NEW YORK STATE OF OPPORTUNITY | Office of General Services | Design & Construction

ADDENDUM NO. 1 TO PROJECT NO. 44765-E

ELECTRICAL WORK
REPLACE SWITCHGEAR
CAPE VINCENT CORRECTIONAL FACILITY
ROUTE 12E
CAPE VINCENT, NY

April 16, 2015

NOTE: This Addendum forms a part of the Contract Documents. Insert it in the Project Manual. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

SPECIFICATIONS

1. Page 261313-11, Paragraph 2.09 B, Add the Following Subparagraph:

   "3. Differential Current Transformers in Generator Termination Box: Furnish differential protection CTs designated for the generator termination box and ship loose to the site."

2. Replace Specification Section 261315 in its entirety with the attached document.

3. Replace Specification Section 263216 in its entirety with the attached document.

END OF ADDENDUM

Margaret F. Larkin
Executive Director
Design and Construction

SECTION 261315

SEQUENCE OF OPERATION FOR ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The System Single-Line Diagram, E602, shows all the equipment in the Cape Vincent CF 13.2kV Electric System that is affected by the control sequences presented in this document.

1.02 SUMMARY

A. This Section includes control sequences and acceptance testing criteria for the Cape Vincent CF 13.2kV Electric System (Electric System), which is composed of the following subsystems (as identified on the single-line diagram):

1. 13.2kV Site Power Distribution Switchgear (Main Swgr)
2. Standby Generator No. 1 (G1)

B. Related Sections include the following:

1. Division 26 Section "Metal Clad Switchgear"
2. Division 26 Section “Modifications to Diesel-Alternator Power System”

1.03 DEFINITIONS AND ABBREVIATIONS

A. CB: Circuit Breaker

B. Generator Control System: The system of PLC’s, master generator controller, individual generator controllers, input/output devices, communication devices, etc. used to control the 13.2kV Main Switchgear and generator set.

C. Fail Safe: With respect to the control circuits in this Control System, fail safe means the loss or failure of a control component or interconnecting signal wire will cause the system to assume a state known to be safe.

D. HMI: Human Machine Interface.

E. Loss of Voltage: Voltage level below an adjustable minimum level (50% to 100% Nominal Voltage), set at 90% for an adjustable time period (set at 10 sec).

F. MOC: Mechanism Operated Contacts used to indicate circuit breaker position. MOC-a = contact open when breaker open, MOC-b = contact closed when breaker open.

G. Nominal Voltage: The expected RMS voltage magnitude at each location in the Electric System under normal operation. In this case its 13.2 kilovolts (kV)

H. Operator: the control system user.

I. Overvoltage: Voltage level above an adjustable minimum level (100% to 120% Nominal Voltage) for an adjustable time period.

J. PLC: Programmable Logic Controller

K. PT: Potential Transformer

L. System Control Screen: The HMI control screen currently being accessed by the Operator.

M. Stable Voltage: Voltage level above an adjustable minimum level (set at > 90%) for an adjustable time period (set at 15 mins).

N. TOC: Truck Operated Contacts used to indicate breaker racked-in status. TOC-a = contact closed when breaker is racked in, TOC-b = contact open when breaker is racked in.

O. Open Transition: The load is disconnected from one source, prior to being connected to the alternate source.

P. Closed Transition: The source from which the load is being transferred remains closed (connected) until the alternate source, to which the load is being transferred, is also closed (connected). After both have been closed, the source from which the load is being transferred is opened (disconnected).

1.04 NORMAL OPERATION

A. The Control System is configured for closed transition between the onsite standby generator and the utility source.

B. Automatic / Manual Operation: The Control System should normally be placed in the Auto Mode. This is accomplished through a two-position Master Auto – Manual Selector Switch at the Control System section.

1. Auto Position: The Control System monitors the Electric System and automatically responds to system inputs as described in this Document. While in the Auto Mode, any manual intervention such as opening or closing a Main or Generator circuit breaker on the Main Swgr, will force the Control System into Manual Mode. The Forced Manual Mode shall be logged in the Alarm History, and shall be displayed on the System Control Screen.
2. Manual Position: The Control System monitors the Electric System, but does not operate any breakers or start the generators automatically under any conditions. All sequences must be carried out manually.
3. Auto – Manual Mode Indication at Main Swgr: Push-to-test LED pilot lights located at the Main Swgr (above the selector switch) will indicate Control System Status.

a. A light labeled “System in Auto” shall be illuminated continuously when in Auto Mode.

b. A light labeled “Manual Mode” shall be illuminated continuously when the Auto – Manual Selector Switch is set to Manual Mode. When the Auto – Manual Selector Switch is set to Auto Mode, but the Control System is forced into Manual Mode, the light shall flash rapidly.

C. The Electric System is normally operated with the incoming PS-1 line to the Main Swgr energized, generator G1 offline and circuit breaker G1 open.

1.05 13.2KV SITE POWER DISTRIBUTION SWITCHGEAR (MAIN SWGR) OPERATION

A. The following control sequences shall occur automatically when the Control System is set to an “Auto” mode. Manual sequences are included where applicable.

B. Loss of Voltage at Breaker PS-1 (Power Source 1):

1. Loss of voltage is detected by CB PS-1 line-side PT’s, and is sensed by the Control System.
2. After the Loss of Utility Timer times out (time delay = 10 seconds), open CB PS-1. All Feeder Breakers on the Main Swgr shall remain closed.
   a. A return of Utility Source voltage at the main breaker (CB PS-1) shall stop the timing sequence and cause the Loss of Utility timer to reset for that breaker. The main breaker shall remain closed.
3. A generator start signal is sent to the generator set, proceed to Paragraph “Generator Operation – Loss of Utility Source.”
4. Manual Operation: The Switchgear Control System should normally be set to “Auto” mode. If “Manual” operation is selected, the above conditions will be monitored, however the main breaker will not trip and the generators will not start.

C. Generator Operation – Loss of Utility Source:

1. Precondition 1: A generator start signal has been sent to the generator controller.
2. Precondition 2: The following conditions must be true:

Condition	CB Name	MOC Contact Positions	TOC-a Contact Position	Breaker Tripped (via 86-Lock Out Relay)	Relay Failure (Self Test) Status
1.	G1	a = Open b = Closed	Closed	Not Tripped	Not Failed

   a. If Precondition 1 is met, but Precondition 2 is not met, the Control System shall annunciate the failure condition on the System Control Screen and terminate the sequence.
   b. If both preconditions are met, proceed to Step 3.
3. The generator set start, ramp up to operating speed and output voltage.

4. In an open-transition, open CB PS-1 and close CB G1 onto the Main Swgr bus, which energizes the Main Swgr Bus.
5. Since the Priority Level 1 breakers are already closed, they are also energized. The Control System shall add feeder breakers according to the programmable priority load add sequence, allowing the Load Add Delay Timer (time delay = 5 seconds) to time out before adding each step, as follows:
   a. Priority Level 1 (already closed): CB PF-1, PF-2, PF-3.
   b. Priority Level 2: Future Use
   c. Priority Level 3: Future Use

D. Manual Generator Operation – Loss of Utility Source:
1. This sequence will be implemented if the automatic sequence is inoperable or disabled. All steps in this sequence must be manually initiated by the Operator.
2. Open CB PS-1.
3. The Operator manually initiates generator startup through the manual generator controls at the HMI.
4. The Control System shall start and ramp up the generator.
5. The Operator manually closes CB G1.

E. Generator Operation – Return of Utility Source:
1. Precondition 1: Stable voltage is detected by CB PS-1 line-side PT's, allowing the Restored Utility Timer (time delay = 15 minutes) in the Control System to time out.
2. Precondition 2: The following conditions must be true:

Condition	CB Name	MOC Contact Positions	TOC-a Contact Position	Breaker Tripped (via 86-Lock Out Relay)	Relay Failure (Self Test) Status
1.	PS-1	a = Open b = Closed	Closed	Not Tripped	Not Failed

   a. If both preconditions are met, proceed to Step 3.

3. Once the Restored Utility Timer has expired and the generator and utility are within the allowable constraints for paralleling outlined in the table below, the Control System shall close CB PS-1 and the Parallel Timer shall be initiated.

Generator Size	Max Frequency Difference (Hz.)	Max Voltage Difference (%)	Max Phase Angle Difference (degrees)
>500-1,500	0.2	5	15

4.
5. The Paralleling Timer shall be set so that the closed transition switching operation, including circuit breaker G1 opening time, occurs in less than 250ms. The Control System shall monitor CB PS-1 and CB G1to ensure

the transfer has been completedThe generator shall run for an adjustable cool down period (15 mins) and shut down.

F. Manual Generator Operation – Return of Utility Source:

1. This sequence will be implemented if the automatic sequence is inoperable or disabled. All steps in this sequence must be manually initiated by the Operator and the transfer will be open transition.
2. Once the Operator has confirmed that Utility power has been restored and stable for 15 minutes, the Operator will open CB G1 and close CB PS-1 manually at the HMI in the order indicated. (The facility will experience a brief outage)
3. Once utility power is restored and the system is stable, the Operator will initiate the shutdown sequence for the generator manually via the HMI.

G. Generator Operation – No-Load Testing:

1. This sequence may be used for periodic generator engine testing. The System Control Screen shall provide controls to initiate this sequence manually at the HMI.
2. Once the Operator initiates this sequence, the generator starts and ramps up and remains running. The generator remains disconnected from the Main Swgr bus. The duration of the no-load test shall be an adjustable timer (10 – 45 min, set at 20 mins).
3. Upon expiration of the no-load test timer, the control system shall shutdown the generator and restore the system to automatic operation.

H. Generator Operation – Load Testing or Storm Approaching Mode:

1. This sequence may be used for periodic generator load testing, or if the facility wants to operate in an island mode due to bad weather that may affect utility service. The System Control Screen shall provide controls to initiate this sequence manually at the HMI. The sequence outlined below will be automatic after it is manually initiated.
2. Precondition 1: Stable voltage is detected by CB PS-1 line-side PT's.
3. Precondition 2: The following conditions must be true:

Condition	CB Name	MOC Contact Positions	TOC-a Contact Position	Breaker Tripped (via 86-Lock Out Relay)	Relay Failure (Self Test) Status
1.	G1	a = Open b = Closed	Closed	Not Tripped	Not Failed

   a. If both preconditions are met, proceed to Step 4.

4. The Operator initiates the sequence.
5. Once the Operator initiates this sequence, the generator set will start, ramp up to operating speed and output voltage.
6. When the generator reaches the allowable constraints listed in the table in item E.3, the Control System shall close CB G1and the Paralleling Timer shall be initiated.

7. The Paralleling Timer shall be set so that the closed transition switching operation, including CB PS-1 opening time, occurs in less than 250ms. The Control System shall monitor CB PS-1 and CB G1 to ensure the transfer has been completed.

I. Generator Operation – Return from Load Testing or Storm Approaching Mode:

1. This sequence shall be a manually-initiated automatic sequence upon completion of load testing or once bad weather has passed.
2. Precondition: The Utility Source is available and stable.
3. Once the Operator initiates this sequence, the steps are the same as listed in "Generator Operation – Return of Utility Source" for returning to utility power and taking the generators offline.

J. Failure Sequences:

1. In all cases below, each failure sequence shall be uniquely annunciated on the System Control Screen. Each failure condition shall be date and time stamped. Coordinate all clocks and sync with the system time clock to properly track conditions.
2. Protective Relay Failure (Self Test Contact Closure): Any CB with this condition shall not be commanded open. The failure condition shall be annunciated on the System Control Screen. However, any breaker with a failed protective relay shall be blocked from closing in all automatic control sequences.
3. Stuck Breaker Monitor (Protective Relay Trip): When the trip coil on any breaker receives a trip signal from a protective relay, a timer is started in the relay. If the breaker fails to open, as verified by monitoring the breaker MOC-a and MOC-b position contacts, the breaker is considered stuck closed. The following stuck breaker conditions apply to each CB on the Main Swgr as follows:
   a. CB PS-1 Stuck Closed: Open all Main Swgr feeder and generator breakers. All downstream facility loads served from Main Swgr will experience an outage until the main breaker is cleared from the bus.
   b. CB G1 Stuck Closed: Open all Main Swgr feeder and incoming power source breakers. All downstream facility loads served from Main Swgr will experience an outage until the generator breaker is cleared from the bus.
   c. Main Swgr Feeder Breakers Stuck Closed: If the breaker was commanded to trip on a through fault, the next upstream device (main breaker, or possibly a gen breaker) will have to clear the fault. Any breaker that trips due to a fault condition shall be blocked from reclosing until the fault condition is repaired and the lock-out relay is reset. If the breaker was commanded to trip for any other reason, no further control action will occur.
4. Stuck Breaker Monitor (Non-Fault Trip): When the trip coil on any breaker receives a trip signal from the Control System during an automatic switching sequence, a timer is started. If the breaker fails to open, as verified by monitoring the breaker MOC-a and MOC-b position contacts, the breaker is considered stuck closed. The following stuck breaker conditions apply to each CB on the Main Swgr as follows:

a. CB PS-1 Stuck Closed: If attempting to open this breaker during a transfer operation and it does not open, the sequence shall terminate and the facility shall remain connected to the utility. CB PS-1 shall remain closed.

b. CB G1 Stuck Closed: The associated generator shall not be shut down automatically. Annunciate the failure condition on the System Control Screen. Shut down the excitation on the generator with the failed breaker. This keeps the available generation online, and removes the chance of backfeeding the generator with the stuck breaker. CB G1 shall remain closed.

c. Main Swgr Feeder Breakers Stuck Closed: If attempting to open this breaker during load shed sequences (provision for future feeders), continue sequence, and record the condition in the Alarm History for later corrective action.

5. Breaker Fails to Close (Stuck Open): When the spring release coil on any breaker receives a voltage signal, a timer is started. If the breaker fails to close, as verified by monitoring the breaker MOC-a and MOC-b position contacts, the breaker is considered stuck open. The following stuck breaker conditions apply to each CB on the Main Swgr as follows:

a. CB PS-1 Stuck Open: Any sequence involving this breaker shall be terminated. The system shall remain in its current state (generators running).

b. CB G1 Stuck Open: Any sequence involving this breaker shall be terminated. Annunciate the failure condition on the System Control Screen and initiate Generator shut-down sequence. The system shall remain in its current state (CB PS-1 “closed”). If the Facility is experiencing a Loss of Utility condition, the downstream loads will have to be switched to an alternate source, or will remain de-energized.

c. Main Swgr Feeder Breakers Stuck Open: No further control action will occur. Any downstream loads served by the stuck open feeder will have to be switched to an alternate source, or will remain de-energized.

6. Bus Fault: Bus faults are detected by bus differential relaying. If a bus fault occurs in a differential zone, all circuit breakers connected to that zone will be tripped and locked out (via bus lock out relay). The Main Swgr has a single differential zone. A bus fault will trip all the breakers connected to the switchgear.

7. Closed-transition Transfer Failure: Once the parallel is made during a closed-transition, the parallel timer shall start and the transfer failure relay shall monitor CB PS-1 and CB G1 to ensure the transfer operation has been completed. If the transfer has not been completed in 500ms, the Control System shall trip CB G1.

PRODUCTS (Not Applicable)

PART 2 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 263216

MODIFICATIONS TO DIESEL-ALTERNATOR POWER SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide modifications to existing engine driven diesel generator set for standby service, as shown on the Drawings and in conformance with this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Metal-Clad Switchgear: Section 261313.

B. Sequence of Operation for Electrical Equipment: Section 261315.

1.03 DIVISION OF RESPONSIBILITY

A. Generator Manufacturer – Milton CAT contracted by the contractor to fabricate and supply the specified equipment. Additional responsibilities include Company Field Advisor service, equipment submittals, factory testing, delivery of the equipment to the jobsite, field inspections upon arrival at the jobsite, supervision of all pre-functional testing procedures, training and additional activities as listed in this specification. An allowance is established for this work.

B. Electrical Contractor - Installation contractor contracted by the Owner to install and integrate the specified equipment for the project. Additional responsibilities include inspection of the equipment upon arrival to the job site, coordination of the equipment delivery, off-loading the equipment and equipment installation, field installed wiring, verification, corrections and modifications, assistance in all pre-functional & functional testing procedures, assistance in generator as-built submittals, preparation of field as-built drawings and additional activities as listed in this specification.

1.04 SUMMARY

A. This Section includes modifications to existing engine driven generator sets with the following components and accessories:

1. Generator Controller
2. Remote Annunciator
3. Voltage Regulator / Speed Governor
4. Engine Sensors
5. Neutral Ground Resistor (Provided by Electrical Contractor)
6. Battery Charger (Provided by Electrical Contractor)

1.05 SUBMITTALS

A. Waiver of Submittals: The "Waiver of Certain Submittal Requirements" in Section 013300 does not apply to this Section.

B. Submittals Package: Submit the shop drawings, product data, and quality control submittals specified below at the same time as a package for approval.

C. Shop Drawings:

1. Show installation details.
2. Indicate interconnect wiring and connection points.

D. Product Data:

1. Catalog sheets, specifications and installation instructions.
2. Bill of materials.

E. Quality Control Submittals:

1. Company Field Advisor Data: Include:
   a. Name, business address and telephone number of Company Field Advisor secured for the required services.
   b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
   c. Services and each product for which authorization is given by the Company, listed specifically for this project.

F. Contract Closeout Submittals:

1. Test Report: System acceptance test report.
2. Certificate: Affidavit, signed by the Company Field Advisor and notarized, certifying that the system meets the contract requirements and is operating properly.
3. Operation and Maintenance Data: Deliver 2 copies, covering the installed products, to the Director's Representative. Include name, address and telephone number of nearest fully equipped service organization.

1.06 QUALITY ASSURANCE

A. Company Field Advisor: Secure the services of a Company Field Advisor from Milton CAT as dictated by the Allowance for Generator Upgrades for the following:

1. Render advice regarding installation and final adjustment of the system.
2. Witness final system test and then certify with an affidavit that the system is installed in accordance with the contract documents and is operating properly.
3. Train facility personnel on the operation and maintenance of the system (minimum of two 2 hour sessions).
4. Explain available service programs to facility supervisory personnel for their consideration.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the ambient environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: Minus 40 to plus 40 deg C.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 ft.

B. The existing generator is 1 MW Caterpillar model 3512.

PART 2 - PRODUCTS

2.01 CATERPILLAR EMCP 4.3 (FURNISHED BY MILTON CAT)

A. Floor Standing Control Panel with the following features and accessories:

1. Integral floor mounting stand (Milton Cat will set panel at rear of generator and wire alarms and sensors on engine, bolting of stand to floor by Electrical Contractor)
2. 25 foot interconnecting harness for engine mounted sensors and alarm switches (wired and connected by Milton CAT)
3. EMCP Controls including:
   a. UL Listed
   b. Emergency Stop Pushbutton
   c. Enviromental sealed face
   d. 480 by 320 pixel, 5.5 inch, white backlit graphical display which denotes text alarm and event descriptions, set points, engine and generator monitoring and is visible in all lighting conditions.
   e. 40 diagnostic event storage in non-volatile memory
   f. Controls
      1) Automatic Start Stop Controls
      2) Engine Cooldown Timer
      3) Engine Cycle Cranking
   g. True RMS Digital AC Metering, 3 phase, +/- 2% accuracy
   h. Digital Indication for :
      1) RPM
      2) DC Volts
      3) Operating Hours
      4) Oil Pressure
      5) Coolant Temperature
      6) Volts (Line-Line, Line-Neutral)
      7) Amps (Per Phase and Average)
   i. Alarm Horn with silencer/reset button
   j. Text Alarm and Event Descriptions
   k. NFPA 110 Alarm LED Indication

1) Low Oil Pressure Alarm
2) Low Oil Pressure Shutdown
3) High Water Temperature Alarm
4) High Water Temperature Shutdown
5) Overcrank Shutdown
6) Overspeed Shutdown
7) Control Switch not in Auto
8) High Battery Voltage
9) Low Battery Voltage
10) Battery Charger AC Failure – requires wiring by electrical contractor from charger
11) Low Coolant Level – requires input from a sensor installed in radiator by Milton CAT, wiring from sensor to Control panel by installing electrical contractor
12) Low Fuel Level Alarm – requires wiring by electrical contractor from existing site daytank.
13) Rupture Basin Alarm – requires wiring by electrical contractor from existing site daytank

l. Twelve (12) Programmable Digital Inputs

m. Sixteen (16) Programmable Digital Outputs

n. Generator Protection as follows:
1) Generator Phase sequence
2) Over/Under Voltage
3) Over/Under Frequency
4) Reverse Power
5) Reverse Reactive Power
6) Overcurrent
7) Current Balance

4. All interconnecting wiring and installation of the Control Panel, not associated with the engine mounted sensors and alarm switches, shall be provided by the electrical contractor.

2.02 GENERATOR AUXILIARIES (PROVIDED BY MILTON CAT UNLESS OTHERWISE NOTED)

A. One (1) Caterpillar NFPA 110 Remote Annunciator (Furnished by Milton CAT; Installed by Electrical Contractor)

B. One (1) Caterpillar Digital Voltage Regulator in control panel (Provided by Milton Cat)

C. One (1) Caterpillar RTD Module – allows display and monitoring of generator winding temperatures at control panel. (Provided by Milton Cat)

D. One (1) Low Coolant Level Sensor Installed in Radiator (Provided by Milton CAT; Field wiring by Electrical Contractor)

E. One (1) Set of sensors/alarm contactors for interface with control panel as follows: (Provided by Milton Cat)

1. Water Temperature Sender
2. Oil Pressure Sender
3. Mag Pick Up for Speed Sensing

F. One (1) Woodard 2301E electronic governor control installed control panel. (Installed by Milton Cat)

G. Differential Current Transformers in generator termination box are to be furnished by Metal-Clad Switchgear Manufacturer and Installed by Milton Cat. Electrical Contractor shall install generator power cables and make all connections from generator CTs to relaying and metering per the contract drawings.

2.03 STARTING SYSTEM (PROVIDED BY ELECTRICAL CONTRACTOR)

A. Description: Existing starting system consists of a 24 V DC battery charger and 4 battery cells. The battery charger and battery cells shall be replaced to allow operation of generator controller. Charger and battery cells shall be provided by electrical contractor.

1. Starting System Components: Sized for reliable operation during two sequential engine-cranking cycles with ambient temperature at maximum.
2. Battery Charger: SENS Model NRG24-20-RC or equivalent
   a. Automatic Float Operation
   b. Input: 120 VAC
   c. Output: 20A, 24 VDC
   d. Includes:
      1) UL Listed
      2) Digital Display Ammeter and Voltmeter
      3) Alarm Package (LED and Form C Contact for each)
         a) High DC Volts
         b) Low DC Volts
         c) AC Failure
         d) Charger Summary Alarm
3. Battery: Nickel-cadmium batteries; Hoppeke Battery Systems Inc. FNC, Marathon's Alcad UHP, McGraw Edison Power Systems Div.'s Americad HED, or SAB Nife Inc.'s Block Battery Type H, with:
   a. Number of cell units as required for voltage of starting system (Cell voltage shall be based on l.2 volts per cell).
   b. Plastic cell containers.
   c. Ampere-hour capacity as recommended by engine manufacturer for a minimum of 3 consecutive starting attempts of 15 seconds each.
   d. Ampere-hour capacity as recommended by engine manufacturer for 60 seconds of continuous cranking. Note: Engine overcrank device shall terminate cranking with enough reserve power to permit additional cranking after an investigation to find the reason for a failure to start.

2.04 GENERATOR PROTECTION (PROVIDED BY MILTON CAT UNLESS OTHERWISE NOTED)

A. Differential Current Transformers

1. Replace the existing current transformers with C100 class current transformers in terminal box to match those provided by switchgear manufacturer.
2. Current Transformers to be furnished by Milton CAT and wired by electrical contractor.

2.05 NEUTRAL GROUNDING RESISTOR (PROVIDED BY ELECTRICAL CONTRACTOR)

A. Electrical Contractor shall provide a neutral grounding resistor, low resistance type. Grounding resistors shall be rated as follows:

1. Volts (line to neutral): 7.6kV
2. Initial current: 200A for 10 seconds.
3. Maximum temperature rise: 760 deg C

B. The neutral grounding resistor shall be designed and factory tested to IEEE Standard 32-1972.

C. The resistor shall consist of stainless steel stamped grid edgewound elements, double insulated. The resistor terminals shall be stainless steel. All resistor endframes, hardware, and non-current carrying spacers must be zinc-plated steel. The resistor bank will be mounted on porcelain standoff insulators with a rating equal to or greater than the line to neutral voltage.

D. Provide window-type ANSI “C” Class current transformer, ratio as shown on the single-line diagram.

E. The neutral grounding resistor shall be field installed by the Electrical Contractor outside the building as indicated on the Drawings. Mounting location and support method shall maintain minimum clearance requirements in accordance with neutral grounding resistor manufacturer’s written specifications.

2.06 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of generator sets and associated auxiliary components that fail in materials or workmanship within specified warranty period. Include one preventative maintenance check while under warranty.

1. Warranty Period: 12 months from date of Substantial Completion.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The Electrical Contractor shall comply with manufacturers' written installation and alignment instructions and with NFPA 110 for generator components.

B. Connections: Make all connections to unit with flexible connections designed for the specific purpose.

C. Electrical Wiring: The Electrical Contractor shall install and wire electrical devices furnished by equipment vendor but not specified to be factory wired.

D. Diesel Fuel:

1. Contractor shall record the existing level of the fuel storage and day tank.
2. Upon completion of all tests provide additional diesel fuel as required to fill the fuel storage and day tank to the previously recorded levels.

3.02 FIELD QUALITY CONTROL

A. Preliminary System Test:

1. Preparation: Have the Company Field Advisor adjust the completed system and then operate it long enough to assure that it is performing properly.
2. Run a preliminary test for the purpose of:
   a. Determining whether the system is in a suitable condition to conduct an acceptance test.
   b. Checking and adjusting equipment.
   c. Training Facility personnel.

B. System Acceptance Test:

1. System Acceptance Tests shall be performed by the Company Field Advisor and assisted by the Electrical Contractor.
2. Preparation: Notify the Director’s Representative at least 3 working days prior to the test so arrangements can be made to have a Facility Representative witness the test.
3. Make the following tests:
   a. Test engine start, transfer to diesel-alternator feeder, retransfer to utility feeder, engine shutdown and system reset in conjunction with system acceptance test required for Section 261313 and 261314.
   b. Test starting system and battery capacity. Crank engine for the required time and number of consecutive starting attempts.
   c. Load Bank Test: Test the generator under full load (1000kW) and ensure proper operation. Submit a test report showing monitored values (Voltage, Current, Frequency) to Engineer. Connect load bank cables to load side of feeder breaker in switchgear. Run the following test at rated voltage:

1) Two hours at full load.
2) During the test period take voltage, current, frequency and all engine instrument readings. Record results at the beginning and end of test and at fifteen minute intervals during test.
3) Electrical Contractor shall provide all medium voltage cables required to connect load bank to switchgear.

d. Test the closed transition operation of the switchgear and generator controls to ensure that proper synchronization and sequence is achieved.

4. Supply equipment necessary for system adjustment and testing.
5. Submit written report of test results signed by Company Field Advisor and the Director's Representative. Mount a copy of the final report in a plexiglass enclosed frame assembly adjacent to the engine instrument panel.

3.03 DEMONSTRATION AND TRAINING

A. The Company Field Advisor shall train Owner's maintenance personnel to adjust, operate, and maintain components. Provide a minimum of two hours training.

1. Coordinate this training with training for switchgear.

END OF SECTION