ZONE 7

DEL VALLE WATER TREATMENT PLANT
ELECTRICAL POWER SYSTEM UPGRADE PROJECT

PRE-PURCHASED EQUIPMENT

February 24, 2009
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DIVISION 16 ELECTRICAL
SECTION 16426
MOLDED CASE AND INSULATED CASE CIRCUIT BREAKER DISTRIBUTION SWITCHBOARDS

PART 1 GENERAL

1.1 SCOPE
A. The Seller shall furnish for installation by others three free-standing, 600VAC, dead-front type, metal enclosed, molded case and insulated case circuit breaker distribution switchboards called Service Entrance Metering Switchboard, Switchboard “MSN” and Switchboard “MSE” respectively. These switchboards shall have features and functions as specified and described in this section.

1.2 REFERENCES
A. American National Standards Institute (ANSI):
   3. C57.13 - Requirements for Instrument Transformers.
B. Institute of Electrical and Electronic Engineers (IEEE).
C. Insulated Cable Engineers' Association (ICEA).
D. National Electrical Code (NEC):
   1. Article 310 - Conductors for General Wiring.
   2. Article 384 - Switchboards and Panelboards.
E. National Electrical Manufacturers' Association (NEMA):
   1. PB-2 - Dead-front Distribution Switchboards.
   2. SG3 - Low Voltage Power Circuit Breakers.
F. Underwriters' Laboratories, Inc. (UL):
   1. UL 891 - Deadfront Switchboards.
   2. UL 489 - Molded Case Circuit Breakers.

1.3 SYSTEM DESCRIPTION
A. Factory assembled, wired, and tested switchboards, with major components being products of a single manufacturer, including but not
limited to, circuit breakers, transformers, instruments, meters and other equipment specified herein and indicated on the Drawings.

1.4 SUBMITTALS

A. Shop Drawings: Submit as a minimum the following information and drawings:
   1. Plan, front, and side view drawings including overall dimensions of each switchboard line-up. Identify shipping splits and show conduit stub-up area locations.
   2. Internal wiring diagram of each compartment including wiring identification and terminal numbers.
   3. Internal compartment-to-compartment interconnection wiring diagrams including wiring identification and terminal numbers.
   4. Complete 3-line diagrams for each switchboard line-up. These drawings shall indicate devices comprising the switchboard assembly including, but not limited to, circuit breakers, control power and instrument transformers, meters, relays, and control devices. Clearly indicate electrical ratings of devices on Drawings.
   5. Complete bill of material list and equipment data sheets identifying appropriate information specific to the switchboard being supplied.
   6. Point to point wiring diagrams and product data for the power metering devices.
   7. Nameplate schedule.

B. Product data including O&M Manual.

C. Submit 5 identical sets of shop drawings neatly put together in three-ring binders with tabs and section isolators per Table of Contents in addition to a CD containing all drawings and manuals in pdf version.

1.5 WARRANTY

A. Submit manufacturer’s standard warranty which shall be at least 18 months

1.6 DELIVERY, STORAGE AND HANDLING

A. The switchboards shall be delivered to the District Del Valle Water Treatment Plant for installation by others. The plant address is 601 Vallecitos Road Livermore CA 94550-9637. Seller shall be responsible for complete delivery and handling of the shipment.
PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Switchboards shall be manufactured by Square D to match existing installation. No other manufacturers shall be acceptable.

B. Service Entrance Metering Switchboard shall be model QED-2 with insulated case circuit breaker.

C. Switchboard “MSN” shall be model QED-2 with insulated case breakers and molded case breakers.

D. Switchboard MSE” shall be model QED-2 with molded case circuit breakers.

2.2 600 VOLTS AC SWITCHBOARDS

A. Furnish indoor dead-front type, low voltage metal-enclosed front accessible switchboards as shown on the single-line diagram and as specified herein.

B. Switchboard and Equipment: Conform to current applicable standards of organizations listed under References.

C. Furnish a complete line-up of switchboards with control as detailed herein. Furnish and install devices or accessories not described, but necessary for the proper installation and operation of the equipment.

D. Rate complete switchboard assembly to withstand mechanical forces exerted during short circuit conditions when connected directly to a power source having available fault current of minimum 65,000 amperes symmetrical at rated voltage. Test switchboard for conformance according to applicable NEMA and UL standards.

E. Manufacturer of the assembly to be manufacturer of air circuit breakers contained therein.

F. Switchboard shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides and rear shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide adequate ventilation within the enclosure.

G. All sections of the switchboard shall be rear aligned with depth as shown on the drawings. All protective devices shall be group mounted. Devices shall be front removable and load connections front accessible enabling switchgear to be mounted against a wall.
2.3 VOLTAGE RATINGS

A. Design and construct switchboard for use on a 480 volt, 3-phase, 4-wire, 60 hertz system with entire assembly suitable for 600 VAC maximum service.

2.4 SERVICE ENTRANCE PULL SECTION AND UTILITY METERING SECTION

A. Service entrance pull section and utility metering section shall be as per Pacific Gas and Electric Company requirements. Obtain PG&E approval prior to submitting shop drawings for review and approval.

B. Metering section shall be provided with required PTs and CTs suitable for installation of revenue meter by PG&E. The service shall be 480V three-phase four wire.

C. Provide a UL 1449 listed surge suppression system of latest MOV type technology. The suppressor shall be of voltage type with thermal fusing. The suppressor shall be capable of withstanding 100,000 amperes per phase and shall be equipped with LED indicator, dry contact for remote alarm and local audible alarm. It shall be Square D SurgeLogic XW series suitable for use with 480/277V three phase four wire service.

D. Provide room toward the rear of the main circuit breaker section for main breaker output cable connections in conduits entering the switchboard at the top.

2.5 MAIN BUS

A. Fabricate main bus and full (100%) neutral of high conductivity, flat, tin plated copper bar having rounded edges suitably braced and supported on high dielectric strength insulators and arranged in the same vertical plane. Buses to have a continuous current-carrying capacity of not less than 2000, 1600 and 1000 amperes respectively as indicated on the Drawings.

B. Insulate all buses to protect against spread of arcing faults and accidental contact by people or foreign objects. Provide bus joints with Bellville spring type washers.

C. Mount bus on insulated supports with coordinated dielectric properties, and strength to withstand magnetic stresses developed by fault current equal to 65,000 amperes symmetrical at rated voltage.

D. Fabricate bus supports from insulation possessing flame-retardant and self-extinguishing, dielectric and anti-hydroscopic properties.
2.6 GROUND BUS

A. Ground Bus: plated copper bar, 1/4 inch by 1 to 2 inch minimum, extending through all cubicles.

B. Provide bus joints with Bellville spring type washers.

C. Ground each housing directly to this bus.

D. Adequately ground relays by No. 6 American Wire Gauge insulated copper wire.

2.7 CIRCUIT BREAKERS

Main circuit breaker and feeder breakers shall be insulated case breakers and molded case breakers as shown on the drawings and as specified below:

A. Molded case circuit breakers;
   1. Protective devices shall be molded case circuit breakers with multifunction adjustable trip unit inverse time and instantaneous tripping characteristics and shall be Square D PowerPact circuit breakers with micrologic trip units

   2. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be non-welding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.

   3. Circuit breakers shall have a minimum symmetrical interrupting capacity as indicated on the Drawings.

   4. Circuit breakers 800-ampere through 2500-ampere frame shall be Square D PowerPact series with microprocessor-based, sensing trip units, model Micrologic series. The trip units shall have programmable protection functions including long time, short time, instantaneous, time delays for each pick up, and ground faults. For main circuit breaker, provide multifunction protective relay to protect the system against single-phase, phase un-balance, phase reversal, negative sequence, current un-balance, under and over voltage (with time delays).

B. Insulated case circuit breakers;
   1. Insulated case circuit breakers shall be fixed, manually operated for
the main and manually operated for branch breakers.

2. Trip units shall be true RMS sensing with 12 functions such as long time, short time, ground fault, instantaneous and delays.

3. Frame size shall be 800A to 1600A with minimum short circuit rating of 65KA symmetrical

4. The breakers shall be Square D MASTERPACT with arc flash protection and with MicroLogic electronic trip unit.

5. Breaker’s lugs shall be sized to accommodate multiple up to 500kcmil cables per phase.

2.8 CURRENT TRANSFORMERS

A. Ring Type Current Transformers: Dry type, for indoor service, insulated for 600 volts. Design to have a mechanical and thermal rating to withstand short-circuit current, stresses, and heating effects equal to the rating of the circuit breaker of the application.

B. Current Ratio: As indicated on the Drawings.

C. Transformers: Rated in accordance with applicable standards; Accuracy of the current transformers suitable for metering accuracy class, and burden for the required devices.

D. Identify for polarity with standard marking or symbols, capable of carrying rated primary current continuously without damage, with ample capacity and accuracy for metering accuracy class, and burden for the required devices.

E. Run secondary wiring from current transformers in suitable wiring trough, or conduit, to proper short-circuiting type terminal blocks for connection to relays, instruments, and other devices.

2.9 POTENTIAL TRANSFORMERS

A. Indoor dry type, single-phase, 60 hertz.

B. Accuracy classification determined according to ANSI Standards suitable for relay accuracy class, and adequate burden for the required devices; potential transformers shall meet the following minimum requirements:
   1. Basic Impulse Insulation Lever (BIL): 30 kilovolt.
   2. Primary Voltage: 480 volts.
5. Metering Accuracy Class: 0.3 at ANSI Standard Burden Z (200 volt-amperes).

C. Identify for polarity with standard markings or symbols. Connect secondaries to potential buses as required. Protect potential transformers with primary and secondary fuses. Protect primary side with current-limiting fuses.

2.10 CONTROL POWER TRANSFORMERS

A. Provide 480 to 120 volt control power transformers as required. Verify that control power transformers have adequate capacity for the load to be served.

B. Protect control power transformers with both primary and secondary fuses. Protect primary side with current limiting fuses.

2.11 CONTROL WIRING AND TESTING

A. Wire and factory test switchboard to satisfy the requirements of the operation described or necessary.

B. Switchboard Wiring: NEC Type SIS, single-conductor, stranded copper, rated 600 volts bundled and secured with nylon ties. Provide flexible stranding for swinging panels. Minimum wire size: No. 14 for control circuits, and No. 12 for potential and current transformer circuits.

C. Route outgoing control wires to master terminal blocks with suitable numbering strips numbered in agreement with the manufacturer's detailed wiring diagrams.

D. Terminate control wiring in molded, screw-type terminal blocks acceptable to ENGINEER. Provide a minimum of 10 percent spare terminal blocks for each circuit breaker and auxiliary compartment. Compression type terminal blocks are not acceptable. Terminal blocks: States Company sliding link Type NT or as accepted by ENGINEER.

E. Number wiring with shrink-type tag devices at both ends consistent with the manufacturer's detailed wiring diagrams. Duplication of wire numbers and terminal block numbers is not acceptable.

F. Provide any necessary writing between circuit breaker for generators and remote generator’s controls.

G. Provide any necessary wiring provisions between metering devices to remote PLC control panel.
2.12 INSTRUMENTS AND METERS

A. Furnish and install instruments and meters complete with devices and associated circuitry necessary to perform the required functions in accordance with these Specifications.

B. Mount instruments on hinged panels secured to the metal enclosed unit. Devices to have enclosing cases, dull black finish, and mount semi-flush. Provide nameplates.

C. Indicating Instruments: Square or rectangular type with anti-parallax scales. Provide zero adjustment external to the case. Include resistors, reactors, or other auxiliaries necessary for complete instruments.

2.13 NAMEPLATES

A. Provide engraved plastic nameplates to identify switchboard units, door mounted components, and internal components.

B. Black lamicoid with white letters fastened with round head stainless steel screws, engraved with the circuit number and circuit name consistent with the Drawings.

C. Label per requirements of NEC, Articles 110-21 and 110-22.

D. Submit nameplate schedule for review and approval.

2.14 ELECTRONIC MULTI-FUNCTION METERS

A. Microprocessor based multifunction meter shall provide the following.
   1. The Individual phase and ground currents
   2. Phase-to-phase and phase-to-neutral voltages
   3. Vars, VA, power factor, frequency
   4. Watts, watt demand, watt-hours
   5. Total harmonic distortion and waveform capture
   6. Device accuracy shall be 1% of full scale
   7. All monitor values shall available via keypad and illuminated display
   8. Four programmable output relays to allow specific control functions
   9. ETHERNET communication port and a MODBUS (RS-485) port shall be provided
  11. Provide a 5 min 150VA UPS with 120VAC input and 120VAC output to power the multi-function meter and the ETHERNET switch.
B. Multi-function electronic meter shall be Square D PowerLogic Model PM870 with ETHERNET module PM8ECC for the main insulated case circuit breaker and shall be PowerLogic Model PM820 also with ETHERNET module PM8ECC for the main molded case circuit breaker.

2.15 WARNING SIGNS

A. Provide a minimum of two warning signs on the front of the switchboard line-up.
   1. Red laminated plastic engraved with white letters approximately 1/2 inch high.
   2. Signs shall read "DANGER HIGH VOLTAGE."

2.16 SOURCE QUALITY CONTROL

A. Completely assemble, wire and test switchboard at the factory. Rigid inspections before and after assembly shall assure correctness of design and workmanship. Provide groups of wires leaving the shipping-assembled equipment with terminal blocks with suitable numbering strips.

B. After assembly, provide the switchboard with lifting channels having eyebolts for attachment of crane slings to facilitate lifting and handling each shipping-assembly unit. These lifting channels shall be removable after equipment is placed on permanent foundations.

C. Furnish and install structural mounting channels in accordance with manufacturer's recommendations to provide proper alignment of the units.

D. Manufacturing facility for switchboard shall be third party certified to ISO 9002. Third party certifier is subject to acceptance of the District.

2.17 SPECIAL REQUIREMENTS

A. The service entrance metering switchboard shall have its right side designed with removable panel which will be removed by the installation contractor because its right side will be located immediately against an existing open pullbox so that cables can be routed internally from section to section.

B. Similarly, the left side of the switchboard MSN shall have removable panel which will be removed by the installation contractor because its left side will be located immediately against an existing open pullbox so that cables can be routed internally from section to section.
C. Submit the shop drawings of the Service Entrance Metering Switchboard to PG&E for their approval prior to submitting the shop drawing to the District for review and approval.

D. Provide one spare 1000A Frame insulated case breaker for future use.

PART 3 EXECUTION

3.1 INSTALLATION ASSISTANCE

A. Seller shall provide assistance to the contractor who is responsible for the installation of equipment per the manufacturer’s recommendations. The seller’s field engineer shall be factory-trained and shall be knowledgeable with the switchboards. He shall supervise the installation of the switchboards as per recommendations by the manufacturer. Two days of field services shall be included for this required work.

3.2 DEMONSTRATION

A. The field engineer shall assist the installation Contractor to demonstrate proper operation of equipment until accepted by the District.

3.3 TRAINING

A. Provide two training sessions of not less than 4-hr each to District’s staff.

END OF SECTION
PART 1 GENERAL

1.1 SCOPE

A. The Seller shall furnish for installation by others a free-standing, indoor type low-voltage (600 volts and below) automatic transfer switch (ATS) function having the ratings, features/accessories and enclosures as specified herein. This ATS is designated as MSN ATS-4 shown on the single-line diagram.

1.2 REFERENCES

A. The automatic transfer switches and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of UL and NEMA as follows:

1. UL 50 -- Cabinets and Boxes
2. UL 489 -- Molded Case Circuit Breakers
3. UL 508 -- Industrial Control Systems
4. UL 1008 -- Transfer Switches
5. UL 1087 -- Molded Case Switches
6. NEMA ICS -- Industrial Controls and Systems.

1.3 SUBMITTALS -- FOR REVIEW/APPROVAL

A. The following information containing in shop drawings (five identical hard copy sets and one CD in pdf version) shall be submitted to the District for review and approval:

1. Master drawing index
2. Dimensioned outline drawing
3. Schematic diagram and theory of operation
4. Component list

5. Conduit entry/exit locations

6. Assembly ratings including:
   a. Short-circuit rating
   b. Voltage
   c. Continuous current.

1.4 REGULATORY REQUIREMENTS

A. A certificate of compliance with UL 1008 must be submitted for the transfer switches to be supplied. The certificate is not required if the manufacturer's published data submitted and approved reflect a UL 1008 listing. Proof of UL 1008 listing does not, however, relieve the Seller of compliance with other provisions of this specification.

1.5 DELIVERY, STORAGE AND HANDLING

A. The automatic transfer switch shall be delivered to the District Del Valle Water Treatment Plant for installation by others. The plant address is 601 Vallecitos Road Livermore CA 94550-9637. Seller shall be responsible for complete delivery and handling of the switch.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Submit five (5) copies of the equipment and maintenance manuals shall be provided.

B. Operation and maintenance manuals shall include the following information:

1. Instruction books and/or leaflets

2. Recommended renewal parts list

3. Drawings and information required by section 1.3.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The automatic transfer switch shall be made by Kohler to match existing installation. No other manufacturers shall be acceptable.
2.2 **RATINGS**

A. The transfer switch shall have withstand, closing and interrupting ratings of 65,000 amperes minimum. Continuous Ampere rating shall be 1000A, 480V three-phase, four-pole as shown on the drawings.

B. The voltage rating of the transfer switch shall be no less than the system voltage rating. The continuous current rating of the transfer switch shall be no less than the maximum continuous current requirements of the system.

C. The transfer switch shall be 100% equipment rated for continuous duty as shown on the drawings and shall conform to the applicable requirements of UL 1008 for emergency system total load.

D. All pilot devices and relays shall be of the industrial type with self-cleaning contacts and rated 10-amperes.

E. The automatic transfer switches shall be fully rated to protect all types of loads, inductive and resistive, from loss of continuity of power, without derating, either open or enclosed.

F. Transfer switches shall have a minimum 60-cycle withstand rating of 65 kA. The transfer switch shall be rated for application with upstream power circuit breakers and insulated case circuit breakers having short-time delay settings of up to 30 cycles. Contacts shall not weld when used with upstream overcurrent protective devices that do not incorporate instantaneous trip units.

2.3 **CONSTRUCTION**

A. The transfer switches shall consist of completely enclosed contact assemblies and a separate control logic panel. The contact assemblies shall be operated by a non-fused motor operator or stored energy mechanism and be energized only momentarily during transfer, providing inherently double throw switching action. Control power for all transfer operations shall be derived from the line side of the source to which the load is being transferred.

B. Transfer switches shall be capable of being operated manually under full load conditions. Manual operation shall be accomplished via a permanently affixed manual operator or integrally mounted pushbutton operators located on the face of the contact assemblies. Removable manual operating handles and handles which move in the event that electrical operators should suddenly become energized while performing a manual transfer operation are not acceptable. The manual operator shall provide the same contact-to-contact transfer time as provided under normal automatic operation to prevent possible flashovers from switching the main contacts slowly. In addition,
provisions shall be made to allow disengagement of the electrical operator during manual operation.

C. Each transfer switch shall be positively interlocked both mechanically and electrically to prevent simultaneous closing of both sources under either automatic or manual operation. Main contacts shall be mechanically locked in position in both normal and emergency positions. A neutral position shall not be possible under normal electrical operation unless a delayed transition accessory is required for switching highly inductive loads. Each transfer switch shall have a manual neutral position for load circuit maintenance. A transfer switch position indicator shall be visible from the front of the switch to show to which source the transfer switch is connected.

D. Inspection and replacement of all separate arcing contacts (moving and stationary) shall be possible from the front of the transfer switch.

E. An electronic sensing and control logic panel shall be separately mounted from the power switching portion of the transfer switch. The two sections shall be connected by control cables with plug-in connectors. The control section shall be capable of being disconnected from the power section for maintenance purposes.

F. The logic circuit shall utilize electronic components mounted on printed circuit boards to accomplish functions such as timing, time delays, and voltage and frequency monitoring. LEDs shall be furnished to indicate the operation of each solid-state function. Modifications shall be available for field installation without voiding the UL label.

G. The transfer switch shall be equipped with a voltage selection plug making it suitable for operation on standard voltages from 208 through 600 volts AC, 50 or 60 hertz, by placing the voltage selection plug in the proper voltage receptacle.

2.4 WIRING/TERMINATIONS

A. Terminal blocks shall conform to NEMA ICS 4. Terminal facilities shall be arranged for entrance of external conductors from the top or bottom of the enclosure. The main transfer switch terminals shall be suitable for the termination of conductors shown on the plans.

2.5 SEQUENCE OF OPERATION

A. The transfer switch shall automatically transfer its load circuit to a standby power supply upon failure of its normal or preferred source.
B. Upon loss of phase-to-phase voltage of the normal source to 80% of nominal, and after a time delay, adjustable from 0.5 to 15 seconds, to override momentary dips and/or outages, a 10-ampere, 30-Vdc contact shall close to initiate starting of the emergency or standby source power plant. Transfer to the alternate source shall take place immediately upon attainment of 90% of rated voltage and frequency of that source. For switches not involving engine generator sets as power plants, transfer shall occur after an adjustable time delay of 1 to 60 seconds to override momentary dips and outages.

C. When the normal source has been restored to 90% of rated voltage, and after a time delay, adjustable from 0.5 to 32 minutes (to ensure the integrity of the normal power source), the load shall be retransferred to the normal source.

D. A time delay, adjustable from 0.5 to 32 minutes, shall delay shutdown of the emergency or standby power source after retransfer to allow the generator to run unloaded for cool-down, after which the generator shall be automatically shut down.

E. If the emergency or standby power should fail while carrying the load, transfer to the normal power supply shall be made instantaneously upon restoration of the normal source to satisfactory conditions.

2.6 ENCLOSURE

A. The transfer switch shall be installed in a NEMA 12 gasketed enclosure.

2.7 ACCESSORIES

A. The following logic and options shall be supplied:

1. The logic of the transfer switch shall function via a microprocessor. The set points shall be field adjustable without the use of special tools. The switch shall have a multi-tap voltage selection plug for ease of voltage adjustment in the field. LED lights shall be included on the exterior of the switch to show:

<table>
<thead>
<tr>
<th>Normal Source Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Source Available</td>
</tr>
<tr>
<td>Normal Source Connected</td>
</tr>
<tr>
<td>Emergency Source Connected</td>
</tr>
<tr>
<td>Load Energized</td>
</tr>
</tbody>
</table>

B. A digital readout shall display each option as it is functioning. Readouts shall display actual line-to-line voltage, line frequency and timers. When timers are functioning, the microprocessor shall display the timer counting down. All set points can be re-programmed from the front of the switch when the switch is
in the program mode. A test pushbutton shall be included as part of the microprocessor. The switch shall include the following:

a. Provide a time delay transfer from the normal power source to the emergency power source (0 seconds to 30 minutes). This option does not effect the engine start circuit.

b. Provide a timer to override a momentary power outage or voltage fluctuation (0 seconds to 120 seconds).

c. Provide a time delay transfer from the emergency power source to the normal power source (0 seconds to 30 minutes).

d. Provide a timer to allow the generator to run unloaded after re-transfer to the normal power supply (1 second to 30 minutes).

e. Provide single-phase under voltage and under frequency sensing on the emergency power source. Voltage shall be factory set at 90% pickup and 80% dropout. Frequency sensing shall be set at 58-hertz pickup and 56-hertz dropout.

f. Provide a pilot light to indicate that the switch is in the normal position as an integral part of the microprocessor.

g. Provide a pilot light to indicate that the switch is in the emergency position as an integral part of the microprocessor.

h. Provide a pilot light to indicate that the normal power is available as an integral part of the microprocessor.

i. Provide a pilot light to indicate that the emergency power is available as an integral part of the microprocessor.

j. Provide auxiliary relay contacts that are energized when the power is available on the normal source.

k. Provide auxiliary relay contacts that are energized when the power is available on the emergency source.

C. The following features shall be provided:

1. Time delay normal to emergency, adjustable.

2. Time delay emergency to normal, adjustable.

3. Green pilot light to indicate switch in normal position and red pilot light to indicate switch in emergency position.

4. White pilot lights marked "Normal Source" and "Emergency Source" to indicate that respective source voltages are available.

5. Tripped position indicating lights for both sources.
6. Relay auxiliary contacts (2 NO and 2 NC) to indicate transfer switch position and the availability of each source.

D. The following features shall also be provided:

1. Time delay engine start, adjustable.
2. Time delay engine cool off, adjustable.
3. Engine start dry contact.
4. Loadbank dump dry contact (for future use)
5. Frequency/voltage relay for emergency source, frequency adjustable from 45 to 60 Hz and voltage fixed at 90% pickup, 70% dropout.
6. Delayed transition time delay, adjustable from 0 to 120 seconds, to allow disconnection of the load during transfer in either direction to prevent excessive inrush currents due to out-of-phase switching of large inductive loads.
7. Four-position selector switch permitting four (4) modes of transfer switch operation: TEST (simulates normal power outage), AUTO (standard automatic operation), OFF (de-energizes control relays and opens the engine start circuit for maintenance purposes), ENGINE START (retains transfer switch in normal position and initiates a testing of the engine start circuit). Furnish white pilot light for OFF indication.

E. A transfer switch position indicator shall be visible from the front of the switch.

F. Provide pump station exerciser (selectable load, no-load transfer). The exerciser will be 7 day selectable for any duration for any day during the week.

G. Provide a serial (Modbus RTU) with RS-485 communication port and one ETHERNET port for future use.

PART 3 EXECUTION

3.1 EXAMINATION

3.2 FACTORY TESTING
A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.

1. Insulation check to ensure the integrity of insulation and continuity of the entire system.

2. Visual inspection to ensure that the switch matches the specification requirements and to verify that the fit and finish meet quality standards.

3. Mechanical tests to verify that the switch’s power sections are free of mechanical hindrances.

4. Electrical tests to verify the complete electrical operation of the switch and to set up time delays and voltage sensing settings of the logic.

B. The manufacturer shall provide three (3) certified copies of factory test reports.

3.3 INSTALLATION

A. The Seller shall provide a field engineer to assist the contractor who is responsible to installs the ATS equipment per the manufacturer’s recommendations and the Contract Drawings. This field engineer with factory-trained experience shall supervise the installation of the ATS and shall provide training to District Staff. This field work shall be one day including field startup assistance and training.

3.4 FIELD ADJUSTMENTS

A. The Seller’s field engineer shall field adjust all timing and voltage settings of the transfer switch as necessary for proper operation of the unit.

3.5 FIELD TESTING

A. Supplier’s field engineer shall assist the Contractor demonstrate satisfactory operations of the installed unit to the District for acceptance.

3.6 TRAINING

A. Supplier’s field engineer Provide 2 hours of training to the District’s personnel.

END OF SECTION