



Alabama Port Authority
Specification Booklet

Project Name **Stacker Reclaimer 2 & 3 Procurement - Electrical Switchgear Supply**

Location Mobile, AL

Project # 11367 **TASK#** 5 April 2026

SPECIFICATIONS AND CONTRACT DOCUMENTS



ALABAMA PORT AUTHORITY

Doug Otto, Director & CEO

Kay Ivey, Governor of Alabama

ISSUED BY

Engineering Services Department

ALABAMA STATE PORT AUTHORITY **INSURANCE REQUIREMENTS FOR CONTRACT WORK**

INDEMNIFICATION

The Contractor shall assume all liability for and shall indemnify and save harmless the State of Alabama and the Alabama State Port Authority, doing business as Alabama State Docks (ASD), and its officers and employees 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.

INSURANCE REQUIREMENTS

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 ASD, nor shall the Contractor allow any subcontractor to commence work until all similar applicable insurance has been obtained by the subcontractor or the Contractor has provided coverage for the subcontractor. The Contractor shall provide, at his expense, insurance in accordance with the following:

General Requirements (applicable to all policies)

All policies of insurance must be written with companies acceptable to ASD. The Contractor shall furnish to ASD certificates of insurance, signed by the licensed agent, evidencing required coverages. ASD 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 ASD 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 ASD.**

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 coverages, in an amount not less than \$3,000,000 for any one occurrence for bodily injury, including death, and property damage liability.

Business Automobile Liability

The Contractor shall take out and maintain during the life of the contract Business Automobile Liability insurance covering any auto in an amount not less than \$1,000,000 for any one occurrence for bodily injury, including death, and property damage liability.

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 Harborworkers' Compensation Act (USL&H), Jones Act, and Railroad Federal Employers Liability Act (FELA).

SECTION 16310 – MEDIUM VOLTAGE SWITCHGEAR

PART 1 - GENERAL

1.0 SCOPE OF WORK

- 1.1 This Section covers the furnishing and installing of medium voltage switchgear from the incoming line terminals to the outgoing line terminals. The CONTRACTOR shall furnish all materials, equipment, tools, labor and supervision to accomplish the work in accordance with this Specification Section and the Contract Drawings.

The New Main 5kV Switchgear shall be indoor rated medium voltage switchgear contained in a weatherproof building. The New Main 5kV Switchgear line-up shall include a 5kV rated incoming section with a Main Breaker and a 5kV rated feeder section with two Feeder Breakers. The 5kV switchgear shall have a 2000A bus rating. See project one line diagram for breaker sizes.

- 1.2 The New Main 5kV Switchgear installation design and layout are based on EATON Metal-Enclosed Switchgear Front-Accessible per EATON Design Guide DG022008EN. To propose an alternate design, see PART 3, Section 10.17 'Requests for Substitution/Alternate'.
- 1.3 The New Main 5kV Switchgear supplied must meet the requirements as specified in these specifications and as detailed in the contract drawings. The New 5kV Switchgear installation shall have a minimum depth of six feet clear working space per the National Electrical Code. Any discrepancies should be immediately brought to the attention of the owner's representative in writing prior to bid. Any discrepancies not brought to the attention of the project representative prior to bid will be the financial responsibility of the contractor to make correct per the owner's representative understanding of the project requirements.
- 1.4 The manufacturer of the switchgear shall furnish and coordinate all major components of the switchgear and provide a single warranty covering all switchgear assemblies and components.
- 1.5 It is the manufacturer's responsibility to verify that all submitted equipment will meet the requirements of the project as shown in the contract drawings.
- 1.6 Switchgear equipment shall be weatherproof (NEMA 3R), rated for a saltwater environment, rodent proof and shall contain 120V space heaters as required.

2.0 REFERENCES

2.1 The medium voltage switchgear shall be designed, assembled, tested, and installed in accordance with latest applicable standards. It shall be the manufacturer's responsibility to be knowledgeable of these standards and codes. The standards and codes are as follows:

- 2.1.1 National Electrical Manufacturers Association (NEMA)
- 2.1.2 Institute of Electrical and Electronic Engineers (IEEE)
- 2.1.3 National Electric Code (NEC)
- 2.1.4 National Fire Protection Association (NFPA)
- 2.1.5 American National Standards Institute, Inc. (ANSI)
- 2.1.6 Underwriters Laboratories (UL) (shall be UL Labeled)

3.0 DOCUMENTATION

3.1 Submittals -- for Review/Approval

- 3.1.1 A submittal review by the Owner's representative is required prior to fabrication to insure compliance with the specifications. All items in the documents must comply with the specifications and variance will not be accepted unless these items are specifically called out in the documents as a variation from the specifications. If items in the documentation do not meet specifications or design requirements and are not specifically called out as non-compliant but make it through the Review/Approval process and fabrication has started, the manufacturer will still be required make these items compliant at no additional cost to the Owner.
- 3.1.2 All information listed for review should be submitted in one package. A designated manufacturer's representative that is familiar with this project should be readily available by telephone, during business hours, during the review period to answer all questions.
- 3.1.3 The following information shall be submitted to the Engineer:
 - a) Master drawing index
 - b) Front view elevation
 - c) Floor plan
 - d) Top view
 - e) Single line
 - f) Schematic diagram
 - g) Nameplate schedule
 - h) Component list
 - i) Conduit entry/exit locations

- j) Assembly ratings including:
 - Short-circuit rating
 - Voltage
 - Continuous current
 - Basic Impulse level
- k) Major component ratings including:
 - Voltage
 - Continuous current
 - Interrupting ratings
- l) Cable terminal sizes
- m) Relay information.
- n) Dimensioned equipment layout.
- o) Detailed drawings on the Utility Compartment (if required).
- p) Control drawings.
- q) Equipment interconnection diagrams.
- r) Single line diagrams.
- s) Three line diagrams.
- t) Relay control diagrams.
- u) Key interlock scheme drawing and sequence of operation.
- v) Utility compliance where specified herein.

3.1.4 After the return of approval drawings or after any change made to previously approved drawings, the manufacturer shall submit a record copy of any and all drawings that contained revisions.

3.1.5 Each revision of any drawing/document must have a revision number/letter and the date the revision was issued.

3.1.6 After completion of the inspection and testing procedures the manufacturer shall submit a complete set of "as built" drawings. These drawings shall function as a record of the final construction of the equipment at the time it left the factory.

3.1.7 Each drawing prepared by the manufacturer shall show, at a minimum, the name, jobsite location, purchase order or contract number, and equipment identification number in addition to any information required by manufacturer.

3.2 Submittals -- for Information

3.2.1 When requested by the Engineer the following product information shall be submitted:

- a) Descriptive bulletins
- b) Product sheets.

3.3 Submittals -- for Closeout

3.3.1 The following information shall be submitted for record purposes:

- a) Final as-built drawings and information.
- b) Wiring diagrams
- c) Certified production test reports
- d) Installation information.
- e) Relay settings, certification, and test reports.
- f) Compliance records from required utility test.
- g) Warranty Information

3.4 Test Documentation

Certified production test reports indicating satisfactory completion of all inspection and test procedures shall be provided (See Section 10.1).

3.5 Operating and Maintenance Manuals

3.5.1 At time of shipment the manufacturer shall provide six (6) copies of the operating and maintenance instructions for all major components contained in the switchgear assembly.

3.5.2 Operation and maintenance manuals shall include the following information:

- a) Instruction books and/or leaflets
- b) Recommended renewal parts list
- c) As-built drawings of the switchgear.

3.5.3 Each complete set of manuals shall be bound and shall contain a table of contents to allow for easy reference.

3.6 Upon completion of the engineering phase, a quotation for one (1) year's recommended spare parts shall be submitted by the manufacturer.

3.7 For all transmittals, submit ten (10) hard copies of all documentation unless otherwise stated herein. In addition to paper copies, all drawings shall be supplied on a CD in AutoCAD 2024 format.

4.0 QUALIFICATIONS

4.1 The manufacturer of the assembly shall be the manufacturer of the major switchgear components within the assembly.

4.2 For the switchgear equipment specified herein, the manufacturer shall be ISO

9000, 9001 or 9002 certified.

- 4.3 The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement. Where specified to meet utility compliance, the manufacturer shall have supplied similar equipment within the last three years in the utility service area.

5.0 WARRANTY

The manufacturer warrants that the equipment specified within this specification will be free from all defects in design, materials, equipment and workmanship, for a period of not less than two (2) years from the **Project Acceptance** date. This warranty shall include all structures, mechanisms and components that are manufactured or provided by the manufacturer. In the event that any part of the equipment appears to be defective in design, manufacture, materials, fabrication, or workmanship within the period of warranty, the Owner will immediately notify the manufacturer in writing of the alleged defect or failure. The manufacturer will thereupon promptly correct any defect or failure without cost to the Owner, or it will authorize the Owner to make, for the manufacturer's account, such repairs or replacements as may be necessary to correct the defect or failure. No allowance will be made for any repairs made by the Owner, or others, unless and until the Owner has given the manufacturer notice of the alleged defect or failure prior to the commencement of such repairs or replacements. However, if the defect is such as to interfere with the Owner's operation, the Owner may, after notification, proceed forthwith to repair the same at the expense of the manufacturer.

6.0 REGULATORY REQUIREMENTS

All equipment shall meet or exceed the requirements of applicable standards of the local utility if required by the utility.

7.0 DELIVERY, STORAGE AND HANDLING

- 7.1 Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.
- 7.2 If the equipment must be delivered prior to the completion of the equipment final installation location, the contractor shall store the equipment at another location per the manufactures requirements. The equipment heaters must be energized at all times by a temporary power source to be supplied by the contractor until the permanent power source is energized. The storage location and conditions must be approved by the Owner, the Owner's Representative and the Manufacturer in writing two weeks prior to delivery.
- 7.3 Upon request the equipment shall be made available for customer inspection prior

to shipment. The Client and Engineer shall be given at least a three (3) weeks written notice prior to the time frame the equipment shall be made available for inspection.

8.0 SERVICE AND ENVIRONMENTAL CONDITIONS

- 8.1 **Unless otherwise specified**, this equipment is intended for use in ambient temperatures that do not exceed a maximum of 50 degrees C (122 degrees F) or a minimum of -30 degrees C (-22 degrees F).
- 8.2 This equipment is intended for use in an area where the elevation is less than 3300 feet above sea level. The de-rating as prescribed by ANSI standards due to altitude do not apply.

PART 2 - PRODUCTS

9.0 MEDIUM VOLTAGE SWITCHGEAR

9.1 Approved Manufacturers:

- a) Siemens
- b) ABB
- c) General Electric
- d) Eaton, Cutler-Hammer
- e) Other manufacturer's must be submitted and approved by the Engineer.

9.2 Ratings -- Switchgear, Switch and Circuit breaker

- 9.2.1 The switchgear shall be designed in accordance with ANSI Standards C37.20.3, C37.20.4, C37.22, C37.57, C37.58 and NEMA Standards SG5 & SG6. The 15kV section shall be UL Listed.
- 9.2.2 The circuit breaker cell rated as shown in 9.2.6 with bus connection to main bus, cell studs with polyester glass spouts, automatic isolating shutters, and cell interlocks as required by ANSI.
- 9.2.3 The runback bus shall be silver plated copper.
- 9.2.4 Each drawout vacuum circuit breaker shall be provided with all required contacts and a minimum of 2 "a" and 2 "b" spare contacts.
- 9.2.5 The circuit breaker shall have two LED status indicating lights, three current transformers, single ratio standard burden, one zero sequence ground current transformer.
- 9.2.6 The switchgear assembly ratings shall be as follows:

	5kV Section
Maximum Design Voltage	4.76 kV
Basic Impulse Level	60 kV
Nominal System Voltage	4.16 kV three-phase, three wire
System Grounding	High-Resistance
Main Bus Continuous Current Rating	2000A
Switch Continuous and Load Break Current Rating	2000A
Switch Fault-Close & Momentary Amp kA ms Asym	39 kA
Switch Short Time (3 sec) Current Carrying Capability	25 kA
Rated Momentary Current kA rms Asym	65 kA
Close and Trip Voltage	120 VAC

9.3 Basic Construction

- 9.3.1 The equipment supplied shall be NEMA 3R construction and shall consist of indoor type circuit breaker and auxiliary cell located in a totally enclosed weatherproof steel housing. Housing shall be rated for saltwater environment.
- 9.3.2 Any required ventilation air from outside must be filtered for saltwater moisture.
- 9.3.3 The equipment shall be suitable for industrial or utility service.

- 9.3.4 The equipment shall be listed and labeled as suitable for Service Entrance.
- 9.3.5 This equipment shall be factory equipped such that additional sections can be added later without nullifying the listing and labeling of the switchgear unit or requiring it to be field labeled.
- 9.3.6 Front Compartment Doors:
 - 9.3.6.1 Each compartment housing a medium voltage device shall be provided with steel hinged door(s).
 - 9.3.6.2 The door(s) shall be provided with provisions for padlocking and a view window for observing circuit breaker position.
 - 9.3.6.3 No tie down bolts or other manual means shall be used to secure the door. A single handle must be provided to operate all required latching.
- 9.3.7 Rear Compartment Doors (If Applicable):
 - 9.3.7.1 Each rear compartment shall be provided with steel hinged door(s).
 - 9.3.7.2 Each rear compartment door shall be bolted shut and be provided with provisions for padlocking.
 - 9.3.7.3 A single handle is required to operate all required latching. Additional tie down bolt are acceptable.
 - 9.3.7.4 Each rear compartment shall be provided with signage indicating all potential dangers to personnel. This sign should also indicate all measures to be taken before access to this compartment is considered safe.
- 9.3.8 Louvers may be provided in the switchgear for ventilation or cooling purposes. These openings shall be filtered to retard the entrance of dust and salt water moisture. Filters shall be easily removable for maintenance.
- 9.3.9 Design must conform to the applicable IEEE standard construction.
- 9.3.10 It shall be the manufacturer's responsibility to coordinate all necessary alignment and interconnection between component sections. The entire assembly must be electrically and mechanically assembled into one single line-up prior to final inspection and shipment.
- 9.3.11 The equipment must be shipped complete, without missing components

or "ship shorts". Purchaser may waive this requirement upon request prior to shipment.

- 9.3.12 To facilitate ease of handling, each shipping section will be no more than two (2) vertical structures. Each shipping section shall be provided with lifting lugs adequately sized for the equipment.
- 9.3.13 Power circuit breakers shall be shipped and packaged separately from the switchgear structure.
- 9.3.14 The depth of the finished equipment shall be sufficient to allow for entrance, bending, and termination of power cables. Individual units shall be provided for top or bottom entrance as specified. A minimum of 30 inches of clearance between terminal pads and the cable entrance shall be provided.
- 9.3.15 Main bus supports between vertical sections of switchgear and inserts shall be constructed of polyester glass of suitable thickness. All material in this assembly shall be flame retardant and track resistant.
- 9.3.16 Bus stand off insulators shall be of polyester material.
- 9.3.17 Power circuit breakers and voltage transformer assemblies shall be drawout construction to provide maximum operator safety.
- 9.3.18 Safety interlocks and barriers as required by ANSI standards shall be provided to prevent personnel from inadvertent exposure to the bus while the switchgear is energized.
- 9.3.19 A continuous tin plated copper ground bus measuring ¼" x 2" shall be provided for the full length of the switchgear assembly. The ground bus shall be capable of carrying the rated short circuit current of the installed circuit breakers for a minimum of 2 seconds. **The 5kV feeder switchgear shall have two separate ground buses, one for normal equipment ground and one for isolated equipment ground. The isolated equipment ground shall be completely isolated and not connected to any other internal grounding system or structural steel. The isolated ground bus shall be permanently labeled as such.**

9.4 Power Circuit Breakers

- 9.4.1 The power circuit breakers shall be electrically operated, three pole, drawout type. The interrupting medium shall be vacuum.
- 9.4.2 Primary line and load connections shall be self-aligning.
- 9.4.3 The drawout mechanism shall hold the power circuit breaker rigidly in

- the fully connected position.
- 9.4.4 The drawout mechanism shall require less than 25 turns to move the circuit breaker from the connected to the disconnected positions.
 - 9.4.5 Each circuit breaker will have four (4) wheels to allow for easy maintenance and movement.
 - 9.4.6 A Lift Truck shall be provided to move a circuit breaker from floor level to the fully connected position.
 - 9.4.7 Interlocks shall be provided to prevent the circuit breaker from disconnecting from the main bus stabs unless the circuit breaker is open.
 - 9.4.8 The power circuit breaker ground connection must be capable of carrying the short circuit rating of the circuit breaker for a minimum of 3 seconds and must also be capable of withstanding the peak current value (or 2.7 times the rated short circuit current) of the circuit breaker.
 - 9.4.9 A grounded metal shutter system shall automatically cover the line and load stab connections when the circuit breaker unit is moved to the disconnected position. The shutter shall be padlockable in the closed position.
 - 9.4.10 Auxiliary contacts to provide circuit breaker element position indication (Truck Operated Cell switch or TOC) and to provide circuit breaker contact position (Mechanism Operated Cell switch or MOC) shall be provided. Both switch operator and switch must be visible and accessible from the front of the low voltage compartment when the circuit breaker is in the fully connected position.
 - 9.4.11 Circuit breaker operating mechanism shall be completely trip free both mechanically and electrically.
 - 9.4.12 Control power and control circuit wiring shall be connected to the power circuit breaker by means of a self aligning system that is automatically connected when the breaker is inserted in the test position and remains connected when the breaker is racked into the connected position.
 - 9.4.13 For operator safety the circuit breaker shall have provision for padlocking it in the disconnected position.
 - 9.4.14 Each circuit breaker shall have a mechanical operations counter.
 - 9.4.15 Each circuit breaker shall have an easily accessible means for contact wear indication.

9.5 Power Bus

- 9.5.1 Main power bus shall be silver-plated copper bar with silver plated joints.
- 9.5.2 The entire bus, except for joints and terminations, shall be completely isolated with metal barriers and insulated with non-removable and flame retardant coating. Field applied insulation shall be approved by Engineer prior to application. Alternatively, exposed connections, including the cable connections points, shall be covered with removable boots which do not require field taping of the joints and connections.
- 9.5.3 The main power bus shall be supported on insulators and mechanically braced to withstand stresses resulting from current values equivalent to the close and latch rating of the largest circuit breaker in the assembly. Bus stand-offs shall be porcelain and the main bus supports shall be polyester glass.
- 9.5.4 Bus joints shall be made with sufficient bolts and torqued to preserve initial contact pressure over the service life of the equipment. Bolts that are torqued to appropriate levels at the factory shall be identified with paint markings. Bolts shall be rated Grade 5 and plated for corrosion resistance.
- 9.5.5 Power bus orientation shall be A-B-C top to bottom, front to back, and left to right when viewed from the front of the switchgear.
- 9.5.6 A bare ground bus shall be provided and be supplied throughout the switchgear. (See 9.3.19)

9.6 Current Transformers (CT)

- 9.6.1 Current transformers shall be installed so that they can be easily maintained or replaced from the front of the switchgear without entering the power bus or cable termination compartments. Unless specified otherwise, the polarity marking shall be toward the circuit breaker.
- 9.6.2 Each current transformer shall be rated to withstand the thermal and mechanical stresses imposed by the short circuit rating of the applied circuit breaker.
- 9.6.3 The secondary termination of current transformers shall be on a shorting terminal block.
- 9.6.4 Current transformers shall have a rated 5 ampere secondary current

unless otherwise specified.

- 9.6.5 Current transformers, when installed, shall be fully rated for the appropriate voltage class. Current transformers with 600 volt insulation levels may be used if installed with fully rated insulation barriers such as around primary disconnect bushing assemblies.

9.7 Voltage Transformers (VT)

- 9.7.1 Voltage transformers and associated fuse assemblies shall be installed in drawout assemblies so that they may be readily disengaged from the power bus.
- 9.7.2 Where physical size restrictions do not allow the voltage transformer to be mounted in a drawout assembly, the voltage transformer may be stationary mounted with the fuses only mounted in the drawout unit. The appropriate interlocks shall be provided to insure maximum operator safety.
- 9.7.2.1 When voltage transformers are mounted in a drawout assembly, they shall be disconnected from the primary by a racking system similar to the circuit breakers that will allow the transformer to be disconnected with the compartment door closed.
- 9.7.2.2 When the voltage transformer is stationary mounted with fuses in a drawout assembly, the fuse assembly shall be disconnected from the primary by a racking system similar to the circuit breakers that will allow disconnecting with the compartment door closed.
- 9.7.3 When moved to the withdrawn position, the transformer drawout unit shall automatically ground the transformer primary windings and the fuses. The ground may not be a momentary or sweeping action, but must be maintained as long as the drawout assembly is not in the connected position.
- 9.7.4 Voltage transformers shall have 120-volt secondaries unless otherwise specified.
- 9.7.5 Voltage transformers shall have an accuracy rating comparable to the metering equipment and a burden capacity equal to twice the initial load.
- 9.7.6 Current limiting fuse protection shall be provided on the primary side of each voltage transformer.
- 9.7.7 Voltage transformers shall be designed to withstand the basic impulse

level of the switchgear.

9.8 Control Power Transformers (CPT)

- 9.8.1 Control power transformers shall be fixed mounted with the primary current limiting fuses mounted in a drawout unit.
- 9.8.2 Fuse assemblies shall be disconnected from the primary by a racking system similar to the circuit breakers that will allow disconnecting with the compartment door closed.
- 9.8.3 When moved to the withdrawn position, the fuse drawout unit shall automatically ground the fuses. The ground may not be a momentary or sweeping action, but must be maintained while the drawout assembly is not in the connected position.
- 9.8.4 Each control power transformer shall have a secondary molded case circuit breaker interlocked with the drawout assembly so that the load is disconnected prior to drawout.
- 9.8.5 All control power transformers shall be provided with one (1) 7 1/2% tap above and below rated voltage.
- 9.8.6 Secondary winding shall be 120/240VAC, single phase, 60Hz, 3 wire unless otherwise specified.

9.9 Control and Secondary Wiring

- 9.9.1 Control wiring shall be SIS type #14 AWG, 41 strand extra flexible, stranded copper or larger.
- 9.9.2 Current transformer secondary wiring shall be SIS type #12 AWG, 65 strand extra flexible, stranded copper or larger.
- 9.9.3 Current transformer secondary wiring shall terminate on shorting type terminal blocks.
- 9.9.4 All control wiring shall be UL listed and have a VW-1 flame retardant rating.
- 9.9.5 Exposed wiring shall be suitably protected against contact with sharp edges. Throughout the assembly it must be neatly bundled and secured with nylon wire ties. Where control wiring passes from cubicle to door it must be wrapped with suitable protection so as to prevent damage. Holes cut to allow control wires to pass from cubicle to cubicle will have a grommet for protection.

- 9.9.6 Splicing of control wire is not permitted. Control wiring must be a continuous length from terminal to terminal.
- 9.9.7 Each control wire shall be marked at both terminations to agree with wiring diagrams. Plastic wire markers of either the slip on or heat shrink variety shall be provided.
- 9.9.8 All control wires leaving the cubicle of origin must first terminate on a terminal block. No control wire may leave a cubicle directly from any other device.
- 9.9.9 Where possible, a minimum of 10% spare terminals shall be provided in each cubicle.
- 9.10 Meters, Switches, and Relays
 - 9.10.1 Indicating meters shall be 1% accuracy, 4½" square switchboard type, with taut band suspension unless otherwise specified.
 - 9.10.2 Control switches shall be rotary cam type with engraved face plates.
 - 9.10.3 Ammeter and voltmeter transfer switches shall have an off position and shall be provided with knurled knob handles.
 - 9.10.4 Selector type control switches (Auto-Manual or Hand-Off-Auto) shall have oval handles.
 - 9.10.5 Circuit breaker control switches shall have pistol grip handles.
 - 9.10.6 Protective relays shall be switchboard drawout type with removable dust tight viewing covers, front accessible connection plugs, built-in test capability, and mechanical targets that may be externally reset. Other electronic or multi-function relays may be specified for particular applications.
 - 9.10.7 Current and voltage test plugs for field monitoring and maintenance shall be provided when specified.
 - 9.10.8 Indicating lights shall be provided when specified on the control schemes. Lamps shall be replaceable from the front of the switchgear without opening the cubicle door.
- 9.11 Nameplates
 - 9.11.1 Laminated plastic engraved nameplates shall be provided.

- 9.11.2 Identification nameplates shall be white with black letters, caution nameplates shall be yellow with black letters, and warning nameplates shall be red with white letters.
- 9.11.3 Each externally visible device or component shall have an identification nameplate. Lettering shall be, at a minimum, 5/32 inches in height.
- 9.11.4 Each internal device or component shall have an identification marking.
- 9.12 Finish
 - 9.12.1 All steel structure members shall be cleaned, rinsed, and phosphatized prior to painting.
 - 9.12.2 Coating process shall be an electrostatically applied polyester powder with a final baked on average thickness between 1.5 and 2.0 mils. **(Must be suitable for saltwater environment)**
 - 9.12.3 Standard exterior finish will be ANSI 61 or ANSI 70 light gray **(Must be approved by the owner prior to application).**
 - 9.12.4 Finish shall have a minimum pencil hardness of 2H as tested per ASTM D3363.
 - 9.12.5 Finish shall pass the ASTM B117 salt spray test for a minimum of 1500 hours.
 - 9.12.6 Finish shall pass impact testing per ASTM D2794 with minimum values of 160 in-lb. for direct impact and 120 in-lb. for reverse impact.
- 9.13 Complete assembly shall have a low frequency withstand (an ac high potential) test performed to assure insulation system integrity.
- 9.14 Manufacturer shall have in place a system of recording, correcting, and verifying resolution of discrepancies discovered during the inspection and testing process.
- 9.15 Trip units
 - 9.15.1 The switchgear manufacturer shall furnish and install, in the switchgear, the quantity, type and rating of protection relays as required by the nature of this project and as indicated on the drawings and described hereinafter in this specification.
 - 9.15.2 Microprocessor Three-Phase Protective Relay. One required for each main and feeder circuit breaker.
 - 9.15.3 Relays for phase time over-current, instantaneous over-current protection, ANSI 50/51, 50/51N, 50/51G, shall be incorporated into a

single device having the features herein specified.

- a) Microprocessor based
- b) 5 Amp CT input.
- c) 120 VAC control power
- d) Shall be a single static drawout relay.
- e) Shall have selectable pick-up ranges that can easily be changed on-site.
- f) Three phase (51) and ground (51G) time overcurrent
- g) Three phase (50) and ground (50G) instantaneous overcurrent
- h) Independent phase and ground curves; ANSI, IAC or IEC/BS142 curve shapes: definite time, moderately inverse, normal inverse, very inverse, extremely inverse
- i) 40 “time dials” for phase and ground time overcurrent curves
- j) Separate pickup level and output relay for each protection element
- k) Three outputs: trip, auxiliary trip, and service
- l) Eight additional output relays shall be an option, one for each protection element
- m) Trip record: display of last five trips
- n) The relay shall have front panel LED indicators for cause of trip, pickup, relay in service, relay malfunction
- o) A clear key shall be available to clear the cause of trip indicators.
- p) A phase current indicator will be provided on the front panel.
- Q) The relay shall comply with surge withstand capability (SWC) standards such as ANSI C37.90 and IEC 255.4.

9.15.4 Relay alarm and/or trip contacts shall not change state if power is lost or an under-voltage occurs. These contacts shall only cause a trip upon detection of an over-current or fault condition based upon programmed settings.

9.16 Ground Check Relay

If required, each feeder breaker shall be equipped with a ground check relay as required by NEC for mobile equipment feeder cables.

9.17 Lockout Relay

Lockout relays, Device 86, shall be included as shown in the construction drawings.

9.18 Undervoltage Relay

Undervoltage relays, Device 27, shall be included as shown in the construction drawings.

9.19 Wiring/Terminations

9.19.1 One (1) terminal pad per phase shall be provided for attaching cable terminal lugs for a maximum of four (4) conductors per phase of the sizes indicated on the drawings. Sufficient space shall be supplied for electrical stress relief termination devices.

9.19.2 Small wiring, fuse blocks and terminal blocks within the vertical section shall be furnished. Each control wire shall be labeled with wire markers. Terminal blocks shall be provided for customer connections to other apparatus.

9.20 Accessories

9.20.1 If cranes are supplied power from this switchgear, coordination Key assemblies shall be provided as shown on the contract drawings and are required to match the systems supplied with the cranes. The type and brand shall be coordinated with the project and approved by the Engineer prior to installation.

9.20.2 5 kV intermediate class surge arresters shall be provided connected at the load side terminations of each main and feeder termination and securely grounded to the metal structure as shown on the drawings. The arresters shall be gap type and rated at line voltage due to the high resistance ground system.

9.20.3 Control power transformers, as called for in 9.8, shall be rated as shown on the contract drawings. The control power transformer shall supply the 120/240V power for all of the requirements of the switchgear as shown in the contract drawings.

9.20.4 Include the following items: One manual charging handle, one circuit breaker racking handle, one interlock override, one circuit breaker test cabinet, and one circuit breaker lift truck.

9.20.5 Ground Studs. Provide OSHA approved type “Ball and Socket” designed ground studs on each bus phase and on the ground bus which is extended outside the cubicle (where practical) to permit connection of portable ground cables. The ground studs shall be capped when not in use. The ground stud cap shall be so constructed for easy removal with a shotgun type of “hotstick”. The ground studs shall be provided in the incoming termination section of each main.

9.20.6 Ground Cables. Provide one set (three required) of 4/0 AWG, 600 volt

insulated, EPR portable ground cables with appropriate ground clamps. The grounding cables shall be approximately 10 foot in length and shall have a threaded grounding ferrule installed on each end. One end of the three phase cables shall have a grounding clamp, and the other end shall be joined together at a three-way grounding terminal block and a socket type grounding clamp.

- 9.20.7 Heaters: This equipment shall be equipped with the appropriate number and size of heaters that are required to protect this equipment from any adverse affects that may be caused by high humidity. These heaters should be temperature controlled by an adjustable device to cause the heaters to turn on and off automatically.

PART 3 - EXECUTION

10.0 FACTORY/PRODUCT TESTING

- 10.1 Each circuit breaker shall be tested for proper adjustment and operation prior to shipment. The circuit breaker shall be given a minimum of 100 mechanical operations. Test reports shall be available upon request.
- 10.2 Entire assembly shall have electrical operation and control wiring tests including correctness of wiring and insulation tests, polarity, verification and sequence tests.
- 10.3 Each vacuum interrupter shall receive a vacuum integrity test by means of the system ac high potential test prior to shipment.
- 10.4 Each circuit breaker shall have a contact timing and contact motion velocity test.
- 10.5 The following standard factory tests shall be performed. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
- 10.6 The switchgear shall be completely assembled, wired, adjusted, and tested at the factory. After assembly, the complete switchgear shall be tested to assure the accuracy of the wiring and the functioning of all equipment.
- 10.7 Production tests shall be performed in accordance with all applicable ANSI standards. These tests shall include, but not be limited to, those defined by ANSI standards C37.20.2, C37.04, C37.06 and C37.09.
- 10.8 The manufacturer shall provide three (3) certified copies of factory test reports.
- 10.9 Factory tests as outlined above shall be witnessed by the owner and/or owner's representative. The manufacturer shall notify the owner in writing two (2) weeks prior to the date the tests are to be performed. Upon notifying the owner, this requirement may be waived at the owner's discretion.
- 10.10 Start-Up and Commissioning

10.10.1 The manufacturer shall supply a factory certified engineer for a **minimum** of three (3) days during startup.

10.10.2 The three (3) copies of the manufacturer's field start-up report shall be supplied after completion.

10.11 Relay Test And Certification

Prior to start-up, each circuit breaker and relay shall be set, tested and certified by a manufacturer's certified factory engineer. The equipment will not be approved until the Engineer is satisfied with the technician's qualifications. All test reports and certifications shall be supplied to the Engineer for approval.

10.12 Field Applied Insulation

All exposed medium voltage bus connections and terminations shall be insulated by a method approved by the manufacturer of the equipment. The contractor shall supply in writing the method in which they would like to field insulate these items.

10.13 Field Adjustments

During construction, a manufacturer's certified factory engineer shall provide technical direction and assistance to the Contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained herein. This engineer shall provide a letter to the Owner certifying that the equipment has been assembled correctly prior to energizing the equipment.

10.14 Manufacturer's Certification

10.14.1 A qualified manufacturer's certified factory engineer shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.

10.14.2 The manufacturer shall provide three (3) copies of the manufacturer's representative's certification.

10.15 Final inspection and testing by the manufacturer's certified factory engineer:

10.15.1 Component bill of material shall be checked for proper quantity, description, and part number.

10.15.2 Physical dimensions shall be checked against approved drawings.

10.15.3 Equipment shall be subjected to a primary current injection procedure to determine proper operation of all current sensitive components.

10.15.4 Equipment shall be subjected to a primary voltage injection procedure to determine proper operation of all voltage sensitive components.

10.16 Training

10.16.1 The manufacturer shall provide a structured training session for up to two Owner's representative for one normal workday at the jobsite.

10.16.2 Training shall not be performed during period of start-up or commissioning.

10.16.3 The training session shall be conducted by a manufacturer's qualified representative. The training program shall include instructions on the assembly including primary equipment, transformer and secondary equipment. All circuit breakers, protective devices and other major components shall be included.

10.17 Requests for Substitution/Alternate:

10.17.1 Substitution/Alternate equipment will be considered if the price and/or delivery advantages exist for the alternate equipment. The impact on the installation plans will be part of the evaluation process as the current layouts are based on the EATON Metal-Enclosed Switchgear Front-Accessible equipment designs.

10.17.2 Where a particular system, product or material is specified by name, consider it as standard basis for bidding, and base proposal on the 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 according to their intended purpose. The ENGINEER shall approve all such substitutions in materials or equipment in writing.

10.17.3 In making requests for substitutions, the SUPPLIER shall list the product, equipment or material he wishes to substitute at or before bid time.

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

10.17.4.1 Required product cannot be supplied in time for compliance with Contract time requirements.

10.17.4.2 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 SUPPLIER.

10.17.4.3 Substantial cost and/or schedule advantage is offered OWNER after deducting offsetting disadvantages including delays, additional compensation for redesigning, investigation, evaluation and other necessary services and similar considerations.

10.17.4.4 Required Product has been discontinued, and a newer version of the specified product is not available.

10.17.5 All requests for substitution shall contain a "Comparison Schedule" and clearly and specifically indicate 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:

10.17.5.1 Principle of operation.

10.17.5.2 Materials of construction or finishes.

10.17.5.3 Thickness of materials.

10.17.5.4 Weight of item.

10.17.5.5 Deleted features or items.

10.17.5.6 Added features or items.

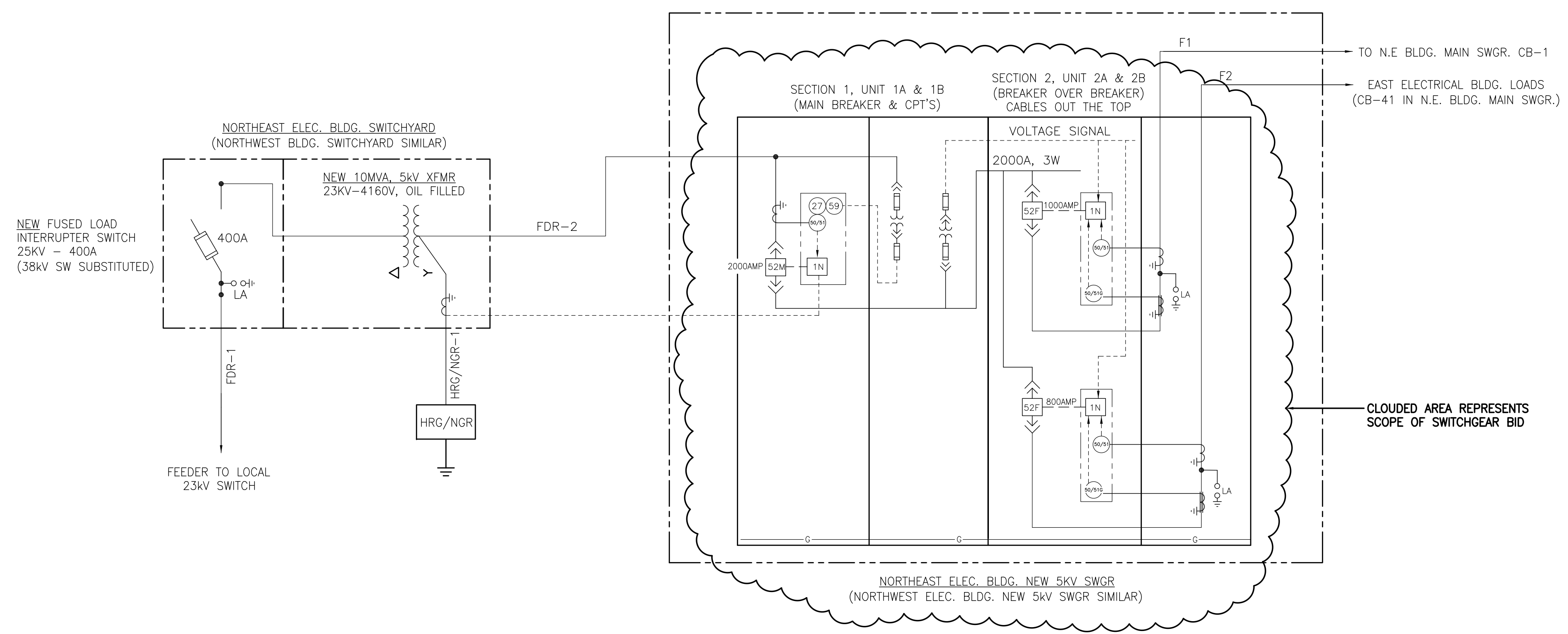
10.17.5.7 Changes in other work caused by the substitution.

10.17.5.8 Performance and rating data.

10.17.6 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 SUPPLIER's expense.

NOTES:

- SEE DWG. E1 FOR THE ELECTRICAL GENERAL SCOPE OF WORK, DRAWING INDEX, GENERAL NOTES AND DRAWING INDEX.
- ALL WORK AND WIRING SHALL COMPLY WITH OR EXCEED ALL NATIONAL ELECTRICAL CODE REQUIREMENTS, AND ALL CODE REQUIREMENTS OF THE STATE, CITY AND LOCAL ELECTRIC CODES.
- ALL EQUIPMENT SHALL BE GROUNDED AND BONDED IN ACCORDANCE WITH LOCAL REGULATIONS AND THE NATIONAL ELECTRIC CODE.
- ALL CONNECTIONS TO SWITCHGEAR AND TRANSFORMERS SHALL BE BOLTED DIRECTLY TO PROVIDED LUGS. CABLE JUMPERS SHALL NOT BE ALLOWED.
- ALL FUSES AND BREAKERS SETTINGS SHALL BE REVIEWED BY THE ENGINEER PRIOR TO PURCHASE AND INSTALLATION.
- CONTRACTOR SHALL VERIFY CABLE TYPES AND SIZED AGAINST SUBMITTALS FROM THE "HRG" SUPPLIER PRIOR TO INSTALLATION.
- THE MV SWITCHGEAR SHALL BE LISTED & LABELED AS SUITABLE FOR "SERVICE ENTRANCE" REFERENCE SPECIFICATION 16310 'MEDIUM VOLTAGE SWITCHGEAR' FOR OTHER REQUIREMENTS.
- SUPPLY HRG IN ACCORDANCE WITH NEC 2023 250.186 AND 250.188. SEE SECTION 16322-9.5.13 OF THE SPECIFICATIONS FOR ADDITIONAL INFORMATION AND REQUIREMENTS. THE HRG CONTROL SYSTEM WILL SEND A TRIP AND PERMISSIVE SIGNAL TO THE MAIN M.V. BREAKER AS SHOWN. THE NEUTRAL FROM THE 5MVA OR 10MVA TRANSFORMER TO THE HRG CONNECTION POINT MUST FOLLOW NEC 250.186B.
- THIS EQUIPMENT IS TO BE PURCHASED AND INSTALLED BY THE OWNER.
- ALL ELECTRICAL EQUIPMENT OR PANELS SHALL BE FIELD MARKED PER NEC 2024, 110.16 TO WARN QUALIFIED PERSONNEL OF POTENTIAL ELECTRICAL ARC FLASH HAZARDS. LABELS SHALL BE BRADY CAT# 94913 OR EQUAL.



CONDUIT & CABLE SCHEDULE

MARK	CONDUCTORS DESCRIPTIONS	CONDUIT SIZE	DISTANCE ESTIMATE (FT)	ROUTING	REMARKS/COMMENTS
FDR-1	6-1/C #4/0 MV105, 25KV, TYPE XLPE W/GND	5"	140'	23KV SWITCH IN NORTHEAST ELECTRICAL BLDG. XFMR YARD TO NEW 10MVA XFMR. LIS	NEW CABLES ROUTED THRU NEW DUCTBANK
FDR-2	12-1/C #500MCM, MV105, 5KV, TYPE XLPE W/GND	5"	100'	NEW 10MVA TRANSFORMER TO NEW 5KV MAIN SWITCHGEAR IN NORTHEAST ELECTRICAL BLDG.	NEW CABLES ROUTED IN NEW DUCTBANK AND CONDUITS.
F1	6-1/C #500MCM, MV105, 5KV, TYPE XLPE W/GND	5"	150'	NEW 5KV MAIN SWITCHGEAR IN NORTHEAST ELECTRICAL BLDG. TO EXISTING 4160V MAIN SWITCHGEAR	NEW CABLES ROUTED IN NEW CONDUIT AND CABLE TRAY
F2	6-1/C #350MCM, MV105, 5KV, TYPE XLPE W/GND	5"	150'	NEW 5KV MAIN SWITCHGEAR IN NORTHEAST ELECTRICAL BLDG. TO EXISTING 4160V MAIN SWITCHGEAR	NEW CABLES ROUTED IN NEW CONDUIT AND CABLE TRAY

MV MAIN SWITCHGEAR DESCRIPTION

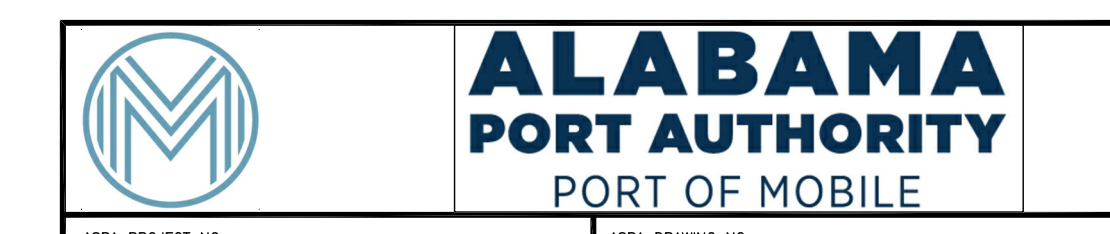
MARK	QTY	DESCRIPTION
02		MV MAIN SWITCHGEAR, 5KV, 2000A BUS, INDOOR RATED, 2000A MAIN BREAKER, 1000A AND 800A FEEDER BREAKERS, EATON MULTI-FUNCTION PROTECTIVE RELAY MICROPROCESSOR-BASED PROTECTION, PHASE OVER CURRENT PROTECTION, GROUND OVER CURRENT PROTECTION, UNDER VOLTAGE PROTECTION, OVER VOLTAGE PROTECTION, AMP METER 2000A, CT'S, PT'S AND CPT'S PER ONE-LINE DIAGRAM THIS DWG. AND SPECIFICATION SECTION 16310 'MEDIUM VOLTAGE SWITCHGEAR'
02		HRG/NGR SYSTEMS PER SPECIFICATION 16322 SECTION 9.5.13. SEE NOTE 8 THIS DRAWING.

SYMBOL LEGEND

- MICROPROCESSOR-BASED PROTECTION EATON EDR-5000 OR EQUIVALENT
- CIRCUIT BREAKER
- PHASE OVER CURRENT
- GROUND OVER CURRENT
- UNDER VOLTAGE 1Ø INVERSE
- OVER VOLTAGE 1Ø INVERSE
- CURRENT TRANSFORMER
- ZERO SEQUENCE CT(GROUND FAULT)
- LIGHTNING ARRESTER
- HIGH RESISTANT GROUND/NEUTRAL GROUND RESISTOR SYSTEMS
- GROUND BUS

FOR BID PURPOSES ONLY

04/10/2026



NOTES	DAVID VOLKERT & ASSOCIATES - 1982 ELECTRICAL DRAWINGS FOR REFERENCE:																			
	DWG. 18 OF 25 (E-3) "NORTH EAST MOTOR CONTROL BLDG. - CONDUIT & CABLE LAYOUT"																			
	SHAW GBB - 2007/08 ELECTRICAL DRAWINGS FOR REFERENCE:																			
	1876-E1 "McDUFFIE TERMINALS 2007/2008 EXP - PKG 2 ELECTRICAL SITE PLAN"	A	ISSUED FOR 5KV MV SWITCHGEAR BID PURPOSES ONLY	WMB	DAW	DAW	04/10/26													
	REFERENCE DRAWINGS	NO.	REVISION	DRAWN	CK'D	APPD	DATE	DRAWN: WMB	CK'D: DAW	APPD: DAW	DATE: 02/18/26	SCALE: AS NOTED								

McDUFFIE TERMINAL POWER STUDY	
N.E. AND N.W. BLDGS NEW 5KV SWITCHGEAR	
PARTIAL ONE-LINE DIAGRAM	
FOR: ALABAMA PORT AUTHORITY	
PROJECT NO: 4734	DWG NO: E8
REV: A	