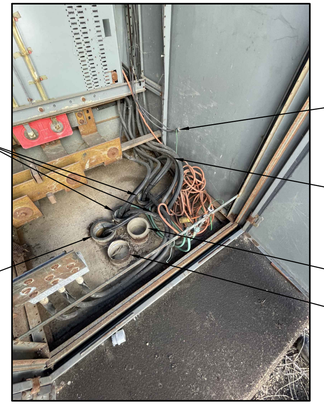
EXISTING SPARE 4" CONDUITS ROUTED FROM THE EXISTING ELECTRICAL MANHOLE TO THE EXISTING MAIN MEDIUM VOLTAGE SWITCH TO REMAIN

EXISTING CONDUIT PENETRATIONS MAIN MEDIUM VOLTAGE SWITCH

2 NOT TO SCALE

EXISTING 4" CONDUITS AND WIRING (3 RUNS OF 3#350mcm, 1#1/0G, 3" CONDUIT EACH) ROUTED FROM THE EXISTING MAIN SWITCHBOARD TO THE INTERNATIONAL TRADE CENTER MAIN MCC. THE CONDUCTORS ARE TO BE DISCONNECTED FROM THE MAIN SWITCHBOARD AND SECURED FOR CONNECTION TO NEW EQUIPMENT IN THE NEW WORK PHASE.

EXISTING 4" CONDUIT AND WIRING ROUTED FROM THE EXISTING MAIN SWITCHBOARD TO THE SEWAGE LIFT STATION #5. THE CONDUCTORS ARE TO BE DISCONNECTED FROM THE MAIN SWITCHBOARD AND SECURED FOR CONNECTION TO NEW EQUIPMENT IN THE NEW WORK PHASE.



NOTE:
THE ELECTRICAL CONTRACTOR IS TO DISCONNECT AND REMOVE THIS SWITCH AND EXCAVATE THE AREA AROUND THESE CONDUITS TO ALLOW FOR THE INSTALLATION OF A NEW 3' W x 5' L x 3' D QUAZITE JUNCTION BOX IN THE NEW WORK PHASE.

EXISTING 3/4" CONDUIT PENETRATION SERVING PANEL SL-1. THE CONDUIT AND WIRING IS TO BE DISCONNECTED AND REMOVED FROM THE MAIN SWITCHBOARD. THIS PANEL IS TO BE REPLACED NEW AND FED FROM NEW ELECTRICAL EQUIPMENT IN THE NEW WORK PHASE.

EXISTING 3/4" CONDUIT PENETRATION TO THE TRANSFORMER SERVING PANEL 2P. THE CONDUIT AND WIRING IS TO BE DISCONNECTED AND REMOVED FROM THE MAIN SWITCHBOARD. THIS PANEL IS TO BE REPLACED NEW AND FED FROM NEW ELECTRICAL EQUIPMENT IN THE NEW WORK PHASE.

EXISTING SPARE 3" CONDUIT. THIS CONDUIT IS TO BE CAPPED FOR FUTURE USE.

EXISTING SPARE 4" CONDUIT. THIS CONDUIT IS TO BE CAPPED FOR FUTURE USE.

EXISTING CONDUIT PENETRATIONS MAIN LOW VOLTAGE SWITCHBOARD

3 NOT TO SCALE

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ALABAMA LICENSED NO. 25105 PROFESSIONAL ENGINEER ANDREW W. MAURIN
2-27-2024

NUMBER	REVISION DESCRIPTION
REVISION	

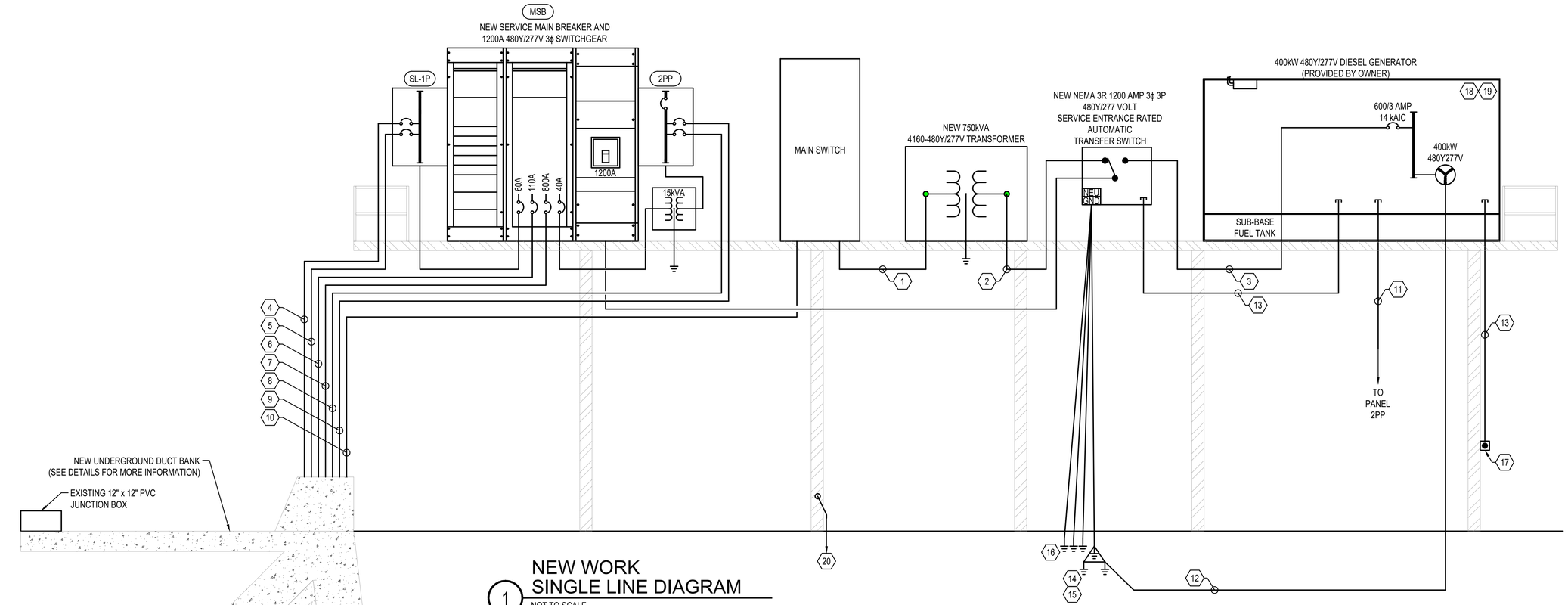
INTERNATIONAL TRADE CENTER GENERATOR REPLACEMENT

MOBILE ALABAMA

DESIGNED BY: TMM
DRAWN BY: TMM
CHECKED BY: AWM
DATE: 01-18-2023

SHEET TITLE: ELECTRICAL EXISTING RISER DIAGRAM

SHEET: E4.1



1 NEW WORK SINGLE LINE DIAGRAM

NOT TO SCALE

NEW WORK SINGLE LINE DIAGRAM NOTES

1. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (3#2/0, 5" CONDUIT) FROM THE NEW MAIN SWITCH TO THE NEW UTILITY TRANSFORMER.
2. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (4 RUNS OF 4#350kcmil, 1#3/0G, 4" CONDUIT EACH) FROM THE NEW UTILITY TRANSFORMER TO THE NEW AUTOMATIC TRANSFER SWITCH.
3. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2 RUNS OF 4#350kcmil, 1#3/0G, 4" CONDUIT EACH) FROM THE OWNER-PROVIDED DIESEL GENERATOR TO THE NEW AUTOMATIC TRANSFER SWITCH.
4. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2#10, 1#10G, 1" CONDUIT) FROM PANEL SL-1P TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS IN THE EXISTING 12" x 12" PVC JUNCTION BOX FEEDING THE NORTH AREA LIGHTING.
5. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2#10, 1#10G, 1" CONDUIT) FROM PANEL SL-1P TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS IN THE EXISTING 12" x 12" PVC JUNCTION BOX FEEDING THE SOUTH AREA LIGHTING.
6. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (4#2, 1#6G, 1 1/2" CONDUIT) FROM THE NEW MAIN SWITCHBOARD TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS FEEDING THE EXISTING SEWAGE LIFT STATION #5.
7. THE ELECTRICAL CONTRACTOR IS TO ROUTE CONDUIT AND WIRING (3 RUNS OF 4#350mcm, 1#1/0G, 3" CONDUIT EACH) FROM THE MAIN SWITCHBOARD TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS FEEDING THE EXISTING MOTOR CONTROL CENTER IN THE INTERNATIONAL TRADE CENTER.
8. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2#10, 1#10G, 1" CONDUIT) FROM PANEL 2PP TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS IN THE EXISTING 12" x 12" PVC JUNCTION BOX FEEDING THE NORTH AREA SECURITY CAMERAS.
9. THE ELECTRICAL CONTRACTOR IS TO ROUTE NEW CONDUIT AND WIRING (2#10, 1#10G, 1" CONDUIT) FROM PANEL 2PP TO THE NEW DUCT BANK STUB-UP. THE WIRING IS TO EXTEND THROUGH THE UNDERGROUND DUCT BANK AND SPLICED TO THE EXISTING CONDUCTORS IN THE EXISTING 12" x 12" PVC JUNCTION BOX FEEDING THE SOUTH AREA SECURITY CAMERAS.
10. THE ELECTRICAL CONTRACTOR IS TO ROUTE CONDUIT AND WIRING (2 RUNS OF 3#2/0, 5" CONDUIT EACH) FROM THE DUCT BANK STUB UP TO THE NEW MAIN SWITCH.
11. THE ELECTRICAL CONTRACTOR SHALL ROUTE 1" CONDUIT FROM PANEL 2P FOR GENERATOR BLOCK HEATER AND BATTERY CHARGER CIRCUITS. 4#10. 1#10G, 1" CONDUIT. UNDERGROUND CONDUIT IS TO BE SCHEDULE 40 PVC. EXTERIOR CONDUIT IS TO BE GALVANIZED RIGID CONDUIT.
12. THE ELECTRICAL CONTRACTOR IS TO CONNECT GROUNDING ROD ELECTRODE CONDUCTOR TO GENERATOR GROUND LUG. BOND NEUTRAL TO GROUND.
13. THE ELECTRICAL CONTRACTOR IS TO INSTALL 1" CONDUIT AND WIRING AS SPECIFIED BY THE MANUFACTURER.
14. PROVIDE THREE 20' GROUND RODS IN TRIANGLE ARRANGEMENT ON 20' CENTERS FOR MADE ELECTRODE SYSTEM. MEASURE RESISTANCE AND ENSURE <25 OHMS.
15. THE ELECTRICAL CONTRACTOR SHALL BOND NEW COPPER CLAD GROUND RODS WITH #3/0 TINNED STRANDED BARE COPPER CONDUCTOR.
16. CONNECT #3/0 TINNED STRANDED BARE COPPER CONDUCTOR TO THE BUILDING GROUND ELECTRODE SYSTEM, BUILDING STEEL, GROUND RODS, WATER PIPE.
17. MAINTAINED OPERATOR PUSHBUTTON STATION. RED BUTTON IN STEEL NEMA 3R LOCKABLE BOX. LABEL WITH A RED MYCARTA PLACARD WITH 1" WHITE LETTERING: "GENERATOR EMERGENCY STOP"
18. THE SUB-BASE FUEL TANK MUST HAVE ATMOSPHERIC PIPING A MINIMUM OF 10 FEET ABOVE THE TANK AND BE EQUIPPED WITH SPILL CONTAINMENT BUCKET.
19. THE ELECTRICAL CONTRACTOR SHALL ASSIGN A 2A10BC FIRE EXTINGUISHER WITHIN 10 FEET (BOTH ACCESSIBLE AND VISIBLE) FROM THE GENERATOR AND AUTOMATIC TRANSFER SWITCH.
20. BOND NEW PLATFORM TO THE GROUNDING ELECTRODE SYSTEM.

GENERAL NOTES

1. ALL CONDUIT AND CONDUIT FITTINGS ABOVE GROUND ARE TO BE PVC COATED AS INDICATED IN THE CABLE AND CONDUIT LEGEND.
2. ALL CONDUIT PENETRATIONS TO EQUIPMENT ON THE NEW PLATFORM ARE TO BE EQUIPPED WITH BONDING BUSHINGS.
3. ALL ELECTRICAL EQUIPMENT INSTALLED ON THE PLATFORM IS TO BE BONDED TO THE PLATFORM GROUNDING ELECTRODE SYSTEM WITH #3/0 STRANDED BARE TINNED COPPER CONDUCTORS. CADWELD TO FRAME.

CABLE AND CONDUIT LEGEND

MV-105 CABLING:	#2/0 AWG PVC JACKET SHIELDED 133% INSULATION POWER CABLE 5kV (OKONITE OR APPROVED EQUAL)
CONDUIT:	PLASTIBOND X" PVC-COATED GALVANIZED RIGID CONDUIT (CATALOG#: PRHCONDUIT-X)
90° ELBOWS:	PLASTIBOND X" PVC-COATED GALVANIZED RIGID CONDUIT FITTINGS (CATALOG#: PRHELB-Xx90)
COUPLINGS	PLASTIBOND X" PVC-COATED GALVANIZED RIGID CONDUIT FITTINGS (CATALOG#: PRCPLG-X)
LB	PLASTIBOND 1" PVC-COATED GALVANIZED RIGID CONDUIT FITTINGS (CATALOG#: PRLB37)

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DELL CONSULTING PROJECT: 23-007

ALABAMA LICENSED No. 25105 PROFESSIONAL ENGINEER ANDREW W. MAURIN 2-27-2024

NUMBER	REVISION DESCRIPTION
REVISION	

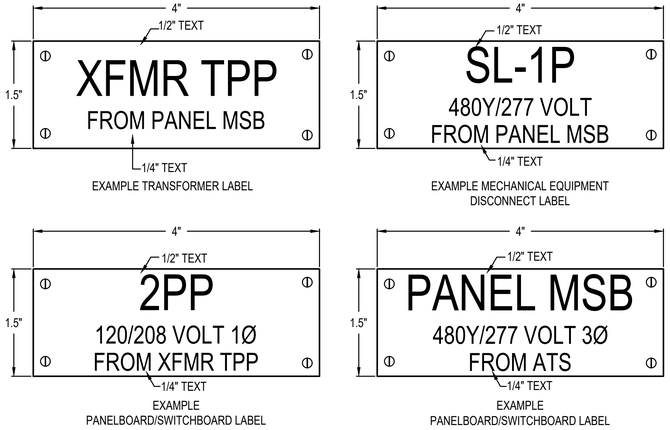
INTERNATIONAL TRADE CENTER GENERATOR REPLACEMENT

MOBILE ALABAMA

DESIGNED BY: TMM
DRAWN BY: TMM
CHECKED BY: AWM
DATE: 05-19-2023

SHEET TITLE: ELECTRICAL NEW WORK RISER DIAGRAM

SHEET: E5.1



ENGRAVED PLASTIC TAG WITH BLACK LETTERS ON WHITE BACKGROUND (RED BACKGROUND FOR EMERGENCY EQUIPMENT). TAG SHALL HAVE ALL EDGES BEVELED AND SMOOTH. SECURE TAG WITH 4 CHROME (STAINLESS STEEL FOR WET OR DAMP LOCATIONS) SCREWS. ADHESIVE BACKING, TAPE, ETC IS NOT ALLOWED. DIMENSIONS ARE MINIMUM, TAG SHALL BE LARGER AS REQUIRED TO FIT APPROPRIATE TEXT.

1 TYPICAL EQUIPMENT LABELING DETAIL

NOT TO SCALE

EMERGENCY
STOP FOR
GENERATOR

ENGRAVED PLASTIC TAG WITH 1" HIGH WHITE LETTERS ON RED BACKGROUND. TAG SHALL HAVE ALL EDGES BEVELED AND SMOOTH. SECURE TAG WITH 2 CHROME (STAINLESS STEEL FOR WET OR DAMP LOCATIONS) SCREWS, ADHESIVE BACKING, TAPE, ETC IS NOT ALLOWED. TAG SHALL BE SIZED AS REQUIRED TO FIT APPROPRIATE TEXT.

2 GENERATOR E-STOP LABEL DETAIL

NOT TO SCALE

PANELBOARD INFORMATION SCHEDULE

MARK	ENCLOSURE TYPE	MOUNTING STYLE	VOLTAGE	Ø	WIRE	MAIN BKR	IF MLO, SERVING BKR	SERVICE RATED	kAIC RATING	Ø BUS RATING (A)	N BUS RATING	FEEDER			NOTES
												CONDUCTORS	GROUND	CONDUIT	
MSB	NEMA 3R	FLOOR	480Y/277V	3	4	1200	N/A	NO	10	1200	100%	4 RUNS OF 4#350	#3/0	4"C EA	
MCC	NEMA 3R	FLOOR	480Y/277V	3	4	800	800	YES	10	800	100%	3 RUNS OF 4#350	NONE	3"C EA	1
SL-1P	NEMA 3R	SURFACE	480Y/277V	3	4	MLO	60	NO	10	60	100%	4#6	#8	1 1/4"C	
2PP	NEMA 3R	SURFACE	208Y/120	3	4	100	N/A	NO	10	100	100%	4#3	#6	1 1/2"C	
NOTES	ALL PANELBOARDS ARE TO BE EQUIPPED WITH ARC FLASH WARNING LABELS IN ACCORDANCE WITH NEC ARTICLE 110.16.														
	ALL PANELBOARDS ARE TO HAVE COPPER BUS.														
	1. THIS EQUIPMENT IS EXISTING. FEEDERS ARE TO BE INTERCEPTED AS DIRECTED ON THE PLAN DRAWINGS.														

TRANSFORMER SCHEDULE

MARK	PRIMARY VOLTAGE	SECONDARY VOLTAGE	Ø	WIRE	KVA	MNT	TYPE	PRIMARY FEEDER SIZE	SIZE GEC TO 3/4"X10' GND ROD	SIZE GEC TO FOUNDATION REBAR, WATER & BLDG STEEL
TPP*	480 DELTA	120-240	1	3	15	PLT	STD	3#10,#10G,3/4"C	#8	#8
TMSB	4160 DELTA	480Y/277	3	3	750	PLT	STD	3#2/0 MV-105, 5"C	#3/0	#3/0
MNT: PLT=PLATFORM MOUNTED										
TYPE: STD=STANDARD PER SPECIFICATIONS.										
*TRANSFORMER IS EXISTING TO BE RELOCATED										

PANELBOARD SCHEDULE

MARK: NEW PANEL 2PP

CKT #	LOAD DESCRIPTION	BREAKER P	BREAKER TRIP	PHASE (kVA) A	PHASE (kVA) B	PHASE (kVA) A	PHASE (kVA) B	BREAKER TRIP	BREAKER P	LOAD DESCRIPTION	CKT #
1	SOUTH SITE SECURITY CAMERAS	1	30					20	1	GENERATOR BLOCK HEATER	2
3	PLATFORM MAINT. REC.	1	20					20	1	GENERATOR BATTERY CHARGER	4
5	SPACE	1						30	1	NORTH SITE SECURITY CAMERAS	6
7	SPACE	1							1	SPACE	8
9	SPACE	1							1	SPACE	10
11	SPACE	1							1	SPACE	12
13	SPACE	1							1	SPACE	14
15	SPACE	1							1	SPACE	16

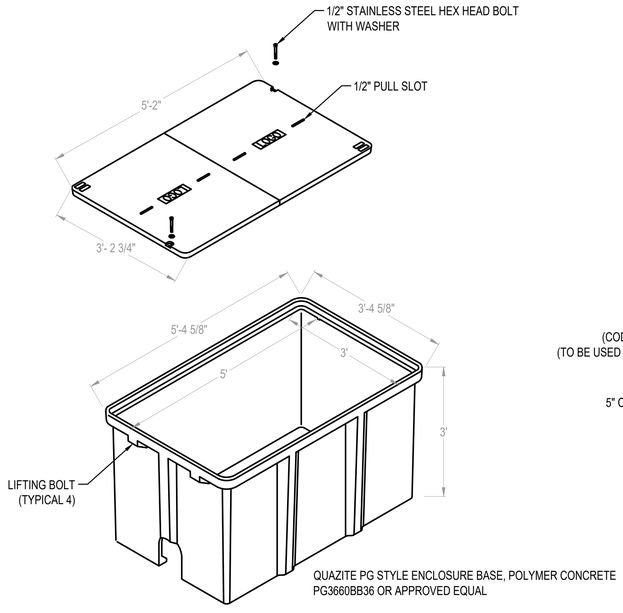
TOTAL (kVA) ØA _____ ØB _____ HIGH PHASE (AMPS) _____
TOTAL CONNECTED LOAD (kVA) _____ TOTAL LOAD (AMPS) _____
CREATE A DIRECTORY TO INDICATE LOAD TYPE (REC, LTG, AHU-1, ETC.) AND ROOM NUMBERS SERVED FOR EVERY BRANCH CIRCUIT.

PANELBOARD SCHEDULE

MARK: NEW PANEL SL-1P

CKT #	LOAD DESCRIPTION	BREAKER P	BREAKER TRIP	PHASE (kVA) A	PHASE (kVA) B	PHASE (kVA) C	PHASE (kVA) A	PHASE (kVA) B	PHASE (kVA) C	BREAKER TRIP	BREAKER P	LOAD DESCRIPTION	CKT #
1	SOUTH AREA LTG	2	20							20	2	NORTH AREA LTG	2
3													4
5	SPARE	2	20							20	2	SPARE	6
7													8
9	SPARE	1	20							20	1	SPARE	10
11	SPARE	1	20							20	1	SPARE	12
13	SPARE	1	20							20	1	SPARE	14
15	SPARE	1	20							20	1	SPARE	16
17	SPARE	1	20							20	1	SPARE	18
19	SPARE	1	20							20	1	SPARE	20
21	SPARE	1	20							20	1	SPARE	22
23	SPARE	1	20							20	1	SPARE	24
25	SPARE	1	20							20	1	SPARE	26
27	SPARE	1	20							20	1	SPARE	28
29	SPARE	1	20							20	1	SPARE	30

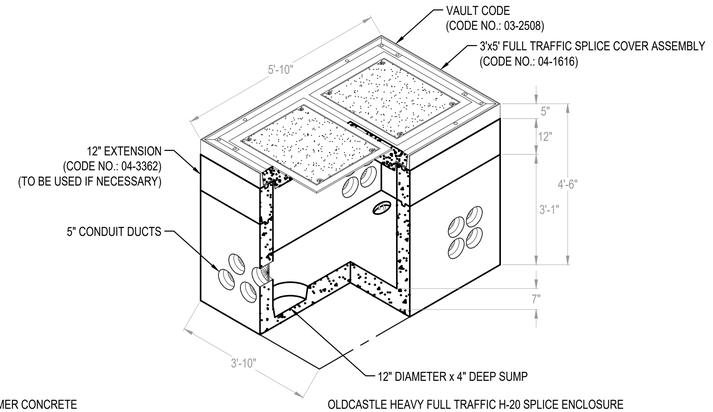
TOTAL (kVA) ØA _____ ØB _____ ØC _____ HIGH PHASE (AMPS) _____
TOTAL CONNECTED LOAD (kVA) _____ TOTAL LOAD (AMPS) _____
CREATE A DIRECTORY TO INDICATE INSTALLED LOADS. INDICATE LOAD TYPE (REC, LTG, AHU-1, ETC.) AND ROOM NUMBERS SERVED FOR EVERY BRANCH CIRCUIT.



QUAZITE PG STYLE ENCLOSURE BASE, POLYMER CONCRETE PG3660BB36 OR APPROVED EQUAL

3 NEW IN-GROUND JUNCTION BOX

NOT TO SCALE



OLDCASTLE HEAVY FULL TRAFFIC H-20 SPLICE ENCLOSURE 3'-0" x 5'-0" x 2'-6" (WEIGHT WITHOUT COVER: 6,000 LBS) (PG&E 352636HFT OR APPROVED EQUAL)

4 NEW IN-GROUND ELECTRICAL VAULT

NOT TO SCALE

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DELL CONSULTING PROJECT: 23-007

ALABAMA LICENSED No. 25105 PROFESSIONAL 2-27-2024 ENGINEER ANDREW W. MAURIN

NUMBER	REVISION	DESCRIPTION

INTERNATIONAL TRADE CENTER
GENERATOR REPLACEMENT
MOBILE ALABAMA

DESIGNED BY: TMM
DRAWN BY: TMM
CHECKED BY: AWM
DATE: 05-19-2023

SHEET TITLE: ELECTRICAL SCHEDULES & DETAILS

SHEET: E5.2

ALABAMA PORT AUTHORITY
PORT OF MOBILE

Specification Booklet

Project Name	**ITC Generator – Electrical Equipment**			
Location	**Mobile, AL**			
Project #	**11210**	**TASK#**	**4**	**March 2024**

Additional Specifications – attached herewith

260000 - GENERAL ELECTRICAL
260010 - CODES AND STANDARDS
260020 - WORK REQUIRED FOR EQUIPMENT FURNISHED BY OTHERS
260500 - ELECTRICAL RELATED WORK
260512 - ALTERATIONS AND ADDITIONS TO EXISTING WORK
260516 - SERVICE ENTRANCE METHODS AND MATERIALS – UNDERGROUND
260526 - GROUNDING AND BONDING
260530 - BASIC ELECTRICAL MATERIALS AND METHODS
260550 - EXCAVATION AND BACKFILL
260553 - ELECTRICAL IDENTIFICATION
261200 - TRANSFORMER-LIQUID FILLED-PAD MOUNTED
261510 - MANHOLES & PULLBOXES
261513 - MEDIUM VOLTAGE POWER CABLE AND ACCESSORIES-UNDERGROUND
262411- LOW VOLTAGE SWITCHBOARDS, INDIVIDUALLY MOUNTED DEVICES
262420 - PANELBOARDS
262726 - GENERAL WIRING DEVICES
263210 - DIESEL GENERATOR
263220 - TRANSFER SWITCHES

SECTION 260000 - GENERAL ELECTRICAL

PART 1 - GENERAL

1.1 The work covered by this division consists of providing all labor, equipment and materials and performing all operations necessary for the installation of the electrical work as herein called for and shown on the Drawings. The work shall include but shall not be limited to the following:

Provide all power, lighting, fire alarm, intercom, telephone, communications, and other electrical systems for the project. Fully coordinate all electrical requirements of equipment being furnished by other Divisions under this construction contract. Each system shall be complete and fully functional.

1.2 Related Documents:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

B. Provisions of this Section apply to work of all Division 26 Sections.

C. All control wiring for Division 23 shall be governed by Division 26 requirements. All control wiring shall be in conduit in compliance with the Specifications.

D. Review all project Drawings to be aware of conditions affecting work herein.

1.3 Definitions:

A. Provide: Furnish, install, and test, complete and ready for intended use.

B. Furnish: Supply and deliver to project site, ready for subsequent requirements.

C. Install: Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

1.4 Permits and Fees: Contractor shall obtain all necessary permits, meters, and inspections required for his work and pay all fees and charges incidental thereto.

1.5 Verification of Owner's Survey Data: Prior to commencing any excavation or grading the Contractor shall satisfy himself as to the accuracy of all survey data indicated on the Drawings and/or provided by the Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the survey data, he shall immediately notify the Engineer. Commencement by the Contractor of any excavation or upgrading shall be held as an acceptance of the survey data by

him after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said survey data.

1.6 Delivery and Storage of Materials: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. All material shall be stored to provide protection from the weather and accidental damage.

1.7 Extent of work is indicated in the Drawings, Schedules, and Specification. Singular references shall not be construed as requiring only one device if multiple devices are shown on the Drawings or are required for proper system operation.

1.8 Field Measurements and Coordination:

A. The intent of the Drawings and Specifications is to obtain a complete and satisfactory installation. Separate divisional Drawings and Specifications shall not relieve the Contractor or Subcontractors from full compliance of work of his trade indicated on any of the Drawings or in any Section of the Specifications. Report conflicts prior to start of work.

B. Verify all field dimensions and locations of equipment to ensure close, neat fit with other trades' work. Make use of all Contract Documents and approved shop drawings to verify exact dimension and locations. Do not scale electrical drawings; rely on dimensions shown on architectural or structural drawings.

C. Coordinate work in this Division with all other trades in proper sequence to ensure that the total work is completed within Contract time schedule and with minimum cutting and patching.

D. Locate all equipment, materials, and apparatus symmetrical with architectural elements. Install to exact height and locations when shown on architectural drawings. When locations are shown only on mechanical drawings, be guided by architectural details and conditions existing at job and correlate this work with that of others. Provide all required work clearances as defined in the NEC.

E. Install work as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways. Cut no structural members without written approval from Engineer or Architect.

F. Carefully examine any existing conditions, piping, and premises. Compare Drawings with existing conditions. Report any observed discrepancies. Written instructions will be issued by the Engineer to resolve discrepancies.

G. Because of the small scale of the Drawings, it is not possible to indicate all offsets and fittings or to locate every accessory. Drawings are essentially diagrammatic. Study carefully the sizes and locations of structural members, wall and partition locations, trusses, and rooms dimensions and take actual measurements on the job. Locate material, equipment and accessories with sufficient space for installing and servicing. Contractor is responsible for accuracy of his measurements and shall not order materials or perform work without verification. No extra compensation will be allowed because field measurements vary from the dimensions on the

Drawings. If field measurements show that equipment or material cannot be fitted, the Engineer shall be consulted. Remove and relocate, without additional compensation, any item that is installed and is later found to encroach on space assigned to another use.

H. Coordinate all equipment being supplied in other divisions to ensure proper electrical connections. Obtain full manufacturer's electrical information and coordinate with electrical system specified. Make adjustments prior to submitting electrical shop drawings. Mark on shop drawings necessary modifications due to equipment being supplied. Contractor shall be responsible for replacement and upgrade of electrical equipment if at time of completion, it is apparent that electrical requirements do not meet the electrical system's supply.

I. Verify all ceiling clearances prior to ordering panelboards and switchboards. Dimensioned drawings are required for all electrical rooms showing actual plan and elevation layouts. Any equipment ordered prior to verifying that it will fit, will be returned at the contractor's expense. Coordinate panelboard and switchboard locations with structural members, beams and column foundations.

J. Coordinate location of electrical equipment with pipes and duct work being supplied by other Divisions. The equipment space including all referenced NEC clearances shall be maintained. If any pipes or duct work violate any electrical clearance requirements, it shall be removed and relocated at the contractor's expense. Drip pans are not permitted unless specifically called for in the construction documents.

K. Guarantee and Service:

1. The Contractor shall guarantee labor, materials and equipment for a period of one (1) year from Substantial Completion, or from Owner's occupancy, whichever is earlier. Contractor shall make good any defects and shall include all necessary adjustments to and replacement of defective items without expense to the Owner.
2. In addition to the manufacturer's guarantee of each item, Contractor shall provide his standard guarantee after final acceptance and make good any defects of materials or workmanship occurring during this period without expense to the Owner.
3. Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding Contractor's Guarantee Bond nor relieving Contractor of his responsibilities during guarantee period.

1.9 Shop Drawings:

A. Shop drawings, product literature, and other approved submittals will only be reviewed if they are submitted in full accordance with the General and Supplementary Conditions and Division 1 Specification sections and the following:

1. Submittals shall include all applicable items referenced in each specification section, and not include items from more than one specification section in the same submittal.
2. Submittals shall be properly identified by a cover sheet showing the project name, Architect and Engineer names, submittal control numbers, specification section, a list of products or item names with model numbers in the order they appear in the package, and spaces for approved stamps. A sample cover sheet is included at the end of this section.

3. Submittals shall have been reviewed and approved by the General Contractor (or Prime Contractor). Evidence of this review and approval shall be an "Approved" stamp with a signature and date on the cover sheet.
4. Submittals shall be combined into a single submittal package with a table of contents. Submittals shall not be issued as multiple individual submittal packages.
5. Submittals that include a series of fixtures or devices (such as lighting fixtures) shall be organized by the fixture number and be marked accordingly. Each fixture must include all items associated with that fixture regardless of whether or not those items are used on other fixtures.
6. The electrical design shown on the drawings supports the mechanical equipment basis of design specifications at the time of design. If mechanical equipment is submitted with different electrical requirements, it is the responsibility of the mechanical contractor to resolve all required electrical design changes (wire and conduit size, type of disconnect or overload protection, point(s) of connection, etc.) and clearly show the new electrical design on the mechanical submittal with a written statement that this change will be provided at no additional cost. Mechanical submittals made with no written reference to the electrical design will be presumed to work with the electrical design. Any corrections required will be at no additional cost.

B. Before ordering any materials or equipment, and within 30 days after the award of Contract the Contractor shall submit to the Engineer one complete schedule showing the make, type, manufacturer's name and trade designation of all equipment.

1. This schedule shall be accompanied by six (6) copies of the manufacturer's printed specifications and shop drawings for each piece of equipment or specialty and shall give dimensions, diagrams, descriptive literature, capacity or rating, kind of material, finish, guarantee, etc., and such other detailed information as the Engineer may require.
2. When approved, such schedule shall be an addition to these Specifications, and shall be of equal force in that no deviation will be permitted except with the approval of the Engineer.
3. Each shop drawing shall reference the Specification section.
4. The submittal should reference any delivery/scheduling problems with the equipment being supplied.
5. The submittal shall not contain any equipment and/or systems that have not been either listed in the construction documents or provided in an addendum as “approved for bidding”. This formality may be waved by the Engineer, if in his opinion, it is to the Owner’s benefit.

C. If shop drawings show variation from the requirements of the Contract Documents, the Contractor shall make specific mention of such variation in his letter of transmittal. If acceptable, Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract.

D. Review of shop drawings, descriptive literature, catalog data, or schedules by the Engineer shall not relieve the Contractor from responsibility for deviations from Contract Drawings or Specifications, unless he has in writing called to the attention of the Engineer such deviation at the time of submission, nor shall it relieve him from responsibility for errors of any sort in shop

drawings, descriptive literature, catalog data, or schedules. Any feature or function specified but not mentioned in the submittal shall be assumed to be included per the specification.

E. Submit shop drawings and any other drawings specifically called for in other sections. Shop drawings shall consist of plans, sections, elevations and details to scale (not smaller than 1/4" per foot), with dimensions clearly showing the installation. Direct copies of small-scale project drawings issued to the Contractor are not acceptable. Drawings shall take into account equipment furnished under other Sections and shall show space allotted for it. Include construction details and materials.

F. Submit product data after award of the Contract and before any equipment or materials are purchased. Product data are defined as manufacturer's printed literature specifically marked to indicate size and model and accompanied by rating sheets listing values showing that equipment meets scheduled or specified values. Properly coded stamp from the Engineer on returned submittal is required before ordering equipment.

G. Coordinate with other division's supplying equipment prior to submitting shop drawings.

H. Shop drawings shall be submitted in one package unless approved otherwise by the Engineer. Provide an index of sections, list manufacturers, and "as-specified" or not. Each Specification Section shall be tabbed with equipment inserted.

I. Electrical Room Drawings: A detailed, 1/4"=1'-0" scaled plan view drawing shall be submitted for each electrical room to ensure that the equipment being supplied will fit properly. Include on the drawings any obstruction from building structural or mechanical. Review all duct work and piping shop drawings to ensure proper clearance. Specific grounding requirements shall be noted on the drawings. This includes additional driven grounds and bonding to building steel, water piping, and foundation rebar. This drawing shall make specific mention of any NEC violation. Conduit and/or equipment placement shall take into account any structural or foundation interference. All equipment within the electrical room shall be labeled and actual dimensions shown. The drawings shall be submitted with the shop drawings and manufacturer's product sheets. Failure to supply scaled drawings shall be the basis of rejecting the entire submittal package.

1.10 Test Reports and Verification Submittals: Submit test reports, certifications and verification letters as called for in other sections. Contractor shall coordinate the required testing and documentation of system performance such that sufficient time exists to prepare the reports, review the reports, and take corrective action within the scheduled contract time.

1.11 O & M Data Submittals: Submit Operations and Maintenance data as called for in other sections. When a copy of approved submittals is included in the O & M Manual, only the final "Furnish and Submitted" or "Furnish as Corrected" copy shall be used. Contractor shall organize these later in the O & M Manuals tabbed by specification number. Prepare O & M Manuals as required by Division 1 and as described herein.[Submit O & M manuals on CD-Rom in addition to required hard bound copies.] Submit manuals at the substantial completion inspection.

PART 2 - PRODUCTS

2.1 All materials shall be new and unused, Owner-supplied, or reused as shown on the Drawings, the best of their respective kinds, suitable for the conditions and duties imposed on them. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following Sections.

2.2 Equipment and Materials

A. Equipment and materials furnished under this Division shall be the product of a manufacturer regularly engaged in the manufacture of such items for a period of three years. Where practical, all of the components shall be products of a single manufacturer in order to provide proper coordination and responsibility. Where required, Contractor shall furnish proof of installation of similar equipment or materials.

B. Each item of equipment shall bear a nameplate showing the manufacturer's name, trade name, model number, serial number, ratings and other information necessary to fully identify it. This plate shall be permanently mounted in a prominent location and shall not be concealed, insulated or painted.

C. The label of the approving agency, such as UL or NEMA, by which a standard has been established for the particular item shall be in full view. Materials shall be UL-listed for the application specified or indicated on the Drawings or Specifications.

D. The equipment shall be essentially the standard product of a manufacturer regularly engaged in the production of such equipment and shall be a product of the manufacturer's latest design.

E. A service organization with personnel and spare parts shall be available within two hours for each type of equipment furnished.

F. Install in accordance with manufacturer's recommendations. Place in service by a factory trained representative where required.

G. Materials and equipment are specified herein by a single or by multiple manufacturers to indicate quality, material and type of construction desired. Manufacturer's products shown on the Drawings have been used as basis for design; it shall be the Contractor's responsibility to ascertain that alternate manufacturer's products meet detailed specifications and that size and arrangement of equipment are suitable for installation.

H. Model Numbers: Catalog numbers and model numbers indicated in the Drawings and Specifications are used as a guide in the selection of the equipment and are only listed for the Contractor’s convenience. The Contractor shall determine the actual model numbers for ordering equipment and materials in accordance with the written description of each item and with the intent of the Drawings and Specifications.

I. All equipment and material shall be manufactured and assembled in the United States.

2.3 Requests for Substitution:

A. Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the particular system, product or material specified. Other systems, products, equipment or materials may be accepted only if in the opinion of the Engineer, they are equivalent in quality and workmanship and will perform satisfactorily its intended purpose. The Engineer shall approve all such substitutions in materials or equipment in writing. This shall occur prior to bidding.

B. In making requests for substitutions, the Contractor shall list the particular system, product, equipment or material he wishes to substitute and at bid time the Contractor shall state the amount he will add or deduct from his base bid if the substitution is approved by the Engineer. If the Contractor allows no deduction or addition to the base bid for such substitution, it shall be so stated on the request.

C. Requests by Contractor for substitution will be considered only when reasonable, timely, fully documented, and qualifying under one or more of the following circumstances.

1. Required product cannot be supplied in time for compliance with Contract time requirements.
2. Required product is not acceptable to governing authority, or determined to be non-compatible, or cannot be properly coordinated, warranted or insured, or has other recognized disability as certified by Contractor.
3. Substantial cost advantage is offered Owner after deducting offsetting disadvantages including delays, additional compensation for redesign, investigation, evaluation and other necessary services and similar considerations.

D. All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate any and all differences or omissions between the product specified as the basis of design and the product proposed for substitution. Differences shall include but shall not be limited to data as follows for both the specified and substituted products:

1. Principle of operation.
2. Materials of construction or finishes.
3. Thickness of materials.
4. Weight of item.
5. Deleted features or items.
6. Added features or items.
7. Changes in other work caused by the substitution.
8. Performance and rating data.

If the approved substitution contains differences or omissions not specifically called to the attention of the Engineer, the Owner reserves the right to require equal or similar features to be added to the substituted products at the Contractor's expense.

2.4 Prior Approval: Prior Approval shall be required for any manufacturer other than those listed for all specified items in the Drawings and Specifications. Submit all requests for approval of the alternate manufacturer's products two weeks prior to bid opening. Approval will be in the form of an Addendum to the Specifications and Drawings. Clearly indicate all differences between the specified and proposed product following the guidelines for substitution herein. This requirement may be waived if, in the opinion of the Engineer, it is in the best interest of the Owner. Submittals received after the award of the bid for equipment that has not been Prior Approved is subject to immediate rejection. *Any Engineering time required due to equipment that has not been Prior Approved is subject to billing charged directly to the contractor at the Engineer's current billing rate.*

PART 3 - EXECUTION

3.1 Workmanship: All materials, fixtures, and equipment shall be installed and completed in a first-class workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which do not present an orderly and reasonably neat and/or workmanlike appearance, or do not allow adequate space for maintenance, shall be removed and replaced when so directed by the Engineer.

3.2 Coordination

A. The Contractor shall be responsible for full coordination of the electrical systems with shop drawings of the building construction so the proper openings and sleeves or supports etc., are provided for conduit, devices, or other equipment passing through slabs or walls.

B. Any additional steel supports required for the installation of any electrical equipment, etc., shall provided by the Contractor.

C. It shall be the Contractor's responsibility to see that all equipment that may require maintenance and operation are made easily accessible, regardless of the diagrammatic location shown on the Drawings.

D. All connections to fixtures and equipment shown on the Drawings shall be considered diagrammatic unless otherwise indicated by a specific detail on the Drawings. The actual connections shall be made to fully suit the requirements of each case and adequately provide for servicing.

E. The Contractor shall protect equipment and fixtures at all times during storage and construction. He shall replace all equipment and fixtures, which are damaged as a result of inadequate protection. Any electrical equipment with electronic components shall be stored off-site in a climate controlled facility until the building conditions are suitable for installation. Any equipment damaged or compromised by unprotected climate control, in the opinion of the Engineer, shall be replaced at contractor's cost with factory new equipment.

F. Prior to starting and during progress of work, examine work and materials installed by others as they apply to work in this division. Report conditions, which will prevent satisfactory installation.

G. Start of work will be construed as acceptance of suitability of work of others.

H. The Contractor shall review all equipment being supplied by other divisions prior to ordering electrical equipment. Any conflicts between equipment being supplied and the electronic requirements on the drawings shall be corrected and incorporated into the electrical submittals prior to ordering equipment. Installation of the electrical system is the contractor's acceptance of equipment requirements. Any conflict with equipment's electrical requirements after electrical system has been installed shall be the responsibility of the contractor to make corrective action. Any corrective action shall be at the contractor's expense.

3.3 Utilities Coordination: The Contractor shall meet with respective personnel of the telephone, cable TV and electric utilities and review all details of the service and distribution. All details shown on contract documents shall be verified for adequacy and accuracy. The Contractor shall incorporate any required revisions without additional cost to the Owner.

3.4 Construction Electrical Utilities: Provide all temporary wiring for power and light required for construction purposes and remove such temporary wiring when use is no longer required. The contractor shall be responsible to provide all cabinets, meter enclosures and conduit required by the local utility for the permanent electrical service.

3.5 Interruption of Service: Before any equipment is shut down for disconnecting or tie-ins, arrangements shall be made with the Engineer and this work shall be done at the time best suited to the Owner. Outages must be scheduled through the Engineer. The Engineer shall review extent, length, and timing of outages. Services shall be restored the same day. Provide temporary power or other services as required during outages. All overtime or premium costs associated with this work shall be invoiced in the base bid.

3.6 Cutting and Patching: Contractor shall be responsible for cutting and patching of all holes, chases, sleeves, and other openings required for installation of equipment furnished and installed under these Specifications. Obtain permission from Engineer before cutting any structural items.

3.7 Equipment Setting: Bolt equipment directly to concrete pads or foundations, using hot-dipped galvanized anchor bolts, nuts and washers. Level equipment. All floor mounted equipment shall be provided with a housekeeping pad at least 4" in depth.

3.8 Painting: Touch-up factory finishes on equipment located inside and outside shall be done under Division 26. Obtain matched color coatings from the manufacturer and apply as directed by manufacturer. If corrosion is found during inspection on the surface of any equipment, clean, prime, and paint, as required. If corrosion is found to be extensive by the Engineer, the equipment shall be removed and replaced with factory new at the expense of the contractor.

3.9 Clean-up: Thoroughly clean all exposed parts of apparatus and equipment of cement, plaster, and other materials and remove all oil and grease spots. Repaint or touch up as required to look like new. During progress of work, Contractor is to carefully clean and leave premises free from debris and in a safe condition.

3.10 Start-up and Operational Test: Start each item of equipment in strict accordance with the manufacturer's instructions; or where noted under equipment specification, a qualified representative of the manufacturer shall do start-up. Alignment, lubrication, safety, and operating control shall be included in start-up check.

3.11 Record Drawings:

A. During the progress of the work the Contractor shall record on their field set of Drawings the corrections, variations, and deviations for systems which are not installed exactly as shown on the Contract Drawings.

B. Upon completion of the work, record drawings shall be prepared as described in the General Conditions, Supplementary Conditions, and Division 1 Sections.

3.12 Certificate of Occupancy:

Following items are required for issue of Certificate of Occupancy. These shall be provided at or before of Substantial Completion Inspection:

A. Provide certification that asbestos containing products were not used in the project.

B. Fire Alarm Certification. In addition, the documentation shall contain witnessed accounts of the shut-down of electrical and mechanical equipment and the operation of fire doors as required by Code and the Construction Documents.

C. Provide certification that the Intercommunications System is fully operational (If applicable).

D. Provide certification that all emergency lights and exit signs are operational.

E. Provide certification that all selective protective devices have been set according to the coordination study/recommendations including all ground fault selections.

3.13 Acceptance

A. Request inspections as required under the Supplementary or General Conditions. Conceal no work until inspected.

B. Punch List: Submit written confirmation that all punch lists have been checked and the required work completed. The contractor at the Engineer's current billing rate shall pay for additional field time required by the Engineer to report or check on past punch list deficiencies.

C. Instructions: At completion of the work, provide a competent and experienced person who is thoroughly familiar with the project, for a period deemed necessary by the Owner to instruct permanent operating personnel in the operation of equipment and control systems.

D. Operation and Maintenance Manuals: Furnish four complete manuals bound in ring binders and organized by system or section. Manuals shall contain:

1. Detailed operating instructions and instructions for making minor adjustments.
2. Complete wiring and control diagrams.
3. Routine maintenance operations.
4. Manufacturer's catalog data, service instructions, and parts list for each piece of operating equipment.
5. Copies of approved submittals.
6. Copies of all manufacturers' warranties.
7. Copies of test reports and verification submittals.

E. Control Diagrams: Frame under glass and mount on equipment room wall. Include copy in O and M Manuals.

F. Test together and separately to determine that:

1. System is free from short circuits and other faults.
2. Motor starter overload devices are sized correctly.
3. Motors rotate correctly.
4. All equipment operates correctly and as specified.

G. Warranties: Submit copies of all manufacturers' warranties.

H. Record Drawings: Submit "Record Drawings".

I. Install engraved metal or plastic nameplates or tags on controls, panels, switches, starters, timers, and similar operable equipment, keyed by number to operating instructions. Dymo type labels are not acceptable.

J. Acceptance will be on the basis of tests and inspections of the work. A representative of the firm that performed the testing shall be in attendance to assist during inspection. Contractor shall furnish necessary electricians to operate system, make any necessary adjustments and assist with final inspection.

This is a sample cover sheet. Use one for each shop drawing.

PROJECT NAME
PROJECT NUMBER

SAMPLE

ARCHITECT/ENGINEER: Dell Consulting, LLC

CONTRACTOR: XYZ Construction

SUBCONTRACTOR: ABC Electrical Contractor

SUPPLIER: Jones Supply Co.

MANUFACTURER: Various

DATE: 2/12/07

Use whatever standard headings you want here

SECTION: 26 51 00 / Interior Lighting

1. Type A

2. Type B

3. Type C

4. Type D

5. Type E

List each item separately

Typical - list mfr name & model number

General Contractor's APPROVAL stamp must be on this sheet.

END OF SECTION

SECTION 260010 - CODES AND STANDARDS

PART 1 - GENERAL

1.1 All work under Division 26 shall be constructed in accordance with the codes and standards listed herein. The design has been based on the requirements of these codes and standards. While it is not the responsibility of the Contractor to verify that all work called for complies with these codes and standards, he shall be responsible for calling to the Engineer's attention any details on the Drawings and/or Specifications that are not in conformance with these or other codes and standards. Current issue of code applies unless specifically noted otherwise.

1.2 Comply with regulations and codes of suppliers of utilities.

1.3 Where no specific method or form of construction is called for in the Contract Documents, the Contractor shall comply with code requirements when carrying out such work.

1.4 Where code conflict exists, generally the most stringent requirement applies.

1.5 Codes or standards applying to a specific part of the work may be included in that section.

PART 2 - CODES AND STANDARDS

2.1 Codes:

A. Florida Building Code – Building – 2020

B. Florida Building Code – Test – Protocols for High Velocity Hurricane Zones – 2020

C. National Electrical Code (NFPA-70) – 2017

D. National Fire Alarm Code (NFPA-72) – 2016

E. Uniform Fire Code (NFPA 1) – 2018 Florida Edition

F. National Electrical Safety Code (NESC)

G. Life Safety Code (NFPA 101) – 2018 Florida Edition

H. Standard for Health Care Facilities (NFPA-99) - 2018

I. FAC 69A-47 The Uniform Fire Safety Standard for Elevators

J. FAC 676-5 Florida Elevator Safety Code

2.2 Codes:

A. International Building Code – 2015

B. International Existing Building Code – 2015

C. International Fire Code – 2015

D. National Electrical Code (NFPA-70) – 2014

E. National Fire Alarm Code (NFPA-72) – 2013

F. ASME 17.1 - 2019

2.3 Standards:

A. All electrical materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments:

1. American National Standard Institutes (ANSI)
2. Illuminating Engineering Society (IES)
3. Institute of Electrical and Electronics Engineers (IEEE)
4. National Electrical Manufacturer's Associations (NEMA)
5. National Fire Protection Association (NFPA)
6. Occupational Safety and Health Act (OSHA)
7. Underwriter's Laboratories, Inc. (UL)
8. TIA/EIA-568.1-E Commercial Building Telecommunications Infrastructure Standard
9. ANSI/EIA/TIA-569-E Commercial Building Standard for Telecommunications Pathways and Spaces
10. ANSI/EIA/TIA-606-C Administration Standard for the Telecommunications Infrastructure
11. ANSI/J-STD-607-D Generic Telecommunications Bonding and Grounding for Customer Premises
12. BICSI - Telecommunications Distribution Methods Manual (TDMM) – 14th Edition
13. SCTE - Society of Cable Television Engineers
14. ASHRAE Standard 90.1 – 2013

1. Auburn University 2021 Design Standards

1. University West Florida Building Design and Construction Standards, June 2016

1. Design and Construction Guidelines for State Facilities in Florida, April 2019

PART 3 - EXECUTION

3.1 Not used.

END OF SECTION

SECTION 260020 - WORK REQUIRED FOR EQUIPMENT FURNISHED BY OTHER DIVISIONS

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Division-26 Basic Electrical Materials and Methods Sections apply to work of this Section.

C. Review all project drawings to be aware of conditions affecting work herein.

PART 2 - PRODUCTS

2.1 Materials for this section are specified in the Section "Basic Materials and Methods."

PART 3 - EXECUTION

3.1 Make connections for the electrical power to equipment furnished and installed in other Divisions.

3.2 Provide raceway boxes, fittings, devices and conductors for the electrical power to equipment furnished and installed in the other Divisions.

3.3 Coordinate wiring and conduit requirements with equipment being furnished prior to rough-in.

3.4 Verify voltage, phase, and current requirements for all equipment being supplied by other divisions. Any modifications shall be incorporated into the electrical submittals with references to any modification and reason. The electrical system is designed around the specified equipment. Any change in the equipment shall be coordinated so that proper electrical protection is obtained. In addition, if the supplied equipment has higher minimum circuit ampacity that the equipment specified, the contractor shall call the modification to the Engineer’s attention and make necessary conduit, wire, circuit breaker and equipment changes to accommodate the higher ampacity requirements.

3.5 Any change from the specified equipment requirements shall be the responsibility of the contractor.

3.6 The electrical contractor shall meet with the Division 23 contractor and fully coordinate locations of mechanical equipment, duct work and piping to ensure that proper working

clearance as required in the NEC is obtained. Any conflict shall be reported to the Engineer in writing prior to the installation of any of the equipment. Refer to additional requirements for planning drawings.

3.7 Coordinate exact locations and electrical rough-in requirements with other Divisions prior to installation to ensure proper clearances and code requirements are met.

END OF SECTION

SECTION 260500 - ELECTRICAL RELATED WORK

PART 1 - GENERAL

1.1 All Division 1 Sections apply to all Division 26 Sections.

1.2 Coordinate for all cutting and patching. Contractor shall review all cutting and patching required prior to bidding and shall coordinate installation.

PART 2 - DIVISION 2 - SITEWORK

2.1 Specific requirements for excavation and backfill for underground conduit are contained in Section 26 05 50.

2.2 The following is part of Division 26 work.

A. Underground electrical utilities.

PART 3 - DIVISION 3 - CONCRETE

3.1 Perform the following as part of Division 26 work, complying with the requirements of Division 3, Concrete.

A. Curbs, foundations and pads for electrical equipment.

B. Encasement of electrical work.

C. Underground structural concrete to accommodate electrical work.

D. Rough grouting in and around electrical work.

E. Patching concrete cut to accommodate electrical work.

PART 4 - DIVISION 4 - MASONRY

4.1 Refer to Division 4, Masonry for:

A. Patching openings to accommodate electrical work.

PART 5 - DIVISION 5 - METALS

5.1 Refer to Division 5, Metals for:

A. Supports for electrical work.

B. Framing openings for electrical equipment.

PART 6 - DIVISION 6 - WOOD

6.1 Refer to Division 6, Wood for:

A. Supports for electrical work.

B. Framing openings for electrical equipment.

PART 7 - DIVISION 7 - THERMAL & MOISTURE PROTECTION

7.1 Refer to Division 7, Thermal and Moisture Protection for:

A. Installation of all supports for electrical work.

B. Caulking and waterproofing of all wall and roof mounted electrical work.

7.2 Perform the following as part of Division 26 work, complying with Division 7 requirements.

A. Fire barrier penetration seals.

B. Caulking and related shielding around ducts and pipes for sound isolation and attenuation.

PART 8 - DIVISION 8 - DOORS AND WINDOWS

8.1 Refer to Division 8, Doors & Windows for:

A. Installation of all access doors for electrical work.

PART 9 - DIVISION 9 - FINISHES

9.1 Refer to Division 9, Finishes for:

A. Painting exposed conduit and equipment.

B. Painting structural metal and concrete for electrical work.

C. Painting access panels.

9.2 Colors shall be selected by the Architect for all painting of exposed electrical work unless specified herein.

9.3 Perform the following as part of Division 26 work.

A. Touch up painting of factory finishes.

PART 10 - DIVISION 23 - MECHANICAL

10.1 Mechanical Contractor shall furnish to Electrical Contractor all necessary nameplate data, equipment power requirements, wiring diagrams, etc., pertaining to the electrical phase of mechanical installation, as well as all required motors, on/off switches, warning lights, relays, and control devices.

10.2 Contractor shall furnish and install all power wiring, starters and contactors, and make final electrical connections to motors, on/off switches, warning lights, relays, and control devices.

10.3 Disconnect switches for mechanical equipment shall be furnished and installed by the Contractor, unless specifically noted on the Drawings as being furnished as part of mechanical equipment.

10.4 Wiring for controls as indicated on the electrical drawings shall be furnished and installed by the electrical contractor. Control wiring and signal wiring between field installed controls, indicating devices and unit control panels as part of mechanical energy management system shall be provided by Division 23, complying with the requirements of Division 26 specifications.

PART 11 - DIVISION 27 - TELECOMMUNICATIONS

11.1 See “Contractor Coordination and Responsibilities Note” on the Drawings.

END OF SECTION

SECTION 260512 - ALTERATIONS AND ADDITIONS TO EXISTING WORK

PART 1 - GENERAL

1.1 The provisions of this Section are in addition to the provisions of Division 1, Building Modifications.

1.2 Building will be occupied by owner during construction.

PART 2 - PERFORMANCE

2.1 General:

A. All necessary additions and alterations to existing work shall be included as required to provide and maintain a complete and proper electrical installation. As necessary, relocate existing electrical work so other trades can pursue their work and maintain building in service, when occupied.

B. The work shall include, but not be limited to, the following:

1. Relocation of fixtures, pull-boxes, electrical ducts, and other similar items, to permit the installation of new equipment.

2. Installation of new conduits, conductors, wiring, and wiring devices, in order to maintain temporary and permanent use of electrical facilities.
3. Disconnection and reconnection of circuits as required for continued operation of services.
4. Provision for the relocation of all mechanical work as required for proper installation of electrical work where not shown or specified in other sections or on other drawings.
5. Repair or replace, as required, any damage due to the installation of the new electrical system in existing areas.

C. Unused, existing, surface mounted work shall be removed and concealed. Outlets shall be blanked off.

D. Existing work to be maintained shall be reconnected and shall have all outlets, boxes and devices accessible after completion of work by other trades.

E. Within NEC limitations, existing conduits may be reused after cleaning.

F. All new work in existing areas shall be exposed on walls in unfinished areas and concealed in finishes in finished areas. Where cutting and patching are required, finishes shall match existing surface finishes. In existing finished areas, all work shall be concealed in new finishes.

G. Consolidate existing and new building ground systems.

H. In general, all new work is intended to be concealed in finishes to be added under this project.

2.2 Existing Building Power Outages:

A. All necessary power outages in existing and in renovated areas shall be at a time approved by Owner in writing and of shortest possible duration. Coordinate details with Engineer, who will assist in determining Owner's requirements, prior to work.

B. Where portions of buildings are altered, and remainder of building continues in operation, temporary wiring shall be provided to maintain all necessary building functions. Provide all equipment, material, labor for a continuous functional system.

2.3 Temporary Wiring for Remodeled Areas:

A. Progress of the work will require temporary wiring installations to utilize a portion of the remodeled area. Wiring may not be the final, permanent installation, and shall be included, as necessary to supply required electrical function.

2.4 Planning for Sequence of the Work:

A. Electrical feeders, branch wiring, signal wiring, and other similar work as shown and specified shall be scheduled to correspond with the sequence of work necessary to demolish, remove and construct new work.

B. Close coordination in scheduling is required between the Owner, Contractor, and other trades to assure a smooth work flow with minimum interference and interruption to building power and communication systems.

2.5 Openings in Existing Work:

A. Provide cutting and patching of existing work as required. Verify exact locations and materials before performing work. Cutting of structural members and bearing walls shall not be done without written approval of the Engineer. Provide access covers were required to meet code requirements.

2.6 Verification of Existing Work:

A. Where shown on the Drawings, work which is "existing" is assumed to be in place and suitable for the necessary alterations and additions required. Contractor shall carefully field check these items and include alterations as may be necessary for proper installation and guarantee.

2.7 Removal and Ownership of Existing Work:

A. Unless noted otherwise, existing electrical work shall be removed. Parts of existing electrical systems that are required to maintain service after the alteration shall remain in service. Unless otherwise specified, all equipment and materials shall remain the property of the Owner except

as that judged obsolete or unusable. The Engineer shall provide all final decisions about obsolete or unusable equipment.

B. Property of Owner shall be delivered to a location where directed by the Owner and all other items shall be promptly removed from the job site. The equipment shall be protected during demolition.

2.8 Cutting of Concrete Materials:

A. Holes for materials and supports shall be made with uniform speed rotation drilling equipment which does not provide effects associated with impact type equipment.

B. The use of impact drills, air drills, and the like is not acceptable for this project.

2.9 Maintenance of Existing Lighting Systems and Electric Outlets:

A. Where new lighting layouts are not shown on the Drawings, the existing lighting fixtures and wiring controls shall be reused. If necessary, these items shall be temporarily removed (as light fixtures), if necessary, and shall be reinstalled where removed. New wiring from existing sources shall be provided where remodeling operations require. These items are not shown on the Drawings and shall be site determined by the Contractor.

B. Where existing electrical outlets are located in areas of remodeling, these shall be maintained in service. This work is not shown on the Drawings and shall be site determined by the Contractor.

2.10 Concealed Work: Where required, provide accessed doors to make electrical devices accessible as required by the NEC. If impractical to install access doors, relocate existing electrical work so that access is not required. This shall include, but not limited to, adding additional conduit, pulling new wire, and adding junction boxes.

PART 3 - EXECUTION

3.1 Not used.

END OF SECTION

SECTION 260516 - SERVICE ENTRANCE METHODS AND MATERIALS – UNDERGROUND

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Division-26 Basic Electrical Materials and Methods Sections apply to work of this Section.

C. Review all project drawings to be aware of conditions affecting work herein.

PART 2 - PRODUCTS

2.1 Materials for this section are specified in the Section "Basic Materials and Methods."

PART 3 - EXECUTION

3.1 Installation shall comply with the requirements of the Utilities Company and the applicable paragraphs in Article "3.0 EXECUTION" of the Section "Basic Materials and Methods."

3.2 Comply with NEC 70 - Underground Services.

3.3 Comply with the Section "Excavation and Backfill."

3.4 Provide concrete pads as shown on the Drawings. Coordinate requirements with Utility company. The Utility Company will provide transformer. Confirm adequacy of dimensions and size and number of openings in concrete pad with Utilities Company.

3.5 The Utility Company will furnish and install the current transformers, potential transformer. The contractor shall coordinate the installation of service feeders with the Utility Company so that the current transformers can be installed. The Utility Company will furnish and install the meter. The contractor shall furnish and install CT cabinets, meter cabinets and all associated conduit. Coordinate exact requirements with local utility.

3.6 The electrical contractor shall provide the raceways and service conductors from the reinforced concrete transformer pad to the service equipment as indicated on the Drawings.

3.7 The Electrical Contractor shall provide the raceways from the transformer pad to the meter cabinet. Minimum conduit size is 1" and shall be RGS. Unless otherwise noted, the meter shall be mounted on a 6"x6"x8' concrete post, provided by the contractor. The location of the post shall be approved by the Utility Company.

3.8 Raceways for service conductors shall be schedule 80 PVC or bitumastic coated rigid metal conduit for straight lengths and bitumastic coated rigid metal conduit for any bends of 45 or 90 degrees. Service entrance raceways shall be concrete encased where specifically noted on the Drawings.

3.9 The 45 or 90-degree bends shall have a minimum radius of 36 inches.

3.10 Rigid metal conduit shall receive two undiluted coats of bitumastic free from holidays and pinholes.

3.11 The Electrical Contractor shall provide 200# test poly cord in each spare raceway.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

1.3 Submittals

A. Product Data: For each type of product indicated.

B. Field Test Reports: Submit written test reports to include the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

C. Test Reports and Verification Submittals:

1. Provide ground system drawings per section 3 of this specification.
2. Perform the following field tests and inspections and prepare test reports.

    a. Ground Resistance Test: See Part 3 of this specification.

    b. Patient Care Area Grounding System Test: See Part 3 of this specification.

1.4 Quality Assurance

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

1. Comply with UL 467.

B. Comply with NFPA 70; for overhead-line construction and medium-voltage underground construction, comply with IEEE C2.

C. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 Manufacturers

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

1. Grounding Conductors, Cables, Connectors, and Rods:

a. Harger Lightning Protection, Inc.
b. Erico Inc.; Electrical Products Group.
c. Thermoweld, Inc.

2.2 Grounding Conductors

A. For insulated conductors, comply with Division 26 Section "Conductors and Cables."

B. Material: Copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

G. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators. (Harger HDGBI series)

2.3 Connector Products

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Copper or Bronze bolted-pressure-type connectors, or compression type. Do not use below grade.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instructions. For use in below grade applications.

2.4 Grounding Electrodes

A. Ground Rods: Sectional type; copper clad steel.

1. Size: 3/4 by 120 inches (19 by 3000 mm) in diameter.

PART 3 - EXECUTION

3.1 Application

A. In raceways, use insulated equipment grounding conductors.

B. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections.

C. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 1 inch (25.4 mm) from wall and support from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.
3. Provide UL Listed compression lugs for all ground conductors to be connected to the ground bus.

3.2 Equipment Grounding Conductors

A. Comply with NFPA 70, Article 250, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated. As a minimum, provide a driven ground rod system (as described below), bond to building foundation rebar, building steel, and building water service.

B. Install equipment grounding conductors in all feeders and circuits. Bond all metal conduit to metal enclosures.

C. Bond equipment grounding conductors installed in metallic raceways/conduits to each end of the raceway.

D. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 6AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4by-12-inch grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

E. Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

F. Common Ground Bonding with Lightning Protection System (where provided): Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

3.3 Installation

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes. Configuration shall be an equilateral triangle. Any deviation from this shape shall be approved by the Engineer in writing.

1. Drive ground rods until tops are 6 inches below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, and as otherwise indicated. Make connections without exposing steel or damaging copper coating.
3. The total depth/length of each ground rod shall be 30’ minimum unless noted otherwise.
4. Provide ground test well at each ground rod location.
5. Ground rods shall be located as close to the main electrical service equipment as possible and shall not be installed under sidewalks, parking areas, or other areas where ground rods cannot be inspected.
6. GPS locate and document location of all ground rods, conductors, and inspection wells.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.

D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Building Foundation: The electrical service, remote buildings and transformers shall be tied to the building foundation. The rebar in the foundation shall be bonded electrically by metal wire.

The rebar shall be turned up and extended through the slab by the equipment so the connection can be within sight and be inspected. The rebar shall be coated with protective paint where it penetrates the concrete slab.

F. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

G. Bond each above ground portion of gas piping system upstream from equipment shutoff valve.

H. Building Steel: The electrical service, transformers and remote buildings shall be tied to building steel.

3.4 Connections

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connections: Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable. Inspect molds prior to use and discard if deformed.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

F. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

G. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.5 Field Quality Control

A. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Ground Resistance Test

a. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

b. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

1) Equipment Rated 500 kVA and Less: 10 ohms.
2) Equipment Rated 500 to 1000 kVA: 5 ohms.
3) Equipment Rated More Than 1000 kVA: 3 ohms.
4) Substations and Pad-Mounted Switching Equipment: 5 ohms.
5) Manhole Grounds: 10 ohms.
6) Building grounding system: 10 ohms.

c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

3. Patient Care Area Grounding System Test per NFPA 99 4.3.3.1, test all conductive surfaces in the patient care areas (except those noted in 4.3.3.1.1.2 and 4.3.3.1.1.3) for voltage and impedance. Submit a test report in chart form identifying all items tested and the results. Any values measured that do not comply with NFPA 99 4.3.3.1 shall be identified, noted, and corrected.

END OF SECTION

SECTION 260530 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. This Section is a Division-26 Basic Materials and Methods Section, and is part of each Division-26 Section making reference to or requiring products specified herein.

C. The requirements of these specifications also apply to Divisions 23, 27, and 28 unless clearly indicated within those Divisions.

1.2 Summary

A. This Section includes the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Concrete equipment bases.
5. Cutting and patching for electrical construction.
6. Touchup painting.

1.3 Definitions

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. RGS: Rigid galvanized steel conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. RNC: Rigid nonmetallic conduit.

1.4 Submittals

A. Product Data: Submit the producer's standard descriptive data sheets for each type of product being provided. Mark the data sheet for the product being provided with an identifying mark or arrow. The following shall be submitted:

1. All Conduit.
2. All conduit fittings.
3. Floor Boxes.
4. Surface Metal Raceway.
5. Cabinets.
6. Conduit coating material for underground use.
7. Fire stopping compound (if required by project requirements).
8. Any other special items being supplied on the project.
9. Cable tray, fittings and shop drawings.

1.5 Quality Assurance

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

B. Comply with NFPA 70.

C. All materials and equipment specified herein shall be UL listed or approved according to the requirements of applicable NEC articles.

1.6 Coordination

A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connections to components furnished by utility companies.

1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."

E. Coordinate equipment clearance and working space with other equipment, pipes, duct work and obstructions prior to rough in. If clearances are compromised during construction, the contractor shall be required to relocate/modify as required to meet clearance requirements.

1.7 Other Divisions

A. The requirements of these specifications also apply to Divisions 23, 27 and 28 unless clearly indicated on the Drawings.

PART 2 - PRODUCTS

2.1 Manufacturers

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

1. Allied Tube and Conduit;
2. Appleton Electric;
3. Belden Corporation;
4. W.H. Brady Co.;
5. Carlon;
6. Challenger,
7. Crouse-Hinds Co.;
8. ETP;
9. Elcen Metal Products Co.;
10. General Cable Co.;
11. General Electric Co.;
12. Hoffman Engineering Co.;
13. E-Box, Inc;
14. Harvey Hubbell, Inc.;
15. Midland-Ross Corporation;
16. Okonite Co.;
17. 0-Z/Gedney;
18. Raco, Inc.;
19. Republic Steel Corporation;
20. 3M; Southwire;
21. Seton Nameplate;
22. Square D Co.;
23. Thomas and Betts;
24. Triangle PWC, Inc.;
25. Walker Parkersburg Textron;
26. Wiremold Co.
27. Westinghouse.Engine Div.

2.2 Raceways

A. Electrical Metallic Tubing (EMT) Federal Specification WWC-563 and ANSI C80.3: ANSI C80.3, galvanized steel, protected inside and out. Maximum size of EMT shall be 4". Minimum size shall be 1/2” 3/4" unless noted otherwise on the Drawings. EMT shall only be used with cables rated 600 volts or less and in indoor locations not subject to physical abuse.

B. Flexible Metal Conduit (FMC) NEC Article 350: galvanized steel protected inside and out.

C. Intermediate Metal Conduit (IMC) Federal Specification WWC-581: ANSI C80.6, galvanized steel, protected inside and out.

D. Rigid Galvanized Steel Conduit (RGS) NEC Article 346: galvanized steel, protected inside and out.

E. Liquid-tight Flexible Metal Conduit (LFMC) NEC Article 351: galvanized steel protected inside and out with sunlight and water resistant and mineral-oil-resistant extruded plastic jacket.

F. Rigid Non-metallic Conduit (RNC): NEMA TC 2, Schedule 40 or 80 PVC, with NEMA TC3 fittings as indicated on the Drawings.

G. Raceway Fittings: Specifically designed for the raceway type with which used.

1. Electrical Metallic Tubing (EMT): Federal Specification W-F-408, except only material of steel is acceptable. Couplings and connectors shall be concrete and rain tight, with connectors having insulated throats. Use gland and ring compression type couplings and connectors for conduit sizes 2" (50mm) and smaller. Use set screw type couplings with four set screws each for conduit sizes over 2" (50mm). Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding. Set screw fittings shall be provided with double set screws for each conduit termination (4 set screws total). Indent type connectors or couplings are prohibited. Die-cast or pressure-cast zinc-alloy fittings or fittings made of "pot metal" are prohibited.
2. Flexible Metal Conduit fittings shall be zinc plated steel or cadmium plated malleable iron screw type with insulated throat and angular wedge fitting between convolutions of conduit. Federal Specification W-F-406 and UL 5.
3. Intermediate Metal Conduit shall have threaded galvanized steel fittings; threadless, compression, galvanized steel fittings or threadless, compression, cadmium plated malleable iron fittings. Fittings shall be rain tight/concrete tight.
4. Rigid Galvanized Steel Conduit shall have threaded fittings, galvanized steel or threadless compression galvanized steel or threadless compression cadmium plated malleable iron. Fittings shall be rain tight/concrete tight.
5. Rigid Non-Metallic Conduit shall have polyvinyl chloride (PVC) fittings suited for the purpose and joined together by a method approved for the purpose. Schedule 80 conduit sections may be joined together with threaded fitting connectors.
6. Liquidtight Flexible Metal Conduit fittings shall be cadmium plated, malleable iron or steel with compression type steel ferrule and neoprene gasket sealing rings, with insulated throat.
7. Wireway fittings shall be steel with rust resistant undercoat and finish coat to match the wireway. The fittings shall be so designed that the sections can be electrically and mechanically fitted together to form a complete system. Dead ends shall be closed.
8. Couplings and Unions shall be galvanized steel, tapered thread standard conduit couplings for intermediate metal conduit and rigid metal conduit. PVC couplings for rigid non-metallic conduit shall use approved adhesive, and threaded couplings shall be used for schedule 80 conduit. Split couplings shall be galvanized steel. Unions shall be ground joint type galvanized steel.
9. Conduit seals shall be galvanized steel, tapered threads for IMC and RMC with sealing compound and fiber.

H. Bushings: Shall be provided at the end of all conduits prior to pulling cables to protect the insulation of the conductor. Provide grounding bushings for metal raceways, boxes, and cabinets to ensure that all metallic surfaces are effectively grounded. Metallic raceway may be

bonded to cabinets, boxes and panelboards by double locknut and bushing to ensure the metallic parts are all effectively grounded. Bushings shall be one of the following types:

1. Zinc plated steel, threaded or threadless
2. Zinc plated steel of threaded or threadless, phenolic insulated with temperature rating of 150 degree C
3. Cadmium plated malleable iron, threaded or threadless
4. Cadmium plated malleable iron, threaded or threadless, phenolic insulated, with temperature rating of 150 degree C
5. Phenolic with temperature rating of 150 degree C
6. Zinc plated steel, or cadmium plated malleable iron; threaded or threadless; non-insulated or insulated with grounding connector or grounding lug.
7. Insulated bushings shall have phenolic insulation molded to the bushing (NEC Article 362).

2.3 Metal Wireways

A. Material and Construction: Shall be sheet metal troughs with hinged or removable covers, rust resistant undercoat and gray finish coat. Sizes shall be as indicated on the Drawings or determined by the Contractor based on NEC requirements according to the number of conductors enclosed. Exterior units shall be weatherproof. Steel shall be minimum 14 gauge.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.4 Surface Raceways (NEC Article 352)

A. Scope: Surface metal raceway system shall be used for branch circuit wiring, fire alarm and other low-voltage wiring in renovated areas where conduit cannot be concealed. The metal raceway system shall consist of raceway, appropriate fittings and device boxes to complete installation per electrical drawings. The areas that are allowed surface metal conduit must be approved by the Engineer.

B. Classification and Use: Surface metal raceway is to be utilized in dry interior locations only as covered in Article 352 Part A of the National Electrical Code, as adopted by the National Fire Protection Association and as approved by the American National Standards Institute. The Wiremold copy V200 and V500 Raceway systems are listed by Underwriter's Laboratories under File Nos. E4376 Guide RJBT and E41751 Guide RJPR.

C. Materials: The Raceway and all system components must be UL Listed. They shall be manufactured of steel; zinc plated, galvanized and/or finished in ivory ScuffCoat (a polyester topcoat over ivory base) and shall be suitable for field repainting to match surroundings.

D. Raceway: The raceway shall be a one-piece design with a base and cover factory assembled. Total width shall be 0.50" by 0.34" deep with a cross sectional area of 0.11 square inch. The

raceway shall be available in 5' lengths. The cover shall be a thickness of 0.025", the base a thickness of 0.04".

E. Fittings: A full complement of fittings must be available including but not limited to mounting clips and straps, couplings, flat, internal and external elbows, cover clips, and bushings. The fitting covers shall be painted with an enamel finish, ivory color to match the V200 raceway. They shall overlap the raceway to hide uneven cuts. All fittings shall be supplied with a base where applicable. A transition fitting shall be available to adapt to other raceways manufactured by Wiremold Company.

F. Devices and Fixture Boxes: Devices boxes shall be available for mounting standard devices and faceplates. A device box shall be available in single and multiple gang operations, up to six gang in some cases, by the use of an adaptor fitting. They shall range in depth from 0.94" to 2.75". Extension boxes shall be available to adapt to existing standard flush switch and receptacle boxes. Round fixture and extension shall be available to mount to fixtures and other devices with mounting centers of 1 15/32", 1 5/8", 1 23/32", 1 27/32", 2 ¾", 3 ½", and 4 1/16" diameters by use of an adaptor fitting. Round fixture and extension boxes shall be available in depths ranging from 0.47" to 1.00" and in diameters of 3.0", 4.75", 5.5" and 6.38". All device and fixture box covers shall be painted with an enamel finish, ivory in color to match the raceway cover.

G. Where fill requirements exceed the 40% fill of the V200, the V500 series shall be used.

H. Box fill shall not exceed that allowed by the National Electric Code.

2.5 Cable Trays

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

1. Cablofil, Inc.
2. Cooper B-Line, Inc.
3. Flex Tray

B. Except as otherwise indicated, provide metal cable trays, of types, classes and sizes indicated with splice hangers and all other necessary accessories. Provide cable trays with rounded edges and smooth surfaces in compliance with applicable standards, and with the following construction features:

1. Spine Type Cable Tray
   a. Materials and finish: Aluminum. Center rails and rungs shall be extruded from Aluminum Association Alloy 6063. All fabricated parts shall be made from Aluminum Association Alloy 5052 and cast parts from Aluminum Association Alloy 319. All hardware and fasteners shall be zinc-plated steel in accordance with ASTM B633.
   b. Cable Trays shall be constructed of a center rail 1.6525"x3.250" with minimum section properties of Sx=0.701 cubic inches and lx=1.174 inches^4. Rungs shall be a single continuous square tube 0.54"x0.54" with radiuses corners and minimum section properties of Sx=0.019 inches^3 and lx=0.005 inches^4. Rungs shall be mechanically connected to the center rail in at least two places;

symmetrical about the center rail, with ends finished to protect installers and cables. B-Line Data-Track Cent-R-Rail systems or approved equal.

c. Rungs shall be spaced every 6".
d. Straight sections shall be supplied in 10' or 12' lengths.
e. Cable tray widths shall be as indicated on the drawings.
f. Splice hangers must also be capable of acting as the support points for all-thread rod.
g. Cable tray loading depth shall be 6".
h. All splices and connectors must be protect cables from the edges of the center rail and act as a barrier to prevent the center rail from transmitting hazardous gases or smoke; hardware must be installed vertically so as not to interfere with the cables in the cable fill area.
i. Where required, expansion splices shall allow for 1" of thermal expansion and contraction.
j. When required, and to provide an area free of center rails for cable transitions, contractor shall install a universal hub fitting. The universal hub fitting must be a cast aluminum structural member, B-Line CAU Series (flat sheets of steel or aluminum are not acceptable), which can be used with cable ties and allows the center rails to be connected so they may be pivoted at connection points.

2. Basket Type Cable Tray:
   a. Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, comply with ASTM B 633, Type 1.
   b. Dimensions: 12 inches wide by 4 inches deep minimum. Wire mesh spacing shall not exceed 2 inches by 4 inches.
   c. Supports: Cable tray shall be supported by trapeze style hanging clips on threaded rods on both sides of the tray. Center supports are prohibited. Exception: Cable tray in TRs which shall be supported by wall brackets.
3. Ladder Rack Cable Tray:
   a. Description: 1.5” high tubular side rail cable runway.
   b. Material: Metal, suitable for indoors, and protected against corrosion by factor powder coat, black unless specified otherwise.
   c. Dimensions: 12 inches wide by 1.5 inches deep minimum. Refer to drawings for alternate dimensions. Rung spacing shall be 9 inches on center.
   d. Supports: Ladder rack shall be supported by trapeze style hanging clips on threaded rod on both sides of the tray. Center supports are prohibited. Exception: Ladder rack in TRs which shall be supported by wall brackets.

4. Provide all necessary transitions at 90-degree angles, tees and change of cable tray size so that the cable tray is continuous. The drawings do not reflect these requirements due to the small scale. Transitions shall also be provided at all change of elevations.

C. Loading Capacities and Testing:
   1. Cable tray shall meet the loading requirements of NEMA 12C.
   2. Upon request, manufacturer shall provide test reports in accordance with the latest revision of NEMA VE-1 or CSA C22.2 No. 126-M91.

D. Coordinate installation with other trades to avoid conflicts prior to installation. Install as required to transition around, above, or below other trades work.

E. Shop Drawings: Provide complete shop drawings indicating all cable trays, devices, support points, offsets and transitions. Drawings shall be 1/8" scale. The Engineer will provide base sheets.

2.6 Boxes, Enclosures, And Cabinets

A. Sheet Metal Outlet and Device Boxes: Galvanized, NEMA OS 1. Boxes shall be 4"x 4" x 1-1/2" deep or larger(4" x 4" x 2 1/8" deep or larger for telecommunications and CATV). Use only in flush interior applications or non-finished surface mounted interior applications.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover. Use in exterior applications and interior finished surface mounted applications.

C. Floor Boxes: Per details on drawings.

D. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasket cover. Use in exterior applications and interior finished surface mounted applications.

E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.

1. Metal Enclosures: Galvanized steel, finished inside and out with manufacturer's standard enamel.

F. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

G. Fabricated Boxes shall be steel with inside and outside surfaces coated with corrosion-resistant paint or weather resistant coating. Covers shall be hinged or screwed with or without gaskets depending on location. All exterior boxes shall be rated NEMA 3R. Boxes shall be sized to meet the NEC Article 370-6 fill requirements.

H. Exterior In-Ground Junction Boxes: UL listed, polymer concrete construction, flared-wall, heavy duty cover (15,000 lbs. over a 10" square), open bottom construction. Equivalent to Quazite "PG" syle. Size as required or as indicated on the drawings, whichever is bigger.

2.7 Conductors

A. Conductors, No. 10 AWG and Smaller: 98% conductivity solid or stranded copper.

B. Conductors, No 8 AWG and Larger: 98% conductivity stranded copper.

C. Insulation: THW, THWN or XHHW unless noted otherwise on the Drawings.

D. Low Voltage Cables: Provide plenum rated where required.

E. Wire Connectors and Splices: Connectors for 600-volt conductors Size No. 18 to No. 6 AWG shall be pressure type, spring connectors. Use 600 volt splicer-reducer pressure connectors for copper conductors to 500 KCMIL. Use rectangular, solderless pressure connectors or split bolt-copper alloy connectors for copper conductors to 1000 KCMIL.

F. MC Cable: UL Type MC – meets applicable NEC standards – 600 Volt 90ºC (dry) rated. Copper power conductors THHN/THWW -2 insulated singles. Green insulated grounding conductor. UL rated for cable tray and environmental air-handling space installation; 1, 2, and 3-hour through-penetration Fire Wall rated. Aluminum interlocked armor, use steel connectors.

G. Wire Pulling Lubricant shall be a product produced specifically for wire pulling lubrication.

2.8 Supporting Devices

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.

C. Slotted-steel channel supports for multiple conduit (trapeze) hangers: Not less than 1-1/2”x1-1/2” (38 mm x 38mm), 12 gage steel, cold formed, lipped channels; with not less than 3/8” (9 mm) diameter steel hanger rods.

1. Channel Thickness: Adjust to suit structural loading of conduit and cables.
2. Fittings and Accessories: Products of the same manufacturer as channel supports.

D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

E. Conduit Straps: All conduit shall be secured with two hole galvanized straps where the following conditions exist:

1. All exterior locations.
2. All interior locations other than mechanical and electrical rooms where the conduit is below 10’. Conduit concealed in wall finishes and ceilings may use single hole strap if allowed by NEC.
3. All other locations not listed above and approved by the NEC may use single hole galvanized straps.
4. Single hole or double hole straps may not be used on direct grade. All conduits on grade shall be mounted to galvanized strut and properly attached and anchored.

F. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

G. Expansion Anchors: Carbon-steel wedge or sleeve type.

H. Toggle Bolts: All-steel springhead type.

2.9 Concrete Bases

A. Concrete Forms and Reinforcement Materials: Shall be provided for all floor mounted electrical equipment including, but not limited to: switchboards, transformers, etc. Concrete bases and structural steel to support this Division's equipment and raceways, and not specifically shown on Structural or Architectural Drawings shall be furnished by the Contractor whose equipment or raceways is to be supported. Provide a raised reinforced 4" concrete base for all floor supported equipment. Equipment installed outdoors on concrete slabs shall be provided with a 4" raised concrete base. Pad shall exceed the equipment's footprint by 4" on all sides. Provide a 1" chamfer on all exposed edges.

B. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength.

2.10 Touchup Paint

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

2.11 Equipment Backboards

A. Equipment Backboards shall be exterior grade 3/4" plywood finished on one side. Finish backboard with two coats of fire retardant gray paint before mounting. Exposed side of plywood shall be smooth interior grade. A copper ground bus shall be supplied with each backboard. The ground bus shall be Harger #TGBI14412TMGB or approved equal. The ground bus shall terminate the #6 AWG ground wire provided from the electrical system. Locate equipment backboards where indicated on the Drawings. Install straight and plumb. Secure to structure using screws, toggle bolts or masonry anchors. DO NOT use plastic or wood plugs in masonry or concrete. Do not install combustible backboards in air handling space, plenums or where prohibited by the local governing authority.

2.12 Sleeves: Sleeves shall be galvanized metal flanged type or schedule 40 galvanized steel pipe.

2.13 Concrete Inserts: Concrete inserts shall be galvanized steel, minimum 14 gauge cut to necessary length for the purpose. Use galvanized hardware.

2.14 Pull Wire and Pull Rope:

A. Pullwire shall be galvanized steel wire, No. 14 AWG minimum size.

B. Pullrope shall be ply cord with 2000 lbs. tensile strength, minimum.

2.15 Terminal Strips: Terminal strips shall be sectional barrier type made of molded phenolic for use in wiring control panels. Number of terminals and ampacity shall be as indicated on the Drawings. The binding head shall be screw in type.

PART 3 - EXECUTION

3.1 Electrical Equipment Installation

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom. Comply with NEC Requirements.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated. Materials and equipment shall be installed in a neat and workmanlike manner according to the standards of the industry. Materials and equipment installed and not meeting the standards of the industry may be rejected and required to be removed and reinstalled by the Contractor at no additional cost to the Owner. Minor location changes from those indicated may be necessary so that work can conform with the building as constructed, to fit work of other trades or to comply with the rules of authorities having jurisdiction. Refer to structural drawings for framed openings for raceways, etc., in floors and roofs. Contractor shall be responsible for locating and providing proper dimensions for all required electrical openings.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 Raceway Application

A. Use the following raceways for outdoor installations:

1. Exposed: RGS.
2. Concealed: IMC or RGS.
3. Underground: RGS. Feeders and branch circuit raceways installed below grade equal to and greater than 3/4" may be Schedule 80 PVC, at the contractor's option. If PVC is used underground or below slab, elbows and risers through grade or slab shall be RGS, except as listed below in paragraph 3.4. All exposed raceways penetrating concrete slab shall be rigid metal conduit (no exceptions). Raceways shall not be routed in concrete slabs on grade. Raceways routed in concrete slabs above grade (second floor or above) shall be either RGS, IMC or Schedule 40 PVC. Communication raceways shall be run overhead within the building except for connection to floor boxes. Communication and/or low voltage system raceways that exit from under the building slab shall be metallic (in all cases). Any raceway not meeting this requirement shall be replaced at the contractor's expense. Additional construction time and compensation for the correction of the deficiency will not be allowed.
4. Rigid metal conduit installed underground or in contact with concrete shall be painted with two coats of alkali and acid resistant paint such as bitumastic or equal. Coating shall not be diluted and shall completely cover conduit. Coating for exposed conduits shall not extend more than 4” above finished grade. Coating system shall be approved by the Engineer prior to use/application.

   RETAIN PARAGRAPH FOR AUBURN PROJECTS ONLY.
5. Rigid metal conduit installed underground or in contact with concrete shall be fully wrapped UL Listed corrosion resistant tape. Tape wrap shall completely cover the metal conduit and shall extend not more than 4” above finished grade.

6. Connection to Vibrating Equipment: LFMC.
7. Provide sealing fittings to prevent passage of water vapor where conduits pass from warm to cold locations, i.e., refrigerated spaces, constant temperature rooms, air conditioned spaces, building exterior walls, roofs or similar spaces.
8. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.

B. Use the following raceways for indoor installations:

1. Exposed: RGS or IMC, except EMT is acceptable in mechanical and electrical rooms above 6' AFF. Conduit may be exposed in equipment rooms, vertical chases, mechanical and electrical rooms, other similar spaces not normally habitable or exposed to public view, and where electrical drawings specifically note "exposed conduit."
2. Concealed: EMT.
3. MC Cable: Shall only be used on short runs from junction box above ceiling to oulet boxes in the ceiling (for light fixtures), and walls (for receptacles and switches, etc.) of the same space or room. EMT or other approved raceway shall be run from this junction box to the serving circuit breaker. MC Cable shall not extend from one space or room to another.
4. Connection to Mechanical, Plumbing and Fire Protection Equipment: LFMC; exceptions: controls not mounted on equipment, which shall comply with Section B above; and smaller air handling units such as variable air volume units and air terminal units mounted above ceilings outside mechanical rooms which shall be FMC.
5. Connection to Vibrating Equipment: FMC; except in wet or damp locations and as listed in B.4, use LFMC.
6. Damp or Wet Locations: IMC or RGS.
7. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.
8. Rigid non-metallic conduit where used for risers in concealed areas, shall transition to metallic conduit at the first junction box, but in no case shall it extend higher than 7' within the space.

C. Use the following raceways for hazardous installations:

1. Raceways in hazardous (classified) areas shall be RGS.
2. Install UL approved sealing fittings that prevent passage of explosive vapors, in hazardous areas equipped with explosive proof lighting fixtures, switches, and receptacles as required by the NEC.
3. All devices and junction boxes shall be rated for the classified areas.

3.3 Raceway And Cable Installation

A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

B. Install raceways and cables at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.

C. Refer to structural drawings for framed openings for raceways, etc., in floors and roofs. Contractor shall be responsible for locating and providing proper dimensions for all required electrical openings. Review structural steel shop drawings and coordinate location of equipment with structural elements to ensure proper clearance and headroom.

D. Layout and install raceways with sufficient clearance to permit proper installation.

E. Install raceways straight and plumb. Squarely cut conduit and properly ream to remove all constriction and burrs before making up joints. Paint exposed threads to retard rusting. Bending of conduit with a pipe tee or vise is prohibited.

F. Conductors shall not be installed until conduit system is complete. Bending radius of insulated wire or cable shall not be less than the minimum recommended by wire or cable manufacturer. Maximum pulling tension of any wire or cable shall not exceed manufacturer's recommended values. Do not injure insulation while installing wire in conduits.

G. Use temporary raceway caps to prevent foreign matter from entering. During construction, after the building has been dried in and prior to any wire being pulled, all conduit shall be cleaned so that it is free of foreign material and water.

H. Provide an equipment grounding conductor which shall be separate from the electrical system neutral conductor. See corresponding specification section.

I. Make conduit bends and offsets so inside diameter is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

J. Make bends in exposed parallel or banked runs from the same centerline.

K. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

L. For slabs located above grade in multistory buildings (second floor and above), embed raceways in slabs in middle third of slab thickness where practical, and leave at least 1-inch (25-mm) concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
2. Space raceways laterally to prevent voids in concrete.
3. Install conduit larger than 1-inch trade size (DN27) parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit or rigid steel conduit before rising above floor.
5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

M. For slabs on grade level, conduit shall be buried below grade by a minimum of 12”. Conduits may not be installed in grade level slabs.

N. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of the pull wire.

O. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch (1830-mm) flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

P. Set floor boxes level and trim after installation to fit flush to finished floor surface. Seal box to prevent entrance of moisture or dirt.

Q. Boxes: Attach boxes to concrete formwork, or to other surrounding building material. Provide additional junction and pull boxes where injury to insulation or deformation of wire would occur due to excessive pulling resistance. When several feeders pass through a common pull box, tag each feeder separately, indicating electrical characteristics and destination.

1. Boxes shall be accurately located. Consult Architectural plans for dimensions.
2. Mount boxes in the course nearest to the height specified when installed in finished block, brick or tile walls.
3. Boxes for use with raceway systems shall be minimum 1 1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum 4 inches square, except 4-by-2 inch boxes may be used where only one raceway enters outlet.
4. Pull boxes shall be at least the minimum size required by NFPA 70 and of code-gauge galvanized sheet steel, or compatible with nonmetallic raceway systems, except where cast-metal boxes are required in locations specified herein. Furnish boxes with screw-fastened covers. Where several feeders pass through a common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.
5. Extension rings shall not be used in new construction. Size all boxes according to fill. Any extension rings found shall be removed at the contractor's expense, unless specifically approved by the Engineer.
6. Recessed Installation: Boxes and covers shall be installed so that the covers are flush with the finished surfaces. Boxes in masonry or tile construction shall have masonry boxes or boxes with square cut tile covers. Do not cut concrete block through its entirety in order to accommodate any type box. "Handy" boxes shall not be used.
7. Boxes in Partitions: Through type boxes are not permitted except where shown on electrical drawings. Recessed outlet boxes, cabinets, consoles, etc., when shown located back-to-back shall be provided with 1/2" fiberglass insulation between the boxes.
8. Verify box/enclosure placement in rated assemblies and comply with UL spacing/opening requirements. Fire stop as required.

R. For all conduits entering junction boxes in interior spaces, seal spare conduits with approved conduit plugs. Seal conduits containing fiber-optic communications cable with conduit sealer.

S. Surface raceway and fittings:

1. Prior to and during installation, refer to manufacturer’s layout drawings indicating all elements of the system. Contractor shall comply with detailed manufacturer’s instruction sheets which accompany system components as well as complete system instruction sheets, whichever is applicable.
2. Mechanical Security. All raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, cabinets, in accordance with manufacturer’s installation sheets.

3. Electrical Security. All metal raceway shall be electrically continuous and bonded in accordance with the National Electrical Code for proper grounding.
4. Raceway Support. Raceway shall be securely supported at intervals not exceeding 10 feet or in accordance with manufacturer's installation sheets.
5. Completeness. All systems shall be installed complete, including bushings and inserts where required by manufacturer's installation sheets. All unused raceway openings shall be closed.
6. Install in dry locations only. It shall be used in all renovated areas where raceway is exposed. Exception: mechanical, electrical, janitor, and storage areas. EMT shall not be used in exposed finished areas.

T. Wet or Damp Locations:

1. Use rigid steel or IMC unless noted otherwise.
2. Provide sealing fittings, to prevent passage of water vapor, where conduits pass from warm to cold locations, i.e., (refrigerated spaces, constant temperature rooms, air conditioned spaces building exterior walls, roofs) or similar spaces.
3. Use rigid steel or IMC conduit within five feet of the exterior and below concrete building slabs in contact with soil, gravel, or vapor barriers. Cover conduit on the outside with factory coating of 20 mil bonded PVC or field coat with asphaltum before installation. After installation, completely coat damaged areas of coating.
4. Wireways and fittings shall be used for exposed work and when installed outdoors or in wet locations shall be approved weatherproof construction.

U. Bushings shall be provided at the end of all conduits to protect the insulation of the conductor. Provide grounding bushings for metal raceways, boxes, and cabinets to insure that all metallic surfaces are effectively grounded. Metallic raceway may be bonded to cabinets, boxes and panelboards by double locknut and bushing to ensure the metallic parts are all effectively grounded.

V. Install pull boxes in conduit at intervals of 200 feet or less except when these intervals will place the pull box cover in a finished floor area or non-accessible place, the interval may be extended to a maximum distance of 300 feet. Request for each deviation or extension of interval shall be made and approval granted by the Engineer before proceeding with the installation. If any conduit run is found to be greater than 300 feet and the contractor has not secured prior approval from the engineer, a new raceway shall be installed to replace the deficient one at the contractor's expense.

W. Conduit Installed in Concrete:

1. Conform to applicable portion of Section 703 of ACI Standard Code for reinforced concrete.
2. Conduit: Rigid Steel, IMC or EMT; except do not install EMT in concrete slabs that are in contact with soil, gravel or vapor barriers.
3. Align and run conduit in direct lines.
4. Locate conduits in center third of concrete slab thickness. Outside conduit diameter not to exceed 1/3 concrete slab thickness. Install no conduit in concrete slabs of less than 3" thick.
5. Conduits in concrete slabs shall not cross at an angle of less than 45 degrees.
6. Conduits shall not pass through beams except when shown on the Drawings.

7. Space vertical installation of conduit through concrete slabs not closer than three diameters on center.
8. Space between conduit in slabs not closer than six diameters apart, except one conduit diameter at conduit crossings.
9. Where conduits rise through floor slabs, curved portion of bends shall not be visible above finish floor.

3.4 Special PVC Requirements

A. Floor Penetrations:

1. Rigid metallic conduit for all exposed conduits, regardless of size and concealed conduits greater than 1 ½". Schedule 40 PVC for conduits less than 1 ½" concealed in walls. All conduit concealed by floor mounted equipment may be schedule 40 PVC (if less than 1 ½" and less than 50 feet and length) or rigid metallic conduit (if 1 ½" or greater and greater than 50 feet in length). Concealed PVC conduit (less than 1 ½") shall transition to metal conduit as soon as practical above slab.

B. Bends:

1. Conduits less than 1 ½": Conduit elbows may be either rigid non-metallic or non-corrosive rigid metallic conduit. In circuit runs exceeding 50', all bends shall be non-corrosive rigid metallic conduit. Bends may be factory or field fabricated using manufacturer approved heat boxes. Field fabricated bends using blowtorch are not acceptable.
2. Conduits 1 ½" and larger: Conduit elbows shall be rigid non-corrosive metallic conduit only, unless specifically allowed otherwise by the Engineer. Schedule 40 PVC elbows shall not be used.
3. A cable pulling plan may be requested by the Engineer on long pulls.
4. The Engineer may allow special provisions for the installation of PVC elbows.

C. Minimum Size:

1. Minimum size of PVC conduit to be installed below slab shall be 3/4".

D. Jointing:

1. Pipe and fittings shall be cement welded or threaded (only for Schedule 80 conduit) and made watertight. All joints shall be cleaned with solvent or sanded smooth prior to application of cement.

3.5 Raceway Methods For Voice, Data And CATV

A. A conduit shall be a home run overhead from each data outlet and each CATV outlet to the serving communications room. Each conduit shall serve one CO outlet only. Conduit shall be 1" trade size for data outlets and 1" trade size for CATV outlets. Total conduit length to each data outlet shall not exceed 280'.

B. J-hook: A conduit shall be stubbed up above ceiling from each data outlet and each CATV outlet to an accessible ceiling space. Each conduit shall serve one CO outlet only. Conduit shall be 1" trade size for data outlets and 1" trade size for CATV outlets. Cables will then be J-hooked to serving telecommunications room.

1. J-hooks shall be independently supported from the building structure. Supporting J-hooks from piping, ductwork, ceiling hangers, etc. shall not be permitted.

C. Cable tray: A conduit shall be stubbed up above ceiling from each data outlet and each CATV outlet to the nearest cable tray. Each conduit shall serve one CO outlet only. Conduit shall be 1" trade size for data outlets and 1" trade size for CATV outlets. Conduit shall terminate at cable tray.

D. Conduit bodies such as 'LB' fittings are not allowable.

E. Pull boxes for 1" data conduits and ¾" CATV conduits shall be 4" wide x 4" long x 2-1/8" deep NEMA 1 galvanized steel with screw cover. Where 1" data or ¾" CATV conduits are tightly racked with uniform spacing, wider pull boxes may be provided to serve multiple conduits. Terminate conduits at opposite ends of pullboxes. Do not terminate conduits at right angles to each other except as specifically indicated.

F. Provide pullboxes for each run of conduit at every 100 feet on center and at each end of conduit runs containing a total of two 90 deg bends or a combination of lesser bends totaling 180 deg (minimum requirements - provide whether specifically indicated or not). Conduit runs containing more than two 90 deg bend without a pullbox are not acceptable. Factory conduit elbows and all other bends shall have a minimum radius of six times the internal conduit diameter. Conduit offsets and pullboxes required to suit field conditions and to conform to these requirements shall be provided at no additional cost to the owner.

G. Conduits that extend outside the building shall be metallic, no exceptions.

H. For existing facilities: NEMA 3R metallic enclosures shall be provided where the conduit exits the building. The box shall be sided to terminate all circuits and provide proper TVSS and grounding. A separate driven ¾" by 20' ground rod shall be driven at each junction box location. Grounding shall also be bonded to the building electrical ground. Metallic conduit shall be properly bonded to the metallic junction box.

3.6 Wiring Methods For Power, Lighting, And Control Circuits

A. Feeders: Type THHN/THWN insulated conductors in raceway.

B. Underground Feeders and Branch Circuits: Type THWN insulated conductors in raceway.

C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.

D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

E. Except for control wiring, the minimum size of wire shall be No. 12 AWG.

F. For all lighting and power receptacle circuits (20 ampere), the minimum wire size is #12 AWG. The total distance for the travelers on three-way circuits shall calculated and distance limitations applied. Wire sizes that are installed and do not meet the size/distance criteria, shall be removed and replaced at the contractor's expense. The larger wire size applies to the home run. Minimum wire size for 120V and 277V, 20 ampere circuits to limit voltage drop to 3% or less is as follows:

1. Less than 50' - #12 AWG (120V).
2. Circuits greater than 50' but less than 100' - #10 AWG (120V).
3. Circuits greater than 100' but less than 150' - #8 AWG (120V).
4. Circuits greater than 150' but less than 270' - #6 AWG (120V).
5. Circuits greater than 270' but less than 420' - #4 AWG (120V).
6. Less than 150' - #12 AWG (277V).
7. Circuits greater than 150' but less than 240' - #10 AWG (277V).
8. Circuits greater than 240' but less than 400' - #8 AWG (277V).
9. Circuits greater than 400' but less than 620' - #6 AWG (277V).
10. Circuits greater than 620' but less than 950' - #4 AWG (277V).

3.7 Wiring Installation

A. General: Conductors shall not be installed until conduit system is complete. Bending radius of insulated wire or cable shall not be less than the minimum recommended by wire or cable manufacturer. Maximum pulling tension of any wire or cable shall not exceed manufacturer's recommended values. Do not injure insulation while installing wire in conduits.

B. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Splices: Splices shall be permitted in junction boxes, outlet boxes of other permanently accessible locations. Conductors No. 6 or smaller shall be spliced with devices approved by Underwriters Laboratories, Inc., as splicing connectors. Splices in conductors larger than No. 6 shall be accomplished with devices approved by Underwriters Laboratories as pressure cable connectors.
2. Splices made in underground boxes or wet locations shall be made with commercial, UL approved cast resin splicing kit (120 volt circuits or greater). Splices for low voltage circuits may not be made below grade or in wet/damp locations.

C. Wire Pulling Lubrication: Shall be used when any wire is pulled by mechanical means. Wire and cable shall be carefully handled during installation. Soap flakes or vegetable soaps shall not be used for lubrication.

D. Install wiring at outlets with at least 12 inches (300 mm) of slack conductor at each outlet.

E. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 468B.

F. Provide dedicated neutrals for all 120V and 277V circuits.

G. Conductors in Parallel: Conductors connected in parallel (electrically joined at both ends to form a single conductor) shall be of the same length, of the same conductor material, the same circular-mil area, the same insulation types and terminate in the same manner. Where installed in separate raceways or cables, the raceways or cables shall have the same physical characteristics.

H. Wiring in switchboards, panelboards, junction cabinets, etc., shall be neatly formed to present a neat and orderly appearance.

I. Interconnections of control wiring shall be on identified numbered terminal strips.

3.8 Expansion Joints

A. Conduits three inches and larger that are secured to the building structure on opposite sides of a building expansion joint, require expansion and deflection couplings. Install couplings in accordance with the manufacturers' recommendations.

B. Provide conduits smaller than three inches with junction boxes on both sides of the expansion joint. Connect conduits to junction boxes with sufficient slack of flexible conduit to produce 5" vertical drop midway between end. Flexible conduit shall have a green copper ground-bonding jumper installed. In lieu of this flexible conduit, expansion and deflection couplings as specified above for three inches and larger conduits are acceptable.

C. Expansion fittings shall be provided for raceways to compensate for thermal expansion and contraction in conduit runs 200 feet or greater and at building expansion joints. Bonding jumpers shall be provided for electrical continuity of the raceway system at the expansion fittings.

3.9 Caulking And Seals:

A. Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases. Fire stop shall be rock wool fiber, silicone foam sealant or approved equal. Completely fill and seal clearances between raceways and openings with the fire stop material. Adhere to manufacturer's installation instructions.

B. At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight.

3.10 Electrical Supporting Device Application

A. Damp Locations and Outdoors: Hot-dip galvanized materials.

B. Dry Locations: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instructions.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.11 Support Installation

A. Install support devices to securely and permanently fasten and support electrical components.

B. Support no electrical work from piping, ductwork, etc. Where metal decking is used, provide supports independent of decking so that loads will not be transferred to decking. Drill through decking and secure supports to concrete slab.

C. Conduit through Slab Supports: Conduit supports for conduits routed from below grade up through concrete slabs shall be solid, metallic type. Metallic conduit shall not be used to support conduits through slab. After concrete slab has been poured and set, supports shall be cut flush with slab.

D. Support conduit within one foot of changes of direction, and within one foot of each enclosure to which it is connected.

E. Electrical devices in lay-in and gypsum board ceilings: Coordinate location of electrical outlets with architectural features of the building and with the equipment of other trades. Boxes or devices mounted between bar joists or "T" bars shall be supported from two bars or joists. Devices and associated boxes shall not be supported by the lay-in tiles.

F. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

G. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

H. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

I. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

J. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.

K. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

L. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals. Vertical conduit inside building shall be supported at each floor level and at 10'0" intervals. Simultaneously install vertical conductor supports with conductors.

M. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers

are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.

N. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

O. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

P. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Wood: Fasten with wood screws or screw-type nails.
2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts.
5. Steel: Welded threaded studs or spring-tension clamps on steel.
   a. Field Welding: Comply with AWS D1.1.
6. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
7. Light Steel: Sheet-metal screws.
8. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

Q. Equipment Supports: Concrete bases and structural steel to support this Division's equipment and raceways, and not specifically shown on Structural or Architectural Drawings shall be furnished by Contractor whose equipment or raceways is to be supported. Provide a raised reinforced 4" concrete base for all floor supported equipment. Equipment installed outdoors on concrete slabs shall be provided with a 4" raised concrete base. If equipment is being installed on grade, concrete base shall be provided that will allow a minimum of 3” above finished grade and sod.

3.12 Firestopping

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Comply with UL assembly rating requirements.

B. Space junction boxes, receptacles and panels installed in rated assemblies to comply with UL listings. Verify prior to installation.

C. Cracks, voids, or holes up to 4" diameter shall be filled with putty, caulking, or one-piece intumescent elastomer which is non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat.

D. For openings 4" or greater use a sealing system capable of passing 3-hour fire test in accordance with ASTM E-814. Sealing system shall consist of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350°F.

3.13 Concrete Bases

A. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement.

3.14 Cutting And Patching

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

C. Sleeves Through Roof: Coordinate setting with Division 7. Contractor setting sleeves for his electrical conduit is responsible for filling sleeve pockets with roof bitumen and insuring there is no moisture leakage during roof guarantee period.

3.15 Field Quality Control

A. Inspect installed components for damage and faulty work, including the following:

1. Raceways.
2. Building wire and connectors.
3. Supporting devices for electrical components.
4. Electrical identification.
5. Concrete bases.
6. Cutting and patching for electrical construction.
7. Touchup painting.

3.16 Refinishing And Touchup Painting

A. Refinish and touch up paint as follows. Paint materials and application requirements are specified in Division 9 Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
5. Finishes in areas not listed or otherwise noted shall be black enamel.
6. Hangers, supports, structural steel and equipment that are not factory finished shall be prime coated and finished coated with color to match the area in which it will be located.
7. Electric cabinets, switchboards, panelboards and equipment that is factory finished and has damaged finish shall be touched up to match the factory finish.
8. All surfaces that are to be painted shall be free of rust, scale, oil and grease before prime coat is applied.
9. Paint all junction boxes and conduit as described herein.

3.17 Grounding

A. Ground and bond in accordance with NEC Article 250 and other applicable articles.

B. Provide an equipment grounding conductor which shall be separate from the electrical system neutral conductor. The equipment grounding conductor shall be colored green. It shall be continuous from a connection at the Service Entrance Equipment Ground to all switchboards, distribution and branch panelboards. Equipment grounding conductors shall be provided in all branch circuits serving convenience outlets, receptacles, portable and permanently installed electrical appliances, equipment apparatus and other miscellaneous metal enclosing bodies including light switch boxes normally within contact of personnel. Branch circuit grounding conductors shall be sized in accordance with the National Electrical Code. Connections at panelboards, outlets, equipment and apparatus shall be made in an approved and permanent manner. Resistance to ground shall not exceed 15 ohms.

C. Bond bushings of the raceway system to ground lugs in boxes, cabinets, motors and equipment to assure electrical continuity of all metallic components of the electrical systems. Comply with the requirements of NEC Articles 250D, 250E, 250F, 250G, 250J and 250K. Where equipment is not provided with a grounding lug, provide ground lugs suitable for wire being installed.

3.18 Cleaning And Protection

A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.19 General Tests And Inspections

A. Prepare systems, equipment, and components for tests and inspections, and perform preliminary tests to ensure that systems, equipment, and components are ready for testing. Include the following minimum preparations as appropriate:

1. Perform insulation-resistance tests.

2. Perform continuity tests.
3. Perform rotation test (for motors to be tested).

B. Test Equipment Suitability: Comply with NETA ATS, Section 5.2.

C. Test Equipment Calibration: Comply with NETA ATS, Section 5.3.

D. Test Electrical Connector and Terminal Torque Report: Prepare a report documenting location for each connector/termination, manufacturer's specified torque value for each connector/termination, and field torque value.

E. Test and Inspection Reports: In addition to requirements specified elsewhere, report the following:

1. Manufacturer's written testing and inspecting instructions.
2. Calibration and adjustment settings of adjustable and interchangeable devices involved in tests.
3. Tabulation of expected measurement results made before measurements.
4. Tabulation of "as-found" and "as-left" measurement and observation results.

END OF SECTION

SECTION 260550 – EXCAVATION AND BACKFILL

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Review all project Drawings to be aware of conditions affecting work herein.

PART 2 - PRODUCTS

2.1 Sand: Clean, hard, uncoated grains free from organic matter or other deleterious substances. Sand for backfill shall be of a grade equal to mortar sand, with 95% passing a No. 8 sieve, and not more than 8% passing a No. 100 sieve.

2.2 Gravel: Clean, well-graded hard stone or lime rock gravel, free from organic material. Size range to be from No. 4 screen retentions to 1".

2.3 Earth: Must be free of stones, wood, roots or rubbish.

2.4 Underground-Line Warning Tape: See Specifications Section 26 05 53/Electrical Identification

PART 3 - EXECUTION

3.1 Ditching and Excavation: Shall be performed by hand wherever the possibility of encountering obstacles or any existing utility lines. The Contractor will be totally responsible to insure that no utility or service interruptions shall be caused and that no existing utilities or obstructions will prohibit installations of service under this Contract at proper grade and location. Where clear and unobstructed areas are to be excavated, appropriate machine excavation methods may be employed. Avoid use of machine excavations within the limits of the building lines except when machine weights and operation will not damage sub-surface structural components or piping.

A. Install longitudinal runs of conduit a minimum of one foot from back of curb or 6 feet from edge of pavement in the absence of curb. If ditches are present, install conduit a minimum of 4 feet from the bottom of the ditch line.

B. Maintain a minimum trench depth of 30 inches (or 12 inches below areas blocked by rock or impenetrable obstructions) below finished grade. Upon completion, restore surface to like-

original condition within 7 calendar days of occurrence of damage. Remove all rock and debris from backfill material. Remove excess material from site and compact area according to NEC Article 300-7. Backfill with excavated material and compact to 95% of original density.

3.2 Bedding: Excavate to bottom grade of raceway to be installed, and shape bed of undisturbed earth to contour of conduit for a width of at least 5% of the conduit diameter. If earth conditions necessitate excavation below raceway grade, bring the bed up to the proper elevation with clean, dry sand deposited in 6" layers and firmly tamped by mechanical means. If sub-cut exceeds 12" or if bed is of an unstable nature, a 6" minimum layer of rock will be required before sand bedding begins.

3.3 Placing: Conduit shall be carefully handled into place in the excavation. Avoid knocking loose soil from the banks of the trench into the conduit bed. Coated conduit shall have special handling slings to prevent damage to the coating. All holidays in the conduit coating shall be touched in before beginning back filling.

A. If one or more conduit is required between the same points, install conduit in one common trench.

3.4 Backfilling: Deposit earth or sand carefully in 6" layers, maintaining adequate side support. Compact fill in 6" layers, using mechanical means up to the top elevation of the conduit and 12" layers to finish grade.

A. Backfill trench at locations along the trench path where non-movable objects, such as rocks and boulders, cannot be avoided. The purpose of the backfill is to provide a gradual change in elevation of the trench, so that excessive bending and stress will not be transferred to conduits once underground conduit system is installed.

3.5 Identification: Provide identifying metalized plastic warning tape above non-metallic conduit and standard plastic warning tape above metal conduit. Warning tape shall be placed approximately 12" above the conduit. Replace surface to the original condition, i.e., sodding, sprigging, and fine grading.

3.6 Excavation shall be maintained in satisfactory condition during the progress of the work. Sub-surface structures shall be constructed in adequately sized excavations and dewatering equipment shall be installed and properly maintained. Shoring shall be employed in the event of unstable soil conditions and in all cases to protect materials and personnel from injury.

3.7 Conduits to be installed below the footings or foundations shall be installed prior to the installation of the footings. All soil shall be compacted to meet the structural requirements for the footings. If it is not possible to install the conduit prior to pouring of the footings, it shall be necessary for the contractor to provide a bridge footing to span the excavation plus 2 feet on either side of the excavation. The footing modifications shall be approved prior to installation by the Structural Engineer.

3.8 After installation of conduits and upon completion of tamping and backfilling, perform a mandrel test on each conduit to ensure no conduit has been damaged. Furnish a non-metallic mandrel having a diameter of approximately 50% of the inside diameter of the conduit through which it is to be pulled. If damage has occurred, replace the entire length of conduit. Ensure pull cord is re-installed.

3.9 Directional Drilling:

A. Maintain a minimum depth of 4 feet under roadways, driveways, sidewalks, etc.

B. Guarantee the drill rig operator and digital walkover locating system operator are factory-trained to operate the make and model of equipment provided and have at least one-year experience operating the make and model of drill rig. Submit documentation of the operator’s training and experience for review at least 2 weeks before start of directional drilling.

C. Provide a means of collecting and containing drilling fluid/slurry that returns to the surface such as a slurry pit. Provide measurements to prevent drilling fluids from entering drainage ditches and storm sewer systems. Prevent drilling fluid/slurry from accumulating on or flowing onto pedestrian walkways, driveways and streets. Immediately remove all drilling fluids/slurry that are accidentally spilled.

D. Directional Drilling Operations:
   1. Provide grounding for the drill rig in accordance with the manufacturer’s recommendations.
   2. Place excavated material near the top of the working pit and dispose of properly. Backfill pits and trenches to facilitate drilling operations immediately after drilling is completed.
   3. Use drill head suitable for the type of material being drilled and sized no more than 2 inches larger than the outer diameter of the conduit. Direct drill to obtain proper depth and desired destination. Pressure grout with an approved bentonite/polymer slurry mixture to fill all voids. Do not jet alone or wet bore with water.
   4. During drilling operation, locate drill head every 10 feet along drill path and before traversing underground utilities or structures. Use digital walkover locating system to

track drill head during directional drilling operation. Ensure locating system is capable of determining pitch, roll, heading, depth and horizontal position of the drill head at any point.

5. Once drill head has reached final location, remove head and install back reamer of appropriate size (no more than 2 inches larger than outer diameter of conduits) to simultaneously facilitate back reaming of drill hole and installation of conduit. Back reamer is sized larger than actual conduits to ensure conduits are not adversely subjected to deviations caused by the original drill operations and are as straight as practical in their final position.
6. The intent of these Specification is to limit the diameter of the actual drill shaft/hole so that it is no more than 2 inches larger than the conduit outer diameter. The 2 inches larger diameter may be accomplished during the original bore or during the back reaming/conduit installation process.
7. Once installation of conduit has started, continue installation without interruption so as to prevent conduit from becoming firmly set. Apply bentonite/polymer slurry mixture during conduit installation.
8. Upon completion of conduit installation, perform a mandrel test on conduit system to ensure conduit has not been damaged. Furnish non-metallic mandrel with a diameter of approximately 50% of the inside diameter of the conduit through which it is to be pulled. If damage has occurred, replace the entire length of conduit and ensure that pull line is re-installed.

E. Drilling Fluids:
1. Use lubrication for subsequent removal of material and immediate installation of the conduit. The use of water and other fluids in connection with directional drilling operations will be permitted only to the extent necessary to lubricate cuttings. Do not jet alone or wet bore with water. Use drilling fluid/slurry consisting of at least 10% high-grade bentonite/polymer slurry to consolidate excavated material and seal drill hole walls.
2. Transport waste drilling fluid/slurry from site and dispose of in a method that complies with Federal, State and local laws and regulations.

3.10 Paved trenching: All conduit installation under existing paved surfaces shall be directional bored. Trenching shall only be permitted with prior approval from the Engineer and Owner. On concrete surfaces, replace the entire joint of concrete unless otherwise specified. On all other surfaces, neatly cut and replace the width of trench with like material.

A. Finish paved areas with materials matching damaged areas. For conduit installed under roadways, cut neatly and replace the width of paved area damaged by trenching. For conduit installed under sidewalks and walkways, remove entire section of slab from joint to joint and replace. Place graded stone material to temporarily maintain traffic where repairs cannot be performed immediately.

3.11 Reconditioning Surfaces:

A. Restore, to their original elevation and condition, unpaved surfaces disturbed during installation of duct, handholes, etc. Preserve sod and topsoil removed during excavation and reinstall after backfilling is completed. Replace sod that is damaged with sod of quality equal to that which was removed. When the surface is disturbed in a newly seeded area, re-seed the restored surface

with the same quantity and formula of seed as that used in the original seeding and provide top soiling, fertilizing, liming, seeding, sodding, sprigging, or mulching.

3.12 Paving Repairs:

A. Where trenches, pits, or other excavations are made in existing roadways and other areas of pavement where surface treatment of any kind exists, restore such surface treatment or pavement to the same thickness and in the same kind as previously existed, except as otherwise specified, and to match and tie into the adjacent and surrounding existing surfaces.

END OF SECTION

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes the following:

1. Identification for raceway.
2. Identification for conductors and communication and control cable.
3. Underground-line warning tape.
4. Warning labels and signs.
5. Instruction signs.
6. Equipment identification labels.
7. Miscellaneous identification products.

1.3 Submittals

A. Product Data: For each electrical identification product indicated.

B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.

C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

1.4 Quality Assurance

A. Comply with ANSI C2.

B. Comply with NFPA 70.

C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 Raceway Identification:

A. Paint: Semi-gloss acrylic-enamel.

B. Marker for circuit identification on box covers: Permanent, waterproof, black ink marker (exception: brown and black painted covers which shall use permanent, waterproof, white paint based marker).

2.2 Conductor and Cable Identification Materials:

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Insulation shall be factory-colored in accordance with paragraph “Installation.”

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking nylon tie fastener.

E. Write-On Tags: Polyester tag, 0.01 inch thick, with corrosion-resistant grommet and polyester or nylon tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.3 Floor Marking Paint:

A. Semi-gloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.

1. Primer: Interior concrete and masonry primer.
2. Finish Coats: Interior semi-gloss alkyd enamel.

2.4 Underground-line Warning Tape:

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 5.5 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core 3.5 mils thick.
4. Printed legend shall indicate type of underground line.

2.5 Warning Labels and Signs:

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.

D. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.

E. Warning label and sign shall include, but are not limited to, the following legends:

F. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.6 Instruction Signs:

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

B. Engraved legend with black letters on white face.

C. Punched or drilled for mechanical fasteners.

D. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 Equipment Identification Labels:

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. Black letters on a white background. White letters on a red background for Emergency and Optional Standby systems.

2.8 Miscellaneous Identification Products:

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 Accessible Raceways More Than 600 V:

A. Identify with "DANGER-HIGH VOLTAGE" in black letters at least 2 inches high, with self-adhesive vinyl labels. Repeat legend at 10-foot maximum intervals.

3.2 Accessible Raceways 600 V or Less, for Service, Feeder, and Branch Circuits:

A. Identify interior raceway systems with paint as follows:

1. Conduits: paint all couplings per the color coding below.
2. Junction Boxes:
    a. Paint all junction and pull box covers per the color coding below.
    b. For covers containing branch circuits: after painting the cover the appropriate color, hand write the panelboard/circuit number contained in the box (i.e. 2P1-15,17,19).
    c. For covers containing feeder circuits: after painting the cover the appropriate color, hand write the feeding panel and load panel (i.e. 4D1 to 2P1A).

B. Coupling and box cover colors as follows:

1. 120/208 Volt Systems: Black.
2. 277/480 Volt Systems: Brown.
3. 120/208 and 277/480 Volt System Junction Boxes containing Emergency Circuits: Paint box cover color of voltage and provide a red stripe.

3.3 Auxiliary Systems:

A. Identify interior raceway systems with paint as follows:

1. Conduits: paint all couplings per the color coding below.
2. Junction Boxes: Paint all junction and pull box covers per the color coding below.

B. Coupling and box cover colors as follows:

1. Fire Alarm System: Red.
2. Access Control & Security System: Yellow.
3. Telecommunication System: Blue.
4. Other Systems: Paint a unique color (do not use any of the above colors or green or white).

3.4 Accessible Raceways 600V or Less, for Service, Feeder, and Branch Circuits:

A. Identify interior raceway systems as follows:
1. Conduits (including couplings and fittings) located above ceilings and exposed in mechanical and electrical rooms shall be factory finished per the color coding below. Exception: conduits located in areas with exposed ceilings may be painted to match surrounding finish provided the couplings and box covers are painted per the color coding below.

2. Junction boxes:
   a. Paint all junction, pull boxes, and covers per the color coding below.
   b. For covers containing branch circuits: after painting the cover the appropriate color, hand write the panelboard/circuit number contained in the box and voltage (i.e. 2P1-15,17,19 / 120/208V). Except as indicated below.
   c. For covers containing feeder circuits: after painting the cover the appropriate color, hand write the feeding panel and load panel and voltage (i.e. 4D1 to TP1A / 480V). Except as indicated below.
   d. For covers in exposed finished areas: After painting the cover the appropriate color, affix a permanent label identifying the circuit/feeder information.
   e. For covers containing lighting control cabling: after painting the cover the appropriate color, label cover with white stenciled lettering reading “LC.”

B. Color coding as follows:

1. 120/208V Normal Power Systems: Silver (Unpainted)
2. 120/240V Normal Power Systems: Purple
3. 277/480V Normal Power Systems: Yellow
4. NEC Article 700 Emergency Power Systems: Orange
5. NEC Article 701 Optional Standby Power Systems: Green
6. Fire Alarm: Red
7. Telecommunications: Blue
8. Security / Access Control / CCTV: White
9. Lighting Controls: Black
10. Other Systems: Paint a unique color (do not use any of the above colors.

3.5 Conductors:

A. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

C. Power-Circuit Conductor Identification: For conductors No. 1/0 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

D. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.

E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

3.6 Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

3.7 Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

3.8 Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

A. Power transfer switches.

B. Controls with external control power connections.

3.9 Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

3.10 Instruction Signs:

A. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

B. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/3inch high letters for emergency instructions at equipment.

3.11 Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

3.12 Labeling Instructions:

A. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a with 1/4-inch high letters on 1-inch high label.

B. Outdoor Equipment: Engraved, laminated acrylic or melamine label.

C. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.

D. Equipment to Be Labeled:

1. Panelboards, electrical cabinets, and enclosures.
2. Access doors and panels for concealed electrical items.
3. Electrical switchgear and switchboards.
4. Transformers.
5. Electrical substations.
6. Emergency system boxes and enclosures.
7. Motor-control centers.
8. Disconnect switches.
9. Enclosed circuit breakers.
10. Motor starters.
11. Push-button stations.
12. Power transfer equipment.
13. Contactors.
14. Remote-controlled switches, dimmer modules, and control devices.
15. Battery inverter units.
16. Battery racks.
17. Power-generating units.
18. Voice and data cable terminal equipment.
19. Master clock and program equipment.
20. Intercommunication and call system master and staff stations.
21. Television/audio components, racks, and controls.
22. Fire-alarm control panel and annunciators.
23. Security and intrusion-detection control stations, control panels, terminal cabinets, and racks.

24. Monitoring and control equipment.
25. Uninterruptible power supply equipment.
26. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

3.13 Installation:

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.

Phase	**208/120-V Circuits**	**480/277-V Circuits**
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green W/ Yellow Stripe

Phase	**208/120-V Circuits**	**480/277-V Circuits**
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White Striped *	Gray Striped *
Ground	Green	Green W/ Yellow Stripe
* The neutral wire shall be striped with the color of the phase conductor. Multi-wire branch circuits using a common neutral are not permitted.		

G. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 18" to 30" above the line and not less than 6" below grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

J. Painted Identification: Prepare surface and apply paint according to Division 09 painting Sections.

K. Identification Schedule: Prior to Substantial Completion Inspection provide one framed and under glass 11" x 17" color copy of the approved Identification Schedule in each electrical room.

END OF SECTION

SECTION 261200 - TRANSFORMER - LIQUID FILLED - PAD MOUNTED

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes the following types of liquid-filled transformers rated over 600V, with capacities up to 3,750 kVA.

1.3 Quality Assurance

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

B. Comply with ANSI/IEEE C 57.12.91.

1.4 Coordination

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.5 Approval Submittals:

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings for each transformer:

1. Wiring and connection diagrams.

1.6 Test Reports and Verification Submittals:

A. Training: Submit letter verifying that Owner training has been received by factory representative.

1. Perform the following field tests and inspections and prepare test reports:

a. NETA ATS: Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.2.2. Certify compliance with test parameters.

B. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 5 percent. Submit recording and tap settings as test results.

C. Output Settings Report: Prepare written report recording output voltages and tap settings.

1.7 O&M Data Submittals:

A. Submit manufacturer's maintenance data. Include these data, a copy of approval submittals (product data & shop drawings) in O&M manual.

PART 2 - PRODUCTS

2.1 Manufacturers

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

1. Cooper Power Systems.
2. General Electric.
3. Cutler Hammer.
4. Square D/Group Schneider NA.
5. ABB.

2.2 Standards: Transformer shall comply with the latest applicable standards of the National Electrical Manufacturers Association (NEMA) and the American National Standards Institute (ANSI).

2.3 Ratings: Transformers shall be rated as shown on the Drawings with primary voltage as required by utility. Impedance of transformers 150 KVA and below shall limit available short circuit current at secondary terminals to 10,000 amperes or less with infinite primary. Impedance of transformers 225 KVA through 500 KVA shall not be less than 4%. Impedance of transformers above 500 KVA shall not be less than 5.3%.

2.4 Construction:

A. Transformer shall be Envirotemp FR3 filled, self-cooled, dead-front, loop feed and weatherproof for mounting on a concrete pad. All windings shall be aluminum.

B. The transformer shall be sealed tank construction of sufficient strength to withstand a pressure of 7 psi without permanent distortion. The cover shall be bolted on and the fastenings tamperproof. Transformer shall remain effectively sealed for a top liquid temperature range of 50°C to 106°C. When required, corrugated cooling panels shall be provided on the back and sides of the tank. Lifting eyes and jacking pads shall be provided.

C. Transformer assembly shall be designed to reduce losses and noise and provide adequate short-circuit strength and heat dissipation. Internal leads are to be insulated, trained and anchored to prevent phase to phase flashover. A tap changing mechanism shall be provided for accurate voltage adjustment without opening the transformer tank. The tap changing mechanism shall be externally operated and shall be for de-energized operation only. Transformers shall have four 2-1/2% rated taps, two above and two below, rated primary voltage.

D. The high and low voltage compartments shall be located side-by-side separated by a steel barrier. When facing the transformer, the low voltage compartment shall be on the right. Terminal compartments shall be full height with individual doors. The high voltage door fastenings shall not be accessible until the low voltage door has been opened. The low voltage door shall have a 3-point latching mechanism with vault type handle having provisions for a single padlock. The doors shall be equipped with lift-off type stainless steel hinges and door stops to hold doors open when working in the compartments. The front sill of the compartment shall be removable to allow the transformer to be rolled or skidded into position over conduit stubs. ANSI tank grounding provisions shall be furnished in each compartment.

E. The high voltage bushings shall be dead front and conform to ANSI C57.12.26 requirements.

F. Provide ON-OFF 550A load break, gang operated, liquid immersed switch. Switch handle with eye for operation with distribution hot stick shall be located in the high voltage compartment.

G. Provide three 10kV M.O.V.E. style distribution class lightning arresters mounted in the high voltage compartment in the unused loop feed bushings for surge protection.

H. The low voltage bushings shall be molded epoxy and provided with blade type spade terminals with NEMA standard hole spacing arranged for vertical take-off. The low voltage neutral shall be an insulated bushing grounded to the transformer tank by a removable grounding strap. Wye-wye connected transformers shall have the high and low voltage neutrals internally tied with a removable link for testing.

I. The base and cabinet and associated hardware shall be stainless steel.

2.5 Accessories: Furnish the following accessories:

A. Nameplate in low voltage compartment.

B. Bolted or welded main tank cover (Welded cover shall be provided with a bolted hand-hole).

C. Stainless steel ground pads (one in each HV and LV compartment) per C57.12.34 section 9.11.3.

D. One-inch drain valve with sampling device located in the primary side compartment.

E. One-inch upper filter press and filling plug.

F. Liquid level indication (pipe plug at 25° C liquid level).

G. Dial type thermometer with resettable maximum reading indicator.

H. Liquid level gauge.

I. Pressure-vacuum gauge.

J. Pressure relief valve.

K. Mounting provision for low voltage current transformers and potential transformers.

L. Schraeder valve.

2.6 Provide all H.V. and L.V. connectors.

2.7 Provide externally removable loadbreak expulsion Bay-O-Net fuse assembly in series with an ELSP backup current-limiting fuse with an interrupting rating of 50kA. All fuses shall be tested and certified for use in Envirotemp FR3 fluid. Provide 2 sets of spare Bay-O-Net fuse assemblies for each transformer provided.

PART 3 - EXECUTION

3.1 Grounding: Provide a copper clad driven ground rod 3/4" x 10'-0". Install ground rod as indicated on Drawings.

3.2 Concrete Pad: Provide a reinforced concrete pad sized to accommodate size of transformer supplied or as shown on plans, whichever is of greater size. Minimum thickness shall be 6".

3.3 Conductor Terminals: Provide all conductor terminals with NEMA bolt configuration and sized to accommodate conductors shown on the Drawings.

3.4 Nitrogen Gas Blanket: Transformer shall be delivered with a minimum internal positive pressure of 2 PSIG of nitrogen gas blanket above the liquid. Contractor shall provide field re-pressurization with dry nitrogen as necessary to prevent internal pressure from falling below 2 PSIG. Contractor shall maintain a log of all repressurizations, including date, time, operator, and pressure readings before and after. Contractor shall notify Engineer within 24 hours of all repressurizations. Pressure shall not exceed maximum rating. If internal pressure is found to be below 2 PSIG, contractor shall immediately report this to Engineer and request instructions for corrective actions. Such actions may include transformer testing and/or replacement and shall be completed by the contractor without change in the contract amount.

3.5 Surge Arrestors: Mount M.O.V.E. surge arresters in the second set of primary loop bushings.

END OF SECTION

SECTION 261510 - MANHOLES & PULLBOXES

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to the work of this Section.

1.2 Summary

A. This Section includes the following:

1. Manholes.
2. Pullboxes.

1.3 Approval Submittals:

A. Product Data: Submit manufacturer's technical product data, specifications and installation instructions for each product provided.

1.4 All pullboxes and manholes shall be traffic rated.

1.5 Quality Assurance

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

B. Comply with NFPA 70.

C. All materials and equipment specified herein shall be UL listed or approved according to the requirements of applicable NEC articles.

PART 2 - PRODUCTS

2.1 Manufacturers

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

1. Southern Precast, Inc.
2. Carlon.

3. Hughes Prestressed.
4. Neenah.
5. Florida Precast.
6. O-Z/Gedney.
7. U.S. Foundry.
8. A.C. Miller Concrete Products, Inc.

2.2 Concrete: Refer to the Division "Concrete". Minimum concrete strength shall be 3,000 pounds, in 28 days.

2.3 Reinforcing Steel and Wire Mesh: Refer to the Division "Concrete".

2.4 Manholes:

A. Manhole shall have an minimum interior clearance of 8'x8' unless otherwise indicated on the drawings.

B. Duct Entrances in Manhole Walls: Provide 4-5" and 2-4" end-bell fittings for each side of manhole. Fittings shall align with elevations of approaching ducts and be located near interior corners of manholes to facilitate racking of cable

C. Provide 2-2" sleeves located above ductbank end-bells on side of manhole with sump pit for PV pump system.

D. Concrete Knockout Panels: 1-1/2 to 2 inches thick, for future conduit entrance and sleeve for ground rod.

2.5 Manhole Covers and Fittings:

A. Manhole Covers and Frames: Round, weatherproof, traffic rated, cast iron complying with ASTM A 48/A 48M, Class 30B with milled cover-to-frame bearing surfaces.
1. Cover Legend: Cast in "ELECTRIC"
2. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

B. Manhole Chimney Components: Precast concrete rings with dimensions matched to those of roof opening.
1. Mortar for Chimney Ring and Frame and Cover Joints: Comply with ASTM C 270, Type M, except for quantities less than 2.0 cu. Ft. where packaged mix complying with ASTM C 387/C 387M, Type M, may be used.

C. Sump Pit: 12" diameter, 4" deep. Locate in corner of manhole.

D. Pulling-In and Lifting Irons in Concrete Walls: 7/8" diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
a. Provide one per wall.
b. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.

E. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; ½" ID by 2-3/4" deep, flared to 1-1/4" minimum at base.
   1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.

F. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with ½" bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.

G. Cable Rack Assembly: Steel, **hot-rolled** galvanized except insulators. Provide a minimum of three racks per wall.
   1. Stanchions: 1.5"x9/16"x3/16" channel; punched with 14 holes on 1-1/2" centers for cable-arm attachment.
   2. Arms: 1-1/2" wide, lengths ranging from 3" with 450-lb minimum capacity to 18" with 250-lb minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.
   3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.

H. Concrete 5500 psi @ 28 days.

I. Reinforcing grade 60.

J. Walls 6" thick, base & top 8" thick.

K. Approximate weight 35,517 lbs, top: 17,520 lbs. Base: 17,997 lbs.

L. Painted exterior.

M. Concrete joint sealer "evergrip 990".

2.6 Fastenings: Shall be manufactured of corrosion-resistant materials such as Type 18-8 stainless steel.

2.7 Structural Requirements:

A. Manholes and underground utility structures shall be designed by an engineer registered in the State of Florida based on ASTM C857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures with A-16 (AASHTO HS20) wheel loads. An additional load case consisting of A-12 (AASHTO HS15) wheel loads with _ of the ASTM C857 impact and with Live Load Spacing of 32 inches rather than 4 feet shown in ASTM C857 Figure 1 shall be considered.

B. As an alternate, precast and reinforced cast-in-place, concrete manholes and underground utility structures with top slabs not longer than 48 inches maximum inside dimension conforming to the 2008 Florida Department of Transportation Design Standards Index No. 200 and Index No. 201 may be utilized without design by an engineer registered in the state of Florida.

PART 3 - EXECUTION

3.1 General: Manhole shall be installed level and at a depth to provide a minimum of 12" of earth above top of manhole. Lid shall be flush with finished grade.

3.2 Set manhole on a minimum 12” rock bedding.

3.3 Excess materials after backfilling shall be disposed by Contractor.

3.4 Provide #2/0 bare copper ground loop on wall 12" above floor around interior perimeter of manhole. All connections exothermic. Provide 3/4" x 10' ground rod.

3.5 Cast-in-Place Manholes and Pull Boxes: Cast-in-place concrete type manholes or pull boxes shall be monolithic. Wood frames shall be used for both interior and exterior walls. Dowels shall be provided at all construction joints. Reinforcing steel and mesh shall be placed as required and supports shall be used to hold them in place until concrete is placed. Top of manholes shall be given a float finish and cover frames shall be grouted in. Install stubs, sump and ground rods as shown on the Drawings.

3.6 Pre-Fabricated Manholes and Pull Boxes: Other than cast in place type, manholes and pull boxes shall be located as shown on the drawings. Design of manholes or pull boxes shall include pulling eyes, cable or conductor racks, etc. Identify with a monument marker.

END OF SECTION

SECTION 261513 - MEDIUM VOLTAGE POWER CABLE AND ACCESSORIES-UNDERGROUND

PART 1 - GENERAL

1.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 Division-26 Basic Electrical Materials and Methods Sections apply to work of this Section.

1.3 Submittals:

A. Product Data: Submit manufacturer's technical product data, specifications and installation instructions for each type of :

1. Cable.
2. Termination.
3. Splice.
4. Elbow.
5. Accessory.

B. Qualification Data: For cable splicer.

C. Cable Pull Calculations: Provide cable pull calculations for each feeder between the manholes, and between manholes and equipment. Field verify all duct bank lengths prior to ordering cables.

D. Cable Pull Plans: Provide pull plans for all primary cable pulls based on the cable pull calculations. Plan shall include:

1. Site layout drawing with cable pulls identified in numeric order of expected pulling sequence and direction of cable pull.
2. List of cable installation equipment.
3. Lubricant manufacturer’s application instructions.
4. Procedure for resealing cable ends to prevent moisture from entering cable.
5. Cable pulling tension calculations of all cable pulls.
6. Cable percentage conduit fill.
7. Cable sidewall thrust pressure.
8. Cable minimum bend radius and minimum diameter of pulling wheels used.
9. Cable jam ratio.
10. Maximum allowable pulling tension on each different type and size of conductor.
11. Maximum allowable pulling tension on pulling device.

1.4 Test Reports and Verification Submittals:

A. Perform the following field tests and inspections and prepare test reports:

1. Insulation resistance test.
2. Shield-continuity test.
3. High Potential Tests: Perform high potential tests conforming to applicable ICEA, ANSI and IEEE standards and cable manufacturer's recommendations. Record test setup and data and submit to engineer. Determine that system is free of faults before connecting to the existing network.

a. Spliced cables (new to existing)

1) When new cables are spliced into existing cables, the acceptance test shall be performed on the new cable prior to splicing.
2) After test results are approved for new cable and the splice is completed, an insulation-resistance test and a shield-continuity test shall be performed on the length of new and existing cable including the splice.
3) After a satisfactory insulation-resistance test, a hi-pot test shall be performed on the cable utilizing a test voltage acceptable to owner and not exceeding 60 percent of factory test value.

PART 2 - PRODUCTS

2.1 Acceptable Producers:

A. Cable: Kerite, Pirelli, Okonite, Cablec.

B. Terminations & Splices: 3M, Raychem

C. Elbows & Accessories: Elastimold, Cooper, 3M

2.2 Primary Power Cable:

A. UL listed MV-105, Sunlight Resistant, of the size and rating indicated on the drawings, single conductor, ethylene-propylene rubber (EPR), 133% insulated, copper tape shield, with outer neoprene or PVC jacket, manufactured in accordance with ICEA S-68-516 and complying with NEC-326. All conductors, drain wires, shields and other metallic components shall be copper.

B. Okonite, Okoguard, Okoseal type MV105 15kV shielded copper power cable 133% insulation or approved equal.

2.3 Terminations: Raychem HVT series. Provide conforming to cable manufacturer's requirements or recommendations.

A. Heat shrink type.

B. Fully shielded construction.

C. Fully submersible.

D. Rated to IEEE 48-1990, class 1.

2.4 Splices: Raychem HVS series for in-line, transition or wye as required or shown on the drawings. Provide conforming to cable manufacturer's requirements or recommendations. Splices shall have the following features:

A. Heat shrink type.

B. Fully shielded construction.

C. Fully submersible.

D. Rated to IEEE 404.

2.5 Separable Connectors and Accessories:

A. 200A Loadbreak Elbows: Meets ANSI/IEEE Standard 386 Separable Insulated Connector Systems. Provide conforming to cable manufacturer's requirements or recommendations. Elbows shall have the following features:

1. Fully shielded.
2. Fully submersible.
3. Have a reinforced stainless steel pulling eye.
4. Have a capacitive test point.

B. M.O.V.E. Surge Arrestors: Meets ANSI/IEEE Standard 386 Separable Insulated Connector Systems. Provide conforming to cable manufacturer's requirements or recommendations. Elbows shall have the following features:

1. Fully shielded.
2. Fully submersible.
3. Have a reinforced stainless steel pulling eye.
4. MCOV rating sized based on phase-to-neutral voltage on grounded wye systems and phase-to-phase voltage for delta systems.

C. 600A Deadbreak T-Bodies: Meets ANSI/IEEE Standard 386 Separable Insulated Connector Systems. Provide conforming to cable manufacturer's requirements or recommendations. Elbows shall have the following features:

1. Fully shielded.
2. Fully submersible.
3. Have a reinforced stainless steel pulling eye.
4. Have a capacitive test point.

D. Accessories: Provide any and all required accessories for a complete and functional system including but not limited to:

1. Connecting plugs.
2. Insulating plugs.
3. Reducing tap plugs.
4. Bushing inserts.
5. Bushing well plugs.
6. Caps.
7. Hot line voltage indicators.

E. Fireproofing Tape: Provide flexible, conformable, submersible, weatherproof, intumescent elastomer cable fireproofing tape not less than 0.030" thick on all cable sections exposed outside conduit, including but not limited to transformer vaults, manholes, switch pits, pull boxes, and switchgear. Secure with glass cloth electrical tape.

F. Identification: Provide engraved phenolic tag on each conductor at all terminations and manholes identifying cable data, circuit data, year installed, and “to” and “from” information. Secure with non-metallic, fungus resistant, heat stabilized nylon self extinguishing cable ties.

G. Ground Cable: Grounding cable pulled with MV phase cables shall be copper, 600V, insulated, minimum size shall be #2.

PART 3 - EXECUTION

3.1 Splices: Medium voltage splices shall be made only in locations shown on the drawings or authorized by the engineer by Field Directive. It is the intent of the design to secure a system for the owner with the minimum number of splices practical. Cable sections lengthened with splices will be required to be replaced with full length sections, as below. Cable splices shall be supported by racks on either side of the splice in underground structures.

3.2 Splice and Termination Workers: Medium voltage splices and terminations shall be made only by workers experienced in the work and approved by the Engineer. Letter of certification demonstrating experience making MV-90/MV-105 splices over the past five years shall be submitted prior to commencement of the work. Material for this splice shall be at Contractor's expense.

3.3 Phasing: Maintain correct phase relationship for all cables. Proper phasing shall be witnessed by PPD Utilities. Provide a minimum of 48 hours for witness of test. All equipment needed to ensure proper phasing shall be provided by Contractor.

3.4 Fireproofing: Install tape in accordance with manufacturer's instruction to all cable sections exposed outside of conduit and not less than one inch (1") inside conduit. Securely fasten both ends to prevent unwrapping.

3.5 Grounding: In every manhole and pullbox and at every switch and transformer, bond cable ground wire to equipment enclosure, ground system and ground rod. Ground all splices and terminations, and cable sheaths where outer jacket is removed.

3.6 Cable Slack: Do not install cables in manholes utilizing the shortest route. Route all cables along the longest path (≤180°) in a manhole or pit prior to exiting. Provide maximum cable length by dressing the loops against the walls. The cable routing shall not interfere with duct entrances.

3.7 Bends: Provide maximum practical radius on all bends. Cable lengths bent to less than the manufacturer's minimum authorized radius, at any point and for any duration of time, shall be replaced as below.

3.8 Replacement: Cable requiring replacement shall necessitate the replacement of all conductors in the conduit over the full cable length. Single phase replacement or the addition of splices is specifically forbidden. This applies to existing as well as new cables.

END OF SECTION

SECTION 262411 - LOW VOLTAGE SWITCHBOARDS, INDIVIDUALLY MOUNTED DEVICES

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes service and distribution switchboards rated 600V and less.

1.3 Definitions

A. GFCI: Ground-fault circuit interrupter.

B. RMS: Root mean square.

C. SPD: Surge protection device

D. SPDT: Single pole, double throw.

1.4 Submittals

A. Product Data: For each type of switchboard, overcurrent protective device, surge protection device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

a. Enclosure types and details for types other than NEMA 250, Type 1.

b. Bus configuration, current, and voltage ratings.

c. Short-circuit current rating of switchboards and overcurrent protective devices.

d. Descriptive documentation of optional barriers specified for electrical insulation and isolation.

e. Mimic-bus diagram.

f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

g. Time-current curves, including selectable ranges for each type of overcurrent protective device.

h. Coordination study of all feeder circuit breakers and the main circuit breaker with recommended settings.

i. Wiring Diagrams: Power, signal, and control wiring.

j. ¼" scale electrical room drawings showing equipment layouts for clearance verification.

2. Operation and Maintenance Data: include the following:

a. Routine maintenance requirements for switchboards and all installed components.

b. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

c. Time-current curves, including selectable ranges for each type of overcurrent protective device.

d. Coordination study of all feeder circuit breakers and the main circuit breaker with recommended settings.

C. Emergency System Selective Coordination Study:

1. In accordance with NEC 700.27, the Contractor shall provide the engineer with a protective device selective coordination study showing recommended settings for all emergency system overcurrent protective devices provided under this contract. Recommended settings shall achieve full short circuit and overload coordination with all upstream devices and provide protection to all cables and other current carrying conductors providing power to or taking power from protective devices provided under this contract. The study shall be prepared by a Florida registered professional engineer and six copies shall be signed and sealed.

2. Report shall contain time-current curves (TCC) for all new devices plotted on four cycle by five cycle log-log paper with all devices clearly identified. Contractor shall indicate all devices studied on a single line diagram. Each TCC shall contain all the devices in each possible path from the generator to the final branch circuit OCPD.

3. Contractor shall set all devices provided under this contract in accordance with coordination study recommendations. Coordination shall be a warranty item under this contract.

A. Short Circuit Analysis / Over-Current Protective Device Coordination Study / Arc Flash Hazard Analysis:

1. The Contractor shall provide the engineer with a Short Circuit Analysis / Over-Current Protective Device Coordination Study / Arc Flash Hazard Analysis for all new panelboards and existing panelboards re-fed from new over-current protective devices provided under this contract. Recommended over-current protective device trip settings shall minimize the available arc flash hazard at each panelboard while maintaining the greatest overload coordination with upstream over-current protective devices. The study shall be prepared by a professional engineer registered in the state in which the project is located. Six copies shall be submitted signed and sealed.

2. Report shall be prepared with either EasyPower or SKM Power Tools power system analysis software. The report shall contain the following:

a. One-line diagram of the system being evaluated that clearly identifies individual equipment busses, bus ID, cable and bus connections, calculated maximum short-circuit current at each bus location and other information pertinent to the power system analysis.
b. Time-current curves (TCC) for all new devices plotted on four cycle by five cycle log-log paper with all devices clearly identified.
c. Arc Flash Hazard calculations for all new panelboards and all existing panelboards downstream of new over-current protective devices in accordance with IEEE 1584.
d. Arc Flash Hazard labels for all equipment included in the study.
e. List of all over-current protective devices and their settings.

3. The short circuit analysis shall utilize transformer design impedances for the actual equipment provided for this project.
4. Contractor shall include any exceptions to selective coordination within the report and provide an explanation as to why selective coordination was not achieved.
5. The study shall be prepared using the actual over-current protective devices to be provided.
6. Contractor shall set all devices provided under this contract in accordance with the study recommendations.
7. Contractor shall use the short circuit data generated by the study to prepare the equipment short circuit current tags for each panelboard, transformer, switchboard, switchgear, etc.
8. It shall be the responsibility of the Contractor to print and affix all Arc Flash Hazard labels.
9. The study shall be submitted at the same time as the product data submittals to ensure a fully compliant system prior to manufacture and installation.
10.

1.5 Quality Assurance

A. Source Limitations: Obtain switchboards through one source from a single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NEMA PB 2, "Deadfront Distribution Switchboards."

E. Comply with NFPA 70.

1.6 Delivery, Storage, and Handling

A. Deliver in sections or lengths that can be moved past obstructions in delivery path.

B. Store indoors in clean dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.

C. Handle switchboards according to NEMA PB 2.1 and NECA 400.

1.7 Project Conditions

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 2, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.8 Coordination

A. Coordinate layout and installation of switchboards and components with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.1 Manufacturers

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 Manufactured Units

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. Square D.
3. Siemens.
4. General Electric Co.; Electrical Distribution & Protection Div.

B. Front-Connected, Front-Accessible Switchboard: Panel-mounted main device, panel-mounted branches, and sections front and rear aligned.

C. Nominal System Voltage: As indicated on the drawings.

D. Main-Bus Continuous Amperage: As indicated on the drawings.

E. Enclosure: Steel, NEMA 250, Type 1.

F. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

G. Barriers: Between adjacent switchboard sections.

H. Insulation and isolation for main bus of main section and for main and vertical buses of feeder sections.

I. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

J. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

K. Pull Box on Top of Switchboard:
   1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
   2. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
   3. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
   4. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

L. Buses and Connections: Three phase, four wire, unless otherwise indicated.
   1. Phase- and Neutral-Bus Material: Silver plated hard-drawn copper of 98 percent conductivity with feeder circuit-breaker line connections.
      a. Use copper for feeder circuit-breaker line connections.
   2. Ground Bus: Minimum-size, hard-drawn copper of 98 percent conductivity, equipped with pressure connectors for feeder and branch-circuit ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.
   3. Contact Surfaces of Buses: Silver plated.
   4. Main Phase Buses, Neutral Buses, and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
   5. Neutral Buses: 100 percent of the ampacity of phase buses, unless otherwise indicated, equipped with pressure connectors for outgoing circuit neutral cables. Bus extensions for busway feeder neutral bus are braced.

M. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.3 Surge Protection Devices

A. Surge Protective Device Description: Modular design, UL 1449 latest Edition Listed, mounted integral to switchboard enclosure with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Arrangement with copper busbars and for direct bolted connections to phase buses, neutral bus, and ground bus.
5. Red and green LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 2A and 24-V dc, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
8. Surge-event operations counter.
9. The SPD system shall be duty life cycle tested to survive a minimum of 1,000 surges per phase of 10kV, 10 kA, IEEE C62.45 Category C3 surge current with less than 10% degradation of clamping voltage.
10. The SPD system shall have EMI/RFI filtering, UL1283 listed and per MIL-STD-220A.
11. Per NEC Article 285.6, SPD shall be marked by a Short Circuit Current Rating (SCCR), equal to or greater than the available fault current where connected (as noted on drawings).

B. Surge Protective Device Description: Modular design, UL 1449 2nd Edition Listed, mounted external to switchboard enclosure with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Serve Surge Protective Device from panel via circuit breaker. Surge Protective Device lead length shall be as short as possible but shall not exceed 18”.
3. Remote enclosure shall match the NEMA rating of the serving panelboard.
4. Integral disconnect switch.
5. Red and green LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 2A, 24-V dc, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
8. Surge-event operations counter.
9. The SPD system shall be duty life cycle tested to survive a minimum of 1,000 surges per phase of 10kV, 10 kA, IEEE C62.45 Category C3 surge current with less than 10% degradation of clamping voltage.
10. The SPD system shall have EMI/RFI filtering, UL1283 listed and per MIL-STD-220A.
11. Per NEC Article 285.6, SPD shall be marked by a Short Circuit Current Rating (SCCR), equal to or greater than the available fault current where connected (as noted on drawings).

C. The SPD system shall be duty life cycle tested to survive a minimum of 2,500 surges per phase of 20kV, 10 kA, IEEE C62.41 Category C3 surge current with less than 5% degradation of clamping voltage.

D. Peak Single-Impulse Surge Current Rating: 200kA per phase (L-N + L-G), 100kA per mode.

E. Protection modes and UL1449 clamping voltage for grounded wye circuits with voltages of 480Y/277 or 208Y/120; 3-phase, 4-wire circuits, shall be as follows:

1. Line to Neutral: 800V for 480Y/277, 400V for 208Y/120.
2. Line to Ground: 800V for 480Y/277, 400V for 208Y/120.
3. Neutral to Ground: 800V for 480Y/277, 400V for 208Y/120.

F. Protection modes and UL 1449 clamping voltage for 240/120 V, single-phase, 3-wire circuits, shall be as follows:

1. Line to Neutral: 400V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400V.

G. Protection modes and UL1449 clamping voltage for 240/120V, 3-phase, 4-wire circuits, with high leg shall be as follows.

1. Line to Neutral: 400V, 800V from high leg.
2. Line to Ground: 400V.
3. Neutral to Ground: 400V.

2.4 Overcurrent Protective Devices

A. Molded-Case Circuit Breaker: NEMA AB 3, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Unless indicated otherwise, breakers smaller than 250A frame shall be thermal-magnetic.
2. Adjustable Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting. Unless indicated otherwise, breakers smaller than 800A frame and at least 250A frame shall be adjustable thermal-magnetic.
3. Electronic Trip-Unit Circuit Breakers: Unless indicated otherwise, breakers 800A frame and larger shall be electronic trip type. RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
   d. Ground-fault pickup level, time delay, and I2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and two-pole configurations with 5-mA trip sensitivity.
7. Ground fault protection shall be provided for main circuit breaker located within switchboard for solidly grounded WYE electrical services of more than 150 volts to ground, but not exceeding 600 volts phase-to-phase for each service disconnecting means rated 1000 amperes or more. Comply with the requirements of NEC 70.
8. Control power: Where no other source of control power is indicated, energy to actuate tripping devices through action of pilot device shall be 120 volts, 60 HZ derived as follows: from control power transformer with secondary voltage of 120 volts, 60 HZ and with primary leads protected by current limiting fuses mounted in plug-in style, dead front fuse block. Locate fuse block and control power transformer within switchboard in protected housing. Connect transformer primary at load side of circuit breaker to be tripped.
9. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished when required. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips. All hardware used on conductors shall have a high tensile strength and an anti-corrosive zinc plating.

B. Molded-Case Circuit-Breaker Features and Accessories: Standard frame sizes, trip ratings, and number of poles. Provide where indicated on the drawings:

1. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.
3. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
4. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
5. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
8. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

C. Enclosed, Insulated-Case Circuit Breaker: Fully rated, encased-power circuit breaker with interrupting capacity rating to meet available fault current.

1. Fixed circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Microprocessor-based trip units with interchangeable rating plug, LED trip indicators, and the following field-adjustable settings:

    a. Instantaneous trip.

b. Long- and short-time pickup levels.
c. Long- and short-time time adjustments with I2t response.
d. Ground-fault pickup level, time delay, and I2t response.

4. Remote trip indication and control.
5. Communication Capability: Integral communication module with functions and features compatible with power monitoring and control system specified in Division 16 Section "Electrical Power Monitoring and Control"
6. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
7. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.

2.5 Digital Metering Device

A. Switchboard shall be provided with a digital power monitoring device. See corresponding specification section.

2.6 Accessory Components and Features

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - TEXT

3.1 Examination

A. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

A. Install switchboards and accessories according to NEMA PB 2.1 and NECA 40.

B. Install and anchor switchboards level on concrete bases, nominal thickness. Concrete base is specified in Division 16 Section "Basic Electrical Materials and Methods," and concrete materials and installation requirements are specified in Division 3.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on centers around full perimeter of base.
2. For switchboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to switchboards.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

D. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

E. Install overcurrent protective devices, surge protection devices, and instrumentation.

1. Set field-adjustable switches and circuit-breaker trip ranges.

3.3 Identification

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Switchboard Nameplates: Label each switchboard compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

C. Mimic Bus Diagram (where indicated on the drawings): Provide mimic bus diagram painted on each section.

3.4 Field Quality Control

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA AT S, Sections 7.1, 7.5, 7.6, 7.9, 7.10, 7.11, and 7.14 as appropriate. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. For all adjustable trip circuit breakers, set all adjustable parameters to match recommended settings issued as part of submittal requirements..
4. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.

b. Instruments, Equipment, and Reports:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

2) Prepare a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 Cleaning

1. On completion of installation, inspect interior and exterior of switchboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.6 Demonstration

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION

SECTION 262420 - PANELBOARDS

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes the following:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.

1.3 Definitions

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. RFI: Radio-frequency interference.

D. RMS: Root mean square.

E. SPD: Surge protection device.

F. SPDT: Single pole, double throw.

1.4 Submittals

A. Approval Submittals:

B. Product Data: Submit manufacturer's technical product data, specifications and installation instructions for each type of:

1. Panelboard
2. Overcurrent protective device
3. Surge protection device
4. Metering device

C. Shop Drawings: For each panelboard and related equipment.

1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
    a. Enclosure types and details for types other than NEMA 250, Type 1.
    b. Bus configuration, current, and voltage ratings.
    c. Short-circuit current rating of panelboards and overcurrent protective devices.
    d. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
    e. Time-current curves, including selectable ranges for each type of overcurrent protective device.
2. Wiring Diagrams: Power, signal, and control wiring.

D. Panelboard Schedules: For installation in panelboards.

E. Electrical Room Layouts: For each electrical room, provide ¼" scale drawing showing equipment layouts for clearance verification. Show all equipment including equipment in other specification sections.

F. Emergency System Selective Coordination Study:

1. In accordance with NEC 700.27, the Contractor shall provide the engineer with a protective device selective coordination study showing recommended settings for all emergency system overcurrent protective devices provided under this contract. Recommended settings shall achieve full short circuit and overload coordination with all upstream devices and provide protection to all cables and other current carrying conductors providing power to or taking power from protective devices provided under this contract. The study shall be prepared by a professional engineer registered within the state in which the project is located. Six copies shall be submitted signed and sealed.
2. Report shall contain time-current curves (TCC) for all new devices plotted on four cycle by five cycle log-log paper with all devices clearly identified. Contractor shall indicate all devices studied on a single line diagram. Each TCC shall contain all the devices in each possible path from the generator to the final branch circuit OCPD.
3. Contractor shall set all devices provided under this contract in accordance with coordination study recommendations. Coordination shall be a warranty item under this contract.
4. It shall be the responsibility of the contractor to ensure a selectively coordinated system and to provide equipment that complies.
5. The study shall be submitted at the same time as the product data submittals to ensure a fully compliant system prior to manufacture and installation.

RETAIN IF PROJECT REQUIREMENT (REQUIRED FOR ALL ALABAMA DCM PROJECTS) DELETE IF DELL CONSULTING HAS APPROVED ADDITIONAL SERVICES TO PROVIDE AN ARC FLASH HAZARD ANALYSIS.

G. Short Circuit Analysis / Over-Current Protective Device Coordination Study / Arc Flash Hazard Analysis:
1. The Contractor shall provide the engineer with a Short Circuit Analysis / Over-Current Protective Device Coordination Study / Arc Flash Hazard Analysis for all new

panelboards and existing panelboards re-fed from new over-current protective devices provided under this contract. Recommended over-current protective device trip settings shall minimize the available arc flash hazard at each panelboard while maintaining the greatest overload coordination with upstream over-current protective devices. The study shall be prepared by a professional engineer registered in the state in which the project is located. Six copies shall be submitted signed and sealed.

2. Report shall be prepared with either EasyPower or SKM Power Tools power system analysis software. The report shall contain the following:
   a. One-line diagram of the system being evaluated that clearly identifies individual equipment busses, bus ID, cable and bus connections, calculated maximum short-circuit current at each bus location and other information pertinent to the power system analysis.
   b. Time-current curves (TCC) for all new devices plotted on four cycle by five cycle log-log paper with all devices clearly identified.
   c. Arc Flash Hazard calculations for all new panelboards and all existing panelboards downstream of new over-current protective devices in accordance with IEEE 1584.
   d. Arc Flash Hazard labels for all equipment included in the study.
   e. List of all over-current protective devices and their settings.
3. The short circuit analysis shall utilize transformer design impedances for the actual equipment provided for this project.
4. Contractor shall include any exceptions to selective coordination within the report and provide an explanation as to why selective coordination was not achieved.
5. The study shall be prepared using the actual over-current protective devices to be provided.
6. Contractor shall set all devices provided under this contract in accordance with the study recommendations.
7. Contractor shall use the short circuit data generated by the study to prepare the equipment short circuit current tags for each panelboard, transformer, switchboard, switchgear, etc.
8. It shall be the responsibility of the Contractor to print and affix all Arc Flash Hazard labels.
9. The study shall be submitted at the same time as the product data submittals to ensure a fully compliant system prior to manufacture and installation.

H. Operation and Maintenance Data: include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 Quality Assurance

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of panelboards and are based on the specific system indicated.

C. 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.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

F. Panelboards shall be listed and labeled by Underwriters' Laboratories, Inc. in accordance with UL Standard 67.

G. Panelboards for use as service disconnecting means shall additionally conform to UL 869.

1.6 Project Conditions

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.7 Coordination

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, duct work piping, and encumbrances to workspace clearance requirements.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

C. Provide recommended settings for all circuit breakers with selectable settings to coordinate with down stream devices.

PART 2 - PRODUCTS

2.1 Manufacturers

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

1. Panelboards and Accessories:

a. Siemens
b. Eaton Corporation; Cutler-Hammer Products.
c. Square D.
d. General Electric Co.; Electrical Distribution & Protection Div.

2.2 Panelboards

A. Enclosures: Galvanized surface-mounted cabinets. NEMA PB 1, Type 1.

1. Rated for environmental conditions at installed location.

a. Outdoor Locations: NEMA 250, Type 3R.

2. Hinged Front Cover (Indoor units only): Entire front trim hinged to box and with standard door within hinged trim cover.
3. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
5. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
6. Directory Card: Type written with transparent protective cover, mounted in welded metal frame, inside panelboard door.
7. Provide an engraved laminated phenolic or micarta nameplate 1" high by 3" wide with minimum 1/4" letters indicating the panelboard identification, voltage and upstream protective device. The panelboard shall also have a nameplate affixed to the panelboard with the following information stamped therein: Nameplate: Manufacturer, Voltage, Ampacity, Type of Panelboard, Manufacturer's Order No. and Date, Interrupting Rating - RMS Sym.

B. Phase and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box. Ground bus shall have the same rating as the panelboard.
3. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads as indicated on drawings.

C. Conductor Connectors: Suitable for use with conductor material.

1. Main and Neutral Lugs: Compression type.
2. Ground Lugs and Bus Configured Terminators: Compression type.

D. Service Equipment Label (where indicated): UL labeled for use as service equipment for panelboards with main service disconnect switches.

E. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.

2.3 Panelboard Short-Circuit Rating

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.4 Distribution Panelboards

A. Doors: Concealed hinges, secured with vault-type latch with tumbler lock; keyed alike.

B. Main Overcurrent Protective Devices: Circuit breaker.

C. Branch Overcurrent Protective Devices:

1. For Circuit-Breakers: Bolt-on circuit breakers.

2.5 Lighting And Appliance Branch-Circuit Panelboards

A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

B. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.6 Load Centers

A. Overcurrent Protective Devices: Plug-in, full-module circuit breaker.

B. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.7 SPD - Service Entrance Devices

A. Surge Protective Device Description: Modular design, UL 1449 latest Edition Listed, mounted integral to panel enclosure with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Arrangement with copper busbars and for direct bolted connections to phase buses, neutral bus, and ground bus.
5. Red and green LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 2A and 24-V dc, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
8. Surge-event operations counter.

9. The SPD system shall be duty life cycle tested to survive a minimum of 1,000 surges per phase of 10kV, 10 kA, IEEE C62.45 Category C3 surge current with less than 10% degradation of clamping voltage.
10. The SPD system shall have EMI/RFI filtering, UL1283 listed and per MIL-STD-220A.
11. Per NEC Article 285.6, SPD shall be marked by a Short Circuit Current Rating (SCCR), equal to or greater than the available fault current where connected (as noted on drawings).

A. Surge Protective Device Description: Modular design, UL 1449 2nd Edition Listed, mounted external to panel enclosure with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Serve Surge Protective Device from panel via circuit breaker. Surge Protective Device lead length shall be as short as possible but shall not exceed 18".
3. Remote enclosure shall match the NEMA rating of the serving panelboard.
4. Integral disconnect switch.
5. Red and green LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 2A, 24-V dc, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
8. Surge-event operations counter.
9. The SPD system shall be duty life cycle tested to survive a minimum of 1,000 surges per phase of 10kV, 10 kA, IEEE C62.45 Category C3 surge current with less than 10% degradation of clamping voltage.
10. The SPD system shall have EMI/RFI filtering, UL1283 listed and per MIL-STD-220A.
11. Per NEC Article 285.6, SPD shall be marked by a Short Circuit Current Rating (SCCR), equal to or greater than the available fault current where connected (as noted on drawings).

B. Peak Single-Impulse Surge Current Rating: 200kA per phase (L-N + L-G), 100kA per mode.

C. Protection modes and UL1449 clamping voltage for grounded wye circuits with voltages of 480Y/277 or 208Y/120; 3-phase, 4-wire circuits, shall be as follows:
1. Line to Neutral: 800V for 480Y/277, 400V for 208Y/120.
2. Line to Ground: 800V for 480Y/277, 400V for 208Y/120.
3. Neutral to Ground: 800V for 480Y/277, 400V for 208Y/120.

D. Protection modes and UL 449 clamping voltage for 240/120 , single-phase, 3-wire circuits, shall be as follows:
1. Line to Neutral: 400V.
2. Line to Ground: 400V.
3. Neutral to Ground: 400V.

E. Protection modes and UL1449 clamping voltage for 240/120V, 3-phase, 4-wire circuits, with high leg shall be as follows.
1. Line to Neutral: 400V, 800V from high leg.

2. Line to Ground: 400V.
3. Neutral to Ground: 400V.

2.8 SPD - Panelboard Devices

A. Surge Protective Device Description: Modular design, UL 1449 2nd Edition Listed, mounted integral to panel enclosure with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Fabrication using bolted compression lugs for internal wiring.
3. Integral disconnect switch.
4. Arrangement with direct bus connections to phase buses, neutral bus, and ground bus.
5. Red and green LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 2A, 24-V dc, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
8. Surge-event operations counter.
9. The SPD system shall be duty life cycle tested to survive a minimum of 2,500 surges per phase of 20kV, 10 kA, IEEE C62.41 Category C3 surge current with less than 5% degradation of clamping voltage.
10. The SPD system shall have EMI/RFI filtering, UL1283 listed and per MIL-STD-220A.
11. Per NEC Article 285.6, SPD shall be marked by a Short Circuit Current Rating (SCCR), equal to or greater than the available fault current where connected (as noted on drawings).

B. Surge Protective Device Description: Modular design, UL 1449 2nd Edition Listed, mounted external to panel enclosure with field-replaceable modules and the following features and accessories:

1. Fuses, rated at 200-kA interrupting capacity.
2. Serve Surge Protective Device from panel via circuit breaker. Surge Protective Device lead length shall be as short as possible but shall not exceed 18”.
3. Remote enclosure shall match the NEMA rating of the serving panelboard.
4. Integral disconnect switch.
5. Red and green LED indicator lights for power and protection status.
6. Audible alarm, with silencing switch, to indicate when protection has failed.
7. One set of dry contacts rated at 2A, 24-V dc, for remote monitoring of protection status. Coordinate with building power monitoring and control system.
8. Surge-event operations counter.
9. The SPD system shall be duty life cycle tested to survive a minimum of 2,500 surges per phase of 20kV, 10 kA, IEEE C62.41 Category C3 surge current with less than 5% degradation of clamping voltage.
10. The SPD system shall have EMI/RFI filtering, UL1283 listed and per MIL-STD-220A.

11. Per NEC Article 285.6, SPD shall be marked by a Short Circuit Current Rating (SCCR), equal to or greater than the available fault current where connected (as noted on drawings).

C. Peak Single-Impulse Surge Current Rating: 100kA per phase (L-N + L-G), 50kA per mode.

D. Protection modes and UL 1449 clamping voltage for grounded wye circuits with voltages of 480Y/277 or 208Y/120; 3-phase, 4-wire circuits, shall be as follows:

1. Line to Neutral: 800V for 480Y/277, 400V for 208Y/120.
2. Line to Ground: 800V for 480Y/277, 400V for 208Y/120.
3. Neutral to Ground: 800V for 480Y/277, 400V for 208Y/120.

E. Protection modes and UL 1449 clamping voltage for 240/120V, single-phase, 3-wire circuits, shall be as follows:
1. Line to Neutral: 400V.Line to Ground: 400V.
2. Neutral to Ground: 400V.

F. Protection modes and UL 1449 clamping voltage for 240/120V, 3-phase, 4-wire circuits, with high leg shall be as follows:

1. Line to Neutral: 400V, 800V from high leg
2. Line to Ground: 400V.
3. Neutral to Ground: 400V.

2.9 Overcurrent Protective Devices

A. Circuit breakers shall be molded case with trip units of size, type and quantity shown on the drawings. The circuit breakers shall be bolt-on type, equipped with individually insulated, braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Large permanent, individual circuit numbers shall be affixed to each breaker in a uniform position. Paper stickers are not acceptable for individual circuit numbers. Individual circuit numbers shall be phenolic. Trip indication shall be clearly shown by the breaker handle. Provisions for additional breakers shall be such that no additional connectors will be required to add circuit breakers. Breaker terminals shall be UL listed as suitable for type and size of conductor provided for.

B. The following are general/minimum requirements. Provide features trip units, etc. per the selective coordination study as required to achieve coordination.

1. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

2. Current-Limiting Circuit Breakers: Frame sizes 400A and smaller; let-through ratings less than NEMA FU 1, RK.

3. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Unless indicated otherwise, breakers smaller than 250A frame shall be thermal-magnetic.

4. Adjustable Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting. Unless indicated otherwise, breakers smaller than 800A frame and at least 250A frame shall be adjustable thermal-magnetic.
5. Electronic Trip-Unit Circuit Breakers: Unless indicated otherwise, breakers 800A frame and larger shall be electronic trip type. RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

C. Multipole Breakers: Provide common trip-type with single operating handle. Breaker design shall be such that overload in one pole automatically causes all poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

2.10 Digital Metering Device

A. Provide where indicated on the drawings a digital power monitoring device (equivalent to Square D PM5560) on the front of the panel fully connected with CT's with the following capabilities:

1. LCD alpha-numeric display.
2. Certified ANSI C12 revenue accuracy.
3. Current per phase and neutral.
4. Volts L-L and L-N.
5. Real Power (kW) A, B, C, total.
6. Reactive Power (kVAR) A, B, C, total.
7. Apparent Power (kVA) A, B, C, total.
8. Power Factor (true) A, B, C, total.
9. Frequency (Hz).
10. Real Energy (kWh) 3 phase total.
11. Reactive Energy (kVARh) 3 phase total.
12. Apparent Energy (kVAh) 3 phase total.
13. RS-485 communications.
14. THD voltage and current A, B, C.
15. Real power demand (kWd) 3 phase total present & peak.
16. Reactive power demand (kVARd) 3 phase total present & peak.
17. Apparent power demand (kVAd) 3 phase total present & peak.
18. Date and time stamping on peak demands.

2.11 Accessory Components And Features

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 Installation

A. Install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 74 inches (1880 mm) above finished floor, unless otherwise indicated.

C. Mount plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.

D. Install overcurrent protective devices and controllers.

1. Set field-adjustable switches and circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

G. Provide four ¾” conduits from all recessed panelboards to above accessible ceiling for future use.

3.2 Identification

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Basic Electrical Materials and Methods."

B. Create a directory to indicate installed circuit loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable. Verify room numbers with Owner prior to creating directory. All room and building numbers/names shall reflect the final labels assigned for occupancy.

C. Panelboard Nameplates: Label each panelboard with engraved laminated-plastic nameplate mounted with corrosion-resistant screws. Nameplate shall comply with the requirements listed in Section 2.2.A.7 above.

3.3 Connections

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Basic Electrical Materials and Methods."

3.4 Field Quality Control

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.

2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.

3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.

4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

D. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scanning of each panelboard. Remove panel fronts so joints and connections are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

2. Record of Infrared Scanning: Prepare a certified report that identifies panelboards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

E. Equipment Meters. Adjust and calibrate as recommended by manufacturer.

3.5 Cleaning

A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION

SECTION 262726 - GENERAL WIRING DEVICES

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters, integral surge suppression units, and isolated-ground receptacles.
2. Single- and double-pole snap switches and dimmer switches.
3. Device wall plates.
4. Pin and sleeve connectors and receptacles.
5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 Definitions

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. RFI: Radio-frequency interference.

E. SPD: Surge protection device.

F. SPR : Surge protection receptacle.

G. UTP: Unshielded twisted pair.

1.4 Submittals

A. Product Data: Submit manufacturer’s technical product data, specifications and installation instructions. For each type of product indicated.

B. Samples: One for each type of device and wall plate specified, in each color specified.

1.5 Quality Assurance

A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.

B. 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.

C. Comply with NFPA 70.

D. UL Listed.

1.6 Coordination

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 Manufacturers

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

1. Wiring Devices:
   a. Hubbell Incorporated; Wiring Device-Kellems.
   b. Leviton Mfg. Company Inc.
   c. Pass & Seymour/Legrand; Wiring Devices Div.
2. Wiring Devices for Hazardous (Classified) Locations:
   a. Crouse-Hinds/Cooper Industries, Inc.; Arrow Hart Wiring Devices.
   b. EGS/Appleton Electric Company.
   c. Killark Electric Manufacturing Co./Hubbell Incorporated.
3. Multioutlet Assemblies:
   a. Hubbell Incorporated; Wiring Device-Kellems.
   b. Wiremold Company (The).
4. Poke-Through, Floor Service Outlets and Telephone/Power Poles:
   a. Hubbell Incorporated; Wiring Device-Kellems.
   b. Pass & Seymour/Legrand; Wiring Devices Div.

c. Square D/Groupe Schneider NA.

d. Thomas & Betts Corporation.

e. Wiremold Company (The).

2.2 Receptacles

A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498. Devices shall be heavy duty, Federal Specification grade.

B. Single Receptacle Devices:

20 amp, 2 pole, 3 wire, 125V, NEMA 5-20R Hubbell HBL5361
30 amp, 2 pole, 3 wire, 125V, NEMA 5-30R Hubbell HBL9308
50 amp, 2 pole, 3 wire, 125V, NEMA 5-50R Hubbell HBL9360
20 amp, 2 pole, 3 wire, 250V, NEMA 6-20R Hubbell HBL5461
30 amp, 2 pole, 3 wire, 250V, NEMA 6-30R Hubbell HBL9330
50 amp, 2 pole, 3 wire, 250V, NEMA 6-50R Hubbell HBL9367
30 amp, 2 pole, 3 wire, 277V, NEMA 7-30R Hubbell HBL9315
50 amp, 2 pole, 3 wire, 277V, NEMA 7-50R Hubbell HBL365
20 amp, 3 pole, 4 wire, 125/250V, NEMA 14-20R Hubbell HBL8410
30 amp, 3 pole, 4 wire, 125/250V, NEMA 14-30R Hubbell HBL9430A
50 amp, 3 pole, 4 wire, 125/250V, NEMA 14-50R Hubbell HBL9450A
60 amp, 3 pole, 4 wire, 125/250V, NEMA 14-60R Hubbell HBL9460A
20 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-20R Hubbell HBL8420
30 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-30R Hubbell HBL8430A
50 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-50R Hubbell HBL8450A
60 amp, 3 pole, 4 wire, 250V, 3PH, No Neutral NEMA 15-60R Hubbell HBL8460A

C. Duplex Receptacle Devices: The receptacle shall be heavy duty specification grade and have the following features: back and side wiring, 0.032 inches thick brass triple wipe power contacts, brass center inset, all brass grounding system, impact resistant nylon face, thick wall thermoset base. 15 amp, 2 pole, 3 wire, 125V, NEMA 5-15R Hubbell HBL5252. 20 amp, 2 pole, 3 wire, 125V, NEMA 5-20R Hubbell HBL5352.

D. GFCI Receptacles: Straight blade devices shall be heavy duty specification grade. Integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter. Hubbell GFR 5362 or approved equal.

E. SPR Receptacles: Straight blade, NEMA WD 6, Configuration 5-20R, with integral SPD in line to ground, line to neutral, and neutral to ground. Hubbell HBL 8362 or approved equal.

1. SPD Components: Multiple metal-oxide varistors; with a nominal clamp level rating of 500 volts and minimum single transient pulse energy dissipation of 140 J line to neutral, and 70 J line to ground and neutral to ground.

2. Active SPD Indication: Visual and audible with light visible in face of device to indicate device is "active" or "no longer in service."

3. Identification: Distinctive marking on face of device to denote SPD-type unit.

F. Occupancy Controlled Receptacles: Split or fully controlled device as indicated on the drawings. Device shall be provided with a UL listed connector assembly to interface with the corresponding occupant sensor or a time-of-day operated control system. The device shall be capable of controlling other standard NEMA 5-15R and 5-20R devices downstream. The device shall provide a failsafe mechanism to turn power to the receptacles ON in the event the status signal from the control system fails. HBL5362LCx or approved equal.

G. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.

H. Combination USB Charger Receptacles:

1. Standard AC Duplex receptacle with two USB charging ports rated at 2.1 A, UL listed to UL 498 and UL 1310.
    a. Device shall have one AC outlet and two USB charging ports (2.1 A @ 5 V DC).
    b. USB ports shall be work with USB 2.0 and 3.0 compatible devices.
    c. Device shall have auto grounding feature.
    d. Where shown on Drawings as ground-fault protected, device shall be wired from load-side of a GFCI receptacle.
    e. Device shall be compatible with standard wall plates.

2.3 Pendant Cord/Connector Devices

A. Description: Matching, locking-type plug and receptacle body connector, NEMA WD 6, Heavy-Duty grade.

1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.4 Cord And Plug Sets

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.5 Switches

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

1. Single Pole, 20 amp, 120/277 shall be Hubbell HBL1221 or approved equal.
2. Double Pole, 20 amp, 120/277V shall be Hubbell HBL1222 or approved equal.
3. Three-Way, 20 amp, 120/277V shall be Hubbell HBL1223 or approved equal.
4. Four-Way, 20 amp, 120/277V shall be Hubbell HBL1224 or approved equal.

B. Snap Switches: Federal Specification grade, quiet type, abuse resistant nylon toggle, color coded base, one piece rivetless copper alloy spring contact arm & terminal plate, one piece integral grounding terminal with #8 brass screw, stainless steel automatic grounding clip, back wiring, one piece rivetless copper alloy spring contact arm and terminal plate. Provide 15 amp switch for circuits controlling up to but not exceeding 15 amperes. Provide 20 amp switch for circuit exceeding 15 amperes but less than or equal to 20 amperes. Provide 30 ampere switches for circuits exceeding 20 amperes but less than 30 amperes.

C. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters. Colors shall be white.

1. Incandescent Dimming Switches: Provide 1500 watt slider type preset dimming switches gang mounted as indicated on the Drawings. The dimmer shall be Lutron NT-1503P. Color shall be white with a white cover plate (clear anodized aluminum if 302SS is not available).
2. Fluorescent Dimming Switches: Provide slider type preset dimming switches gang mounted as indicated on the Drawings. The dimmer shall be Lutron NTF series with voltage and amperage as required. Color shall be white with a white cover plate (clear anodized aluminum if 302SS is not available).
3. Low voltage dimming switch: 600 watt slider type preset dimming switches gang mounted as indicated on the drawings. The dimmer shall be Lutron NLV-600. Color shall be white with white cover.

2.6 Wall Plates

A. Single and combination types to match corresponding wiring devices.

1. Material for Finished Spaces: Provide UL listed one-piece device plates for outlets to suit the devices installed. Except as noted below, all wiring device plates shall be 302 stainless steel, 0.032 in. thick high-impact smooth nylon white. Jumbo device plates shall be used on all walls, Hubbell ‘SJ’ series, 302 stainless steel high-impact smooth nylon white or approved equal. Sectional type device plates will not be permitted. Screws shall be machine-type with countersunk heads in color to match finish of plate.
2. Material for Unfinished Spaces: Provide UL listed one-piece device plates for outlets to suit the devices installed. Except as noted below, all wiring device plates shall be 302, stainless steel 0.032 in. thick. Jumbo device plates shall be used on all walls, Hubbell ‘SJ’ series, 302 stainless steel or approved equal. Sectional type device plates will not be permitted. Screws shall be machine-type with countersunk heads in color to match finish of plate.
3. Material for Wet Locations: Plates installed in wet locations shall be cast, gasketed and UL listed for "wet locations."

2.7 Floor Service Fittings

A. Type: Modular, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Power Receptacle: NEMA WD 6, Configuration 5-20R, unless otherwise indicated.

2.8 Finishes

1. Wiring Devices Connected to Normal Power System: White , unless otherwise indicated or required by NFPA 70.
2. Wiring Devices Connected to Emergency Power System: Red.
3. SPR Devices: Blue.

2.9 Finishes

1. Wiring devices connected to normal power system: Grey.
2. Wiring devices connected to normal power system controlled by Occupancy Sensor: White.
3. Wiring Devices Connected to Emergency Power System: Red.
   a. Faceplates shall be engraved with “EMERGENCY” in red letters.
4. Isolated Ground – Orange
5. SPR Devices: Blue.

PART 3 - EXECUTION

3.1 Installation

A. Install devices and assemblies level, plumb, and square with building lines.

B. Mounting Heights: Mounting heights for receptacle outlets shall be 18" above finished floor or as indicated on the Drawings. Mounting heights for receptacles over casework shall be 7" above counter top. Verify all receptacle heights prior to rough-in. Provide a written description to the Engineer, prior to rough-in, any conflicts. The Contractor shall at his expense, be responsible for the relocation of any receptacle not installed according to these specifications.

C. Prior to roughing-in wall outlet boxes, the Contractor shall verify from general construction drawings; door swings, type of wall finishes and locations for counters and work benches. Do not scale the plans; location of devices is shown on plans in desired vicinity. The Contractor shall carefully locate devices symmetrically and in coordination with architectural features.

D. Switches that control remote outlets, fans, etc., shall have engraved plastic name tags indicating the outlets, fans, etc. that are controlled.

E. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.

F. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Remove wall plates and protect devices and assemblies during painting.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 Connections

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 Field Quality Control

A. Perform the following field tests and inspections:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION

SECTION 263210 - DIESEL GENERATOR

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes packaged diesel engine generator sets with the following features and accessories:

1. Battery charger.
2. Base mounted fuel tank.
3. Engine-generator set.
4. Muffler.
5. Exhaust piping external to set.
6. Outdoor enclosure.
7. Remote annunciator.
8. Remote stop switch.
9. Starting battery.
10. Battery heater.
11. Block heater.
12. Exhaust insulation.

B. Related Sections include the following:

1. Division 26 Section "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine-generator sets.

1.3 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.

B. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth, expressed in Hertz or cycles per second.

1.4 Submittals

A. Product Data: Include the following:

1. Data on features, components, accessories ratings, and performance.
2. Thermal damage curve for generator.
3. Time-current characteristic curves for generator protective device.
4. Recommended circuit breaker setting.
5. Load calculations showing maximum voltage drop for each step.
6. Exhaust system insulation.
7. Rain cap.
8. Equipment enclosure with wind rating.
9. Fuel tank with required fuel containment and safeguards.
10. Day tank (if required).
11. Remote annunciator and wiring requirements.
12. Emergency kill switch and wiring requirements.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Qualification Data: For manufacturer.

D. Certified summary of prototype-unit test report.

E. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.

F. Certified Summary of Performance Tests: Demonstrate compliance with specified requirement to meet performance criteria for sensitive loads.

G. Test Reports:

1. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
2. Report of sound generation.

3. Field quality-control test reports.

H. Certification of Torsional Vibration Compatibility: Comply with NFPA 110.

I. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition include the following:

1. List of tools and replacement items recommended to be stored at the Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

J. Warranty: Special warranty specified in this Section.

1.5 Quality Assurance

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than 4 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’s Distributor Qualifications: A qualified supplier. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance repairs. Service cannot be sublet to another service organization.

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

D. Comply with NFPA 30 and 37A.

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110 requirements for emergency power supply system.

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

I. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

J. Fuel containment. Comply with applicable state requirements.

1.6 Coordination

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

1.7 Warranty

A. Special Warranty: Manufacturer's standard form in which 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: Five years from date of Substantial Completion.

1.8 Maintenance Service

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly 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. Maintenance agreements shall include parts and supplies as used in manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 Manufacturers

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

1. Kohler Co; Generator Division
2. Caterpillar; Engine Div.
3. Onan Corp./Cummins Power Generation; Industrial Business Group.

2.2 Engine-Generator Set

A. Packaged engine-generator set shall be a coordinated assembly of compatible components.

B. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit as evidenced by records of prototype testing.

C. Output Connections: Three phase, four wire.

D. Safety Standard: Comply with ASME B15.1.

E. Nameplates: Each major system component shall be equipped with a nameplate to identify manufacturer's name and address, and model and serial number of component.

F. Mounting Frame: Adequate strength and rigidity to maintain alignment of mounted components without depending on concrete foundation. Mounting frame shall be free from sharp edges and corners and shall have lifting attachments arranged for lifting with slings without damaging components.

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

2.3 Generator-Set Performance

A. Over sizing generator compared with the rated power output of the engine is permissible to meet specified performance.

1. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

2. Generator temperature shall be Class F or Class B. Minimum ratings shall be 90 degree C Lloyds, 95 degree C ABS, 105 degree C continuous, 130 degree C standby (Rise by resistance method, Mil-Std-705, Method 680.1b).

B. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.

C. Steady-State Voltage Modulation Frequency: Less than 1 Hz.

D. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.

E. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.

F. 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.

G. Transient Frequency Performance: Less than 2-Hz variation for a 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.

H. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. The telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

I. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, the system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components and without a current boost system.

J. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

K. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.4 Service Conditions

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: Minus 15 to plus 40 deg C.
2. Altitude: Sea level to 500 feet.

2.5 Engine

A. Fuel: Fuel oil, Grade DF-2.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).

D. Lubrication System: The following items are mounted on engine or skid:

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.

E. Engine Fuel System:

1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

G. Governor: Adjustable isochronous, with speed sensing.

2.6 Engine Cooling System

A. Description: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

B. Radiator: Rated for specified coolant.

C. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

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

E. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

1. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.7 Fuel Supply System

A. Comply with NFPA 30.

B. Day Tank (where indicated on drawings): Comply with UL 142, freestanding, factory-fabricated fuel tank assembly, with integral, float-controlled transfer pump and the following features:

1. Containment: Integral rupture basin with a capacity of 150 percent of nominal capacity of day tank.
   a. Leak Detector: Locate in rupture basin and connect to provide audible and visual alarm in the event of day-tank leak.
2. Tank Capacity: As recommended by engine manufacturer for an uninterrupted period of 4 hours' operation at 100 percent of rated power output of engine generator system without being refilled.
3. Pump Capacity: Exceeds maximum flow of fuel drawn by engine-mounted fuel supply pump at 110 percent of rated capacity, including fuel returned from engine.
4. Low-Level Alarm Sensor: Liquid-level device operates alarm contacts at 25 percent of normal fuel level.
5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 100 percent of normal fuel level.
6. Piping Connections: Factory-installed fuel supply and return lines from tank to engine; local fuel fill, vent line, overflow line; and tank drain line with shutoff valve.

7. Redundant High-Level Fuel Shutoff: Actuated by high-level alarm sensor in day tank to operate a separate motor device that disconnects day-tank pump motor. Sensor shall signal solenoid valve, located in fuel suction line between fuel storage tank and day tank, to close. Both actions shall remain in shutoff state until manually reset. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine-generator set.
8. Return pump returning fuel to main storage tank.

C. Base-Mounted Fuel Oil Tank: Factory installed and piped, complying with all local, state and federal guidelines and with UL 142 fuel oil tank. Features include the following:

1. Tank level indicator.
2. Dual wall construction with leak detection.
3. Capacity: Fuel for 48 hours continuous operation at 100 percent rated power output.
4. Vandal-resistant fill cap.
5. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.8 Engine Exhaust System

A. Muffler: Critical type, sized as recommended by engine manufacturer; sound level measured at a distance of 10 feet (3 m) from exhaust discharge shall be 85 dBA or less. Muffler shall be mounted inside generator weatherproof housing. Shall be mounted such that generator housing can be fully opened for maintenance.

B. Condensate Drain for Muffler: Schedule 40, black steel pipe connected to muffler drain outlet through a petcock.

C. Connection from Engine to Exhaust System: Flexible section of corrugated stainless-steel pipe.

D. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liner.

E. Exhaust Piping External to Engine: ASTM A 53/A 53M, Schedule 40, welded, black steel, with welded joints and fittings and exterior insulation.

F. Rain Cap: Rain cap shall be aluminum or stainless steel and shall penetrate the top of the housing and contain no elbows outside housing.

G. Insulation: For all installations, the exhaust system shall be fully insulated as recommended by the generator manufacturer.

2.9 Combustion-Air Intake

A. Description: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

2.10 Starting System

A. Description: 24-V electric, with negative ground and including the following items:

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Environmental Conditions" Paragraph in "Service Conditions" 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 specified in "Environmental Conditions" Paragraph in "Service Conditions" Article 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.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in "Environmental Conditions" Paragraph in "Service Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Heater: Provide where generator is installed outdoors. Provide automatic disconnect for when generator is running.
9. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. 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 C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.

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

    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.

    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.

2.11 Control And Monitoring

A. Functional Description: 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 the generator set. When mode-selector switch is switched to the on position, the generator set starts. The off position of the same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down the generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down the generator set. Control system shall be microprocessor based.

B. 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 generator set. Mounting method shall isolate the control panel from generator-set vibration.

C. Indicating and protective devices and controls shall include those required by NFPA 110, and the following:

D. Indicating and Protective Devices and Controls:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Start-stop switch.
11. Overspeed shutdown device.
12. Coolant high-temperature shutdown device.
13. Coolant low-level shutdown device.
14. Oil low-pressure shutdown device.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.

E. 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.

F. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 26 Section "Electrical Power Monitoring and Control."

G. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.

1. Engine high-temperature shutdown.
2. Lube-oil low-pressure shutdown.
3. Over speed shutdown.
4. Remote emergency-stop shutdown.
5. Engine high-temperature prealarm.
6. Lube-oil low-pressure prealarm.
7. Fuel tank, low-fuel level.
8. Low coolant level.
9. Over crank shutdown.
10. Coolant low-temperature alarm.
11. Control switch not in auto position.
12. Battery-charger malfunction alarm.
13. Battery low-voltage alarm.

H. Remote Alarm Annunciator: Comply with NFPA 99. Labeled LED shall identify each alarm event. Common audible signal shall sound for alarm conditions. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

I. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation. Install as indicated on the Drawings or Engineer approved location.

J. Provide TVSS on all circuits exiting genset.

2.12 Generator Overcurrent And Fault Protection

A. Generator Circuit Breaker: Molded-case, thermal-magnetic type; 100 percent rated; complying with NEMA AB 1 and UL 489.

1. Tripping Characteristic: Designed specifically for generator protection. Provide circuit breaker settings to coordinate with generator damage characteristics.
2. Trip Rating: Matched to generator rating.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Ground-Fault Indication (where indicated on drawings): Comply with NFPA 70, Article 700-7(d). Integrate ground-fault alarm indication with other generator-set alarm indications.

2.13 Generator, Exciter, And Voltage Regulator

A. Comply with NEMA MG 1 and specified performance requirements.

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

C. Electrical Insulation: Class F.

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

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

F. Excitation shall use no slip or collector rings, or brushes, and shall be arranged to sustain generator output under short-circuit conditions as specified.

G. Enclosure: Drip proof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band. Isolated from load to prevent tracking.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding. Dipped and baked, harmonic distortion not to exceed 5% total RMS line to line.

L. Subtransient Reactance: 12 percent, maximum.

2.14 Outdoor Generator-Set Enclosure

A. Description: Vandal-resistant, weatherproof painted marine-grade aluminum Level 2 sound attenuated enclosure.

1. The enclosure shall be UL2200 listed, providing a sound level of 75.2 dB(A) while the generator is operating at 100% load at 23 feet (7 meters) using acoustic insulation and acoustic-lined inlet hoods, constructed from a minimum of 0.125-inch thick formed heavy duty aluminum panels. The acoustic insulation used shall meet UL 94 HF1 flammability classification. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement. The enclosure shall use a vertically louvered air inlet and outlet hood with 90-degree angle to discharge air up and reduce noise. The enclosure shall have an integral rodent guard and skid end caps. The enclosure shall be certified to 186 mph (299 kph) wind load rating. The snow load rating shall be 70 lbs./ sq. ft. or greater.

2. Generator Enclosure Integral Load Center: The generator set enclosure shall be furnished with a 120/208Y 3-Phase/4-Wire, 100A main circuit breaker load center with a minimum of 12 branch circuit breakers. The load center shall support all necessary generator accessory circuits. At a minimum the load center shall feed:
   a. (2) LED lights via (2) 3-way switches
   b. (2) duplex GFCI convenience receptacles
   c. Battery charger
   d. Generator block heater
   e. Motorized dampers, where provided.
3. The generator set enclosure shall be furnished with separate set of DC LED lights powered by the starting battery on a fused circuit with a 0-60 minute "No-Lock-On" timer.
4. The enclosure shall allow the generator set to operate at full load based on the cooling capability of the genset. The enclosure will account for no more than a 5°C derating of the ambient cooling capability of the generator.
5. Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit. A minimum of two doors per side shall be provided. Access to the genset controller and main line circuit breaker(s) shall through a door and shall meet the minimum working clearance requirements of the National Electric Code.
6. The enclosure shall be furnished with stainless steel latches, hinges, and hardware on the external panels of the enclosure. Access doors shall be rubber sealed to prevent water intrusion and to minimize noise.
7. Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.
8. A duct between the radiator and air outlet shall be provided to prevent recirculation of hot air.
9. The complete exhaust system shall be internal to the enclosure.
10. The critical silencer shall be fitted with a tailpipe and rain cap.

B. HVHZ Enclosure Requirements:
   1. Enclosure shall conform to the Florida Building Code for High-Velocity Hurricane Zones.
   2. Enclosure shall be third-party tested and certified to meet the following standards:
      a. Large Missile Impact Level E (FBC TAS 201-94)
      b. Uniform Static Air Pressure (FBC TAS 202-94)
      c. Cyclic Wind Pressure Loading (FBC TAS 203-9)
      d. Ultimate Design Pressure – Wall Panels +/- 65PSF
      e. Ultimate Design Pressure – Roof Panels +/- 100PSF
   3. Louvers:
      a. Inlet louvers: aluminum, motorized.
      b. Outlet louvers: galvaneel steel, gravity activated 90° louvers to prevent entry of rain and snow.

2.15 Finishes

A. Indoor Components: Manufacturer's electrostatically applied powder coat over corrosion-resistant pretreatment and compatible standard primer.

B. Outdoor Enclosures and Components: Cleaned with two-stage alkaline cleaning process, manufacturer's electrostatically applied powder coat over corrosion-resistant pretreatment and primer and finish coated with powder baked fade-, scratch-, and corrosion resistant Power Armor heavy-duty industrial finish.
   1. The enclosure shall surpass a 3,000 hour salt spray corrosion test per ASTM B-1117.

C. Enclosure finish shall be manufacturer's standard color.

2.16 Source Quality Control

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

   1. Tests: Comply with NFPA 110, Level 1 energy converters in Paragraphs 3.2.1, 3.2.1.1, and 3.2.1.2.
   2. Generator Tests: Comply with IEEE 115.
   3. Components and Accessories: Items furnished with installed unit that are not identical to those on tested prototype shall have been factory tested to demonstrate compatibility and reliability.

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

   1. Full load run.
   2. Maximum power.
   3. Voltage regulation.
   4. Transient and steady-state governing.
   5. Single-step load pickup.
   6. Safety shutdown.

C. 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 of 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 Concrete Bases

A. Coordinate size and location of concrete bases. Shall be 8" thick, exceeding genset footprint by 12" on all sides and be 4" higher than grade level. Provide as defined in 26 05 11. Provide rebar reinforcement, #6 on 12" centers on top and bottom. Provide a ground strap from rebar, 4/0 copper.

B. Provide a counterpoise ground loop around the concrete pad. Ground loop shall be 4/0 copper, 12" below grade. Provide two driven ground rods on opposite corners of the counterpoise loop. Ground rods shall be copper clad ¾" x 30'. Bond pad rebar with counterpoise loop. Provide a 4/0 copper lead to the generator grounding pad.

3.3 Installation

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

B. Install packaged engine generators level on concrete base.

1. Vibration Isolation: Mount packaged engine generators on restrained spring isolators or internal vibration isolators.

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

D. Install exhaust-system piping. Extend to point of termination outside structure. Size piping according to manufacturer's written instructions.

1. Install condensate drain piping for engine exhaust system. Extend drain piping from low points of exhaust system and from muffler to condensate traps and to point of disposition.
2. Support exhaust piping and muffler with pipe hangers spaced a maximum of 20 feet (6 m) horizontally and at each floor vertically. Pipe hangers are specified in Division 15 Section "Hangers and Supports."
3. Restrain exhaust piping and mufflers with cable-type bracing assemblies. Cable-type bracing assemblies are specified in Division 26 Section "Seismic Controls for Electrical Work."
4. All exhaust piping and muffler within the building shall be insulated by manufacturer approved insulation system.
5. Provide a manufacturer approved rain cap on the end of the exhaust piping.
6. Provide approved building sleeve where exhaust exits the building. Sleeve shall be weatherproof.

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

3.4 Connections

A. Drawings indicate general arrangement of piping and specialties. The following are specific connection requirements:

1. Install fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

2. Connect cooling-system water supply and drain piping to diesel-engine heat exchangers. Install flexible connectors at connections to engine generator and remote radiator.

3. Connect fuel piping to engines with a gate valve and union.

   a. Diesel storage tanks, tank accessories, piping, valves, and specialties for fuel systems outside the building are specified in Division 2 Section "Fuel Oil Distribution."

   b. Diesel fuel piping, valves, and specialties inside the building are specified in Division 15 Section "Fuel Oil Piping."

   c. Natural- and LP-gas piping, valves, and specialties for gas distribution outside the building are specified in Division 2 Section "Natural Gas Distribution."

   d. Natural- and LP-gas piping, valves, and specialties for gas piping inside the building are specified in Division 15 Section "Fuel Gas Piping."

4. Connect exhaust-system piping to engines.

B. Ground equipment according to Division 26 Section "Grounding and Bonding." Generator shall be configured as a “separately derived electrical system” by bonding the neutral and ground at the generator.

C. Connect wiring according to Division 26 Section "Conductors and Cables."

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.5 Identification

A. Identify system components according to Division 26 Section "Basic Electrical Materials and Methods."

3.6 Field Quality Control

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Sections 7.15.2.1 and 7.22.1 (except for vibration baseline test). Certify compliance with test parameters.
2. Perform tests recommended by manufacturer.
3. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, the following:
    a. Single-step full-load pickup test.
4. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
    a. 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.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.
5. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
6. 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.

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

D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of the National Institute for Standards and Technology, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge system 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.

G. Perform reactive load bank test for a minimum of 4 hours at 0.8 pf.

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

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

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

K. 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.

3.7 Startup Service

A. Engage a factory-authorized service representative to perform startup service.

B. Inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

C. Complete installation and startup checks according to manufacturer's written instructions. Provide test documentation to Engineer.

D. Provide a full fuel tank at final acceptance. Fuel shall be new and receipt shall be provided in close out documents. Provide suitable fuel additive, as recommended by manufacturer, to preserve fuel. Include information on fuel additive in close out documents.

3.8 Demonstration

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

1. Coordinate this training with that for transfer switches.
2. Fully demonstrate operation, maintenance, and emergency procedures with Owner’s representative.

END OF SECTION

SECTION 263220 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 Summary

A. This Section includes transfer switches rated 600 V and less, including the following:
   1. Automatic transfer switches.
   2. Bypass/isolation switches.
   3. Nonautomatic transfer switches.

1.3 Submittals

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, sections, and elevations showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

   1. Wiring Diagrams: Single-line diagram. Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition include the following:

   1. Features and operating sequences, both automatic and manual.
   2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4 Quality Assurance

A. Manufacturer Qualifications: Maintain a service center capable of providing training, parts, and emergency maintenance repairs within a response period of less than eight hours from time of notification.

B. Source Limitations: Obtain automatic transfer switches, bypass/isolation switches, nonautomatic transfer switches, remote annunciators, and remote annunciator and control panels through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for emergency service under UL 1008, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NEMA ICS 1.

E. Comply with NFPA 70.

F. Comply with NFPA 99.

G. Comply with NFPA 110.

H. Comply with UL 1008 unless requirements of these Specifications are stricter.

PART 2 - PRODUCTS

2.1 Manufacturers

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

1. Contactor Transfer Switches:

a. Emerson; ASCO Power Technologies, LP.
b. Kohler Co.; Generator Division.
c. Onan Corp./Cummins Power Generation; Industrial Business Group.
d. Russelectric, Inc.

2.2 General Transfer-Switch Product Requirements

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including 100% tungsten filament lamp loads.

B. Tested Fault-Current Closing and Withstand Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

C. Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels have communication capability matched with remote device.

D. Solid-State Controls: Repetitive accuracy of all settings is plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

E. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

F. Neutral Terminal: Switched, solid and fully rated.

G. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

H. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color code or by numbered or lettered wire and cable tape markers at terminations.

1. Designated Terminals: Pressure type suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

I. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

J. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Switch Action: Double throw; mechanically held in both directions.
2. Contacts: Fully rated silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

2.3 Automatic Transfer Switches

A. Comply with Level 1 equipment according to NFPA 110.

B. Microprocessor based.

C. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

D. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

2.4 Automatic Transfer-Switch Features

A. Undervoltage Sensing for Each Phase of Normal Source: Senses low phase-to-ground voltage on each phase. Pickup voltage is adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.

B. Time delay for override of normal-source voltage sensing delays transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.

C. Voltage/Frequency Lockout Relay: Prevents premature transfer to generator. Pickup voltage is adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency is adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

D. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes. Provides automatic defeat of delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.

E. Test Switch: Simulates normal-source failure.

F. Switch-Position Pilot Lights: Indicate source to which load is connected.

G. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
2. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

H. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

I. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

J. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.

K. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.

L. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

1. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
2. Push-button programming control with digital display of settings.
3. Integral battery operation of time switch when normal control power is not available.

2.5 Bypass/Isolation Switches

A. Comply with requirements for Level 1 equipment according to NFPA 110.

B. Description: Manual type, arranged to select and connect either source of power directly to load, isolating transfer switch from load and from both power sources. Include the following features for each combined automatic transfer switch and bypass/isolation switch:

1. Means to lock the bypass/isolation switch in the position that isolates the transfer switch with an arrangement that permits complete electrical testing of transfer switch while isolated. While isolated, interlocks prevent transfer-switch operation, except for testing or maintenance.
2. Drawout Arrangement for Transfer Switch: Provides physical separation from live parts and accessibility for testing and maintenance operations.
3. Bypass/Isolation Switch Current, Voltage, Closing, and Short-Circuit Withstand Ratings: Equal to or greater than those of associated automatic transfer switch, and with same phase arrangement and number of poles.
4. Contact temperatures of bypass/isolation switches do not exceed those of automatic transfer-switch contacts when they are carrying rated load.
5. Operability: Constructed so load bypass and transfer-switch isolation can be performed by 1 person in no more than 2 operations in 15 seconds or less.
6. Legend: Manufacturer's standard legend for control labels and instruction signs give detailed operating instructions.
7. Maintainability: Fabricate to allow convenient removal of major components from front without removing other parts or main power conductors.

C. Interconnection of Bypass/Isolation Switches with Automatic Transfer Switches: Factory-installed copper bus bars; plated at connection points and braced for the indicated available short-circuit current.

2.6 Nonautomatic Transfer Switches

A. Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternate Source." Switch is capable of transferring load in either direction with either or both sources energized.

B. Operation: Electrically actuated by push buttons designated "Normal Source" and "Alternate Source." In addition, removable manual handle provides quick-make, quick-break manual-switching action. Switch is capable of electrically or manually transferring load in either

direction with either or both sources energized. Control circuit disconnects from electrical operator during manual operation.

C. Double-Throw Switching Arrangement: Incapable of pauses or intermediate position stops during switching sequence.

2.7 Nonautomatic Transfer-Switch Accessories

A. Pilot Lights: Indicate source to which load is connected.

B. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and alternate-source sensing circuits.

1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
2. Emergency Power Supervision: Red light with nameplate engraved "Alternate Source Available."

C. Unassigned Auxiliary Contacts: One set of normally closed contacts for each switch position, rated 10 A at 240-V ac.

2.8 Remote Annunciator System

A. Functional Description: Remote annunciator panel annunciates conditions for indicated transfer switches. Annunciation includes the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.9 Remote Annunciator And Control System

A. Functional Description: Include the following functions for indicated transfer switches:

1. Indication of sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Indication of switch position.
3. Indication of switch in test mode.
4. Indication of failure of digital communication link.
5. Key-switch or user-code access to control functions of panel.
6. Control of switch-test initiation.
7. Control of switch operation in either direction.
8. Control of time-delay bypass for transfer to normal source.

B. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to stand-alone, self-contained operation. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation.

C. Remote Annunciation and Control Panel: Solid-state components. Include the following features:

1. Controls and indicating lights grouped together for each transfer switch.
2. Label each indicating light control group. Indicate the transfer switch it controls, location of switch, and load it serves.
3. Digital Communication Capability: Matched to that of transfer switches supervised.
4. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.

2.10 Finishes

A. Enclosures: Manufacturer's polyester powder coat over corrosion-resistant pretreatment and primer.

2.11 Source Quality Control

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1 Application

A. Four-Pole Switches: install neutral switching.

3.2 Installation

A. Floor-Mounted Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 2 inches (50 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated. Cast anchor-bolt inserts into bases. Comply with Division 3 Section "Cast-in-Place Concrete."

B. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

C. Identify components according to Division 26 Section "Basic Electrical Materials and Methods."

3.3 Wiring To Remote Components

A. Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

3.4 Connections

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.5 Field Quality Control

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.

2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.22.3. Certify compliance with test parameters.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.

b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.

c. Verify that manual transfer warnings are properly placed.

d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

b. Simulate loss of phase-to-ground voltage for each phase of normal source.

c. Verify time-delay settings.

d. Verify pickup and dropout voltages by data readout or inspection of control settings.

e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.

f. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

C. Coordinate tests with tests of generator and run them concurrently.

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

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

3.6 Demonstration

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.

1. Coordinate this training with that for generator equipment.

END OF SECTION