Addendum #1

Project: Lift Station 3 Generator Replacement
From: David Lawrence, P.E., General Manager
Date: April 6, 2021

Questions and Answers

1. Is a bid bond required for this project?

   No.

2. Is the pre-bid mandatory?

   No.

3. Confirm if generator requires an enclosure or if it is open type.

   See attached generator specifications for details.

4. Provide primary breaker size amps.

   See attached generator specifications for details.

5. Confirm insulation class and temp rise.

   See attached generator specifications for details.

6. Is IBC certified acceptable?

   See attached generator specifications for details.

7. Is ATS required? If ATS is existing provide ATS ratings.

   No. BBARWA has an ATS on site.

8. Are any generator accessories required? (i.e. Battery, Battery Charger, Block Heater, etc.)

   See attached generator specifications for details.

9. If accessories are required provide a sketch showing power panel, generator and ATS locations.

Drawings are not available. Bidders will be able to see these locations during the pre-bid meeting.

10. Are circuit breakers feeding accessories existing?

    See attached generator specifications for details.

Clarifications and Additions

1. See attached Generator Set Specification.

2. The pre-bid meeting will be held at 121 Palomino Drive, Big Bear City, Ca 92314. There will be a site visit to Lift Station 3. There is no conference call option for this pre-bid.

Plan Revisions

None this Addendum.

Acknowledgment in Receipt of Addendum

Firm Name: _____

By (Printed): _____

By: (Signature): _____

Title: _____

Note: A signed acknowledgment in receipt of this addendum MUST be included with your bid proposal.

Generator Set Specification

BBARWA Lift Station #3 Generator Replacement

SECTION 263213.13 - DIESEL EMERGENCY ENGINE GENERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes packaged diesel engine generators for emergency use with the following features:
   1. Diesel engine.
   2. Alternator.
   3. Unit-mounted radiator.
   4. Control and monitoring.
   5. Generator overcurrent and fault protection.
   6. Vibration isolation devices.
   7. Finishes.

B. Related Requirements:
   1. Section 263600 "Transfer Switches" for transfer switches, including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.3 DEFINITIONS

A. AREP: Auxiliary winding regulation excitation principle. Voltage support for the AVR comes from independent auxiliary windings located in the main stator.

B. AVR: Automatic voltage regulator.

C. EPS: Emergency power supply.

D. EPSS: Emergency power supply system.

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

F. PMG: Permanent magnet generator. Voltage support for the AVR comes from an independent auxiliary permanent magnet generator which is mounted on the shaft extension of the alternator.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
   2. Include thermal damage curve for generator.

3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour (liters per hour) at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
5. Include airflow requirements for cooling and combustion air in cubic feet per minute (cubic meters per minute) at 0.8 power factor, and reference air-supply temperature. Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
6. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

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

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates for engine generator, accessories, and components, from manufacturer.
1. Component Importance Factor: 1.5.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For engine generators to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
a. Operating instructions mounted adjacent to generator location.
b. Training plan.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Two years from date of generator commissioning or shipment date, whichever occurs first.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements; MTU 4R0113 DS125 (Indoor Application) or a comparable product by one of the following:
   a. Any changes to the generator set installation requirements due to manufacturers' products differing from the Basis-of-Design Product are the responsibility of the contractor.
   b. Any alternate shall be submitted for approval to the consulting engineer at least 14 days prior to bid. Alternate bids must list any deviations from this specification.

B. Source Limitations:
   1. Obtain packaged engine generators and engines from a single manufacturer.
   2. Obtain packaged engine generators and auxiliary components from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Engine generator, batteries, battery racks, silencers, load banks, sound attenuating equipment, accessories, and components shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7-10**].
   1. The term "withstand" means "the unit will remain in place without separation of any parts when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Shake-table testing shall comply with ICC-ES AC156. Testing shall be performed with all fluids at worst-case normal levels.
   3. Component Importance Factor: 1.5 .

B. B11 Compliance: Comply with B11.19.

C. CSA Compliance:
   1. Comply with CSA 22.1.
   2. Comply with CSA 282.

D. NFPA Compliance:
   1. Comply with NFPA 37.
   2. Comply with NFPA 70.
   3. Comply with NFPA 99.
   4. Comply with NFPA 110 requirements for Level 1 EPSS.

E. UL Compliance: Comply with UL 2200.

F. Engine Exhaust Emissions: Comply with EPA NSPS requirements for emergency generators and applicable state and local government requirements.

G. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at property line due to sound emitted by engine generator, including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation. Comply with ISO 8528-10 for sound measurements at 3.2 feet (1 m) and 23.0 feet (7 m).

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

1. Ambient Temperature: 122 deg F(50 deg C).
2. Relative Humidity: Zero to 100 percent.
3. Altitude: Sea level to [**1000 feet(300 m)**].

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

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

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

C. EPSS Class: Engine generator shall be classified as a Class 6 according to NFPA 110.

D. Generator Set Rating: 125 kW.

E. Power Factor: 0.8 lagging .

F. Frequency: 60 Hz

G. Voltage: 480 -V ac.

H. Phase: Three-phase, twelve-wire wye .

I. Governor: Adjustable isochronous, with speed sensing.

J. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
   1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and engine generator center of gravity.

K. Capacities and Characteristics:
   1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries [**with capacity as required to operate as a unit as evidenced by records of prototype testing**].
   2. Nameplates: For each major system component to identify manufacturer's name, model, and serial number, of component.

L. Engine Generator Performance:
   1. Steady-State Voltage Operational Bandwidth: 0.25 percent of rated output voltage, from no load to full load, and one-percent for non-PMG alternators.
   2. Load Factor: 85-percent load factor according to ISO 8528-1.
      a. If below, supplier shall provide updated documents for performance modified to 85-percent load factor in regards to time before overhaul (TBO) and the respective maintenance schedule.
   3. When facility loads are provided, a generator set sizing report from the manufacturer shall be provided, detailing each load, and the performance for each step.
   4. Transient Voltage Performance: Not more than [**15**] [**20**] percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 3.5-seconds.
   5. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency, from no load to full load, and 0.5 percent for mechanical governed engines.

6. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
7. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
8. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
9. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically with PMG/AREP, without damage to generator system components.
10. Unit shall be capable of accepting 100 percent load step in one step per NFPA 110 requirements.
11. Start Time: Comply with NFPA 110, Type 10 , system requirements.

2.4 DIESEL ENGINE; John Deere or approved equivalent

A. Fuel: ASTM D 975 diesel fuel oil, Grade 2-D S15.
1. Biodiesel content less than or equal to 7 percent.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine or skid mounted.
1. Filter and Strainer: Select according to engine manufacturer's requirements for particle removal.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater with Isolation Valves: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and with UL 499.

E. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.
1. Coolant: Glycol-based antifreeze and water mixture for freeze protection to minus 20 deg F(minus 29 deg C), with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant, from cold start to 100 percent load condition.
3. Expansion Tank: Rated to withstand maximum closed-loop coolant-system pressure for engine used. Equip with gage glass and petcock. Replace gage glass with a pressure sensor when gage glass is located more than 8 feet (2.4 m) from the floor.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.
   a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.

b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer: Designed to meet sound attenuation levels as specified herein. Ships loose, contractor to install & insulate.

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

H. Starting System: Match engine ECU and genset control voltage requirements.
1. Components: Sized so they are not damaged during a full engine-cranking cycle, with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: As required by NFPA 110 for system level specified .
4. Battery: Lead acid , with capacity within ambient temperature range specified in "Performance Requirements" Article to provide NFPA 110 specified cranking cycle without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Include accessories required to support and fasten batteries in place.
   a. Compartment Heater: Thermostatically controlled heater shall be arranged to maintain battery above 50 deg F (10 deg C) regardless of external ambient temperature within range specified in "Performance Requirements" Article.
   b. Compartment Ventilation: Provide ventilation to exhaust battery gases.
7. Battery Stand: Factory-fabricated, two-tier metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
8. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation.
9. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:
   a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
   b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F (minus 40 deg C) to 140 deg F (plus 60 deg C) to prevent overcharging at high temperatures and undercharging at low temperatures.
      1) Temperature Probe: Equip battery charger with a temperature probe on the negative cable when battery heaters are used.
   c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
   d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
   e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
   f. Enclosure and Mounting: NEMA 250, Type 1 wall-mounted cabinet.

2.5 DIESEL FUEL-OIL SYSTEM

A. Comply with NFPA 30.

B. Day Tank
1. Provide a UL listed main storage tank with a capacity of 275 U.S. gallons. The tank shall be double wall construction with a minimum of 110% secondary containment. The tank shall incorporate the following features and options to make a complete system. The tank system shall be a model PY600275DW as manufactured by Pryco.
2. The tank shall be constructed of heavy gauge steel and include a lockable fill cap, fuel level gauge, drain fittings for both the tank and the double wall, four 1" npt fittings, normal vent connections and the required UL emergency vent connections. All threaded connections, except the drain fittings, shall be located above the normal full level. The supply / return fitting shall have removable pipe stem's that terminate within one inch of the tank bottom.
3. The tank shall be primed and painted to match the color of the generator.
4. The tank shall include alarms for low level (option 203) and leak / rupture detection (option 295M). Each alarm shall have dry contacts for remote signaling (option 204).
5. Include 2" vent line termination mushroom type caps for the normal vent openings and 4" pressure relief type vent caps for the primary & secondary emergency vent openings (option 323). The design and labeling of the emergency vent caps shall comply with the requirements of NFPA 30.
6. Design to connect to an existing Nema 3R Remote Fill Station (option 230-22) is included that is used to monitor the tank fuel filling activities. At 90% full, an alarm horn sounds and a light is illuminated. At 95% the alarm horns sounds, light illuminates and a normally open solenoid valve (option 361) closes allowing no more fuel to enter the tank.

2.6 CONTROL AND MONITORING

A. Provide minimum run time control set for 15 minutes, with override only by operation of a remote emergency-stop switch.

B. Comply with UL 2200 for stationary engine generator assemblies and UL 508A for ancillary controls, such as Master Control Panel mounted off the generator set.

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

D. Control and Monitoring Panel:
1. Digital controller with integrated LCD display, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
    a. PLC logic incorporating drag and drop ladder logic available for the owner/user. Logic shall be designed such that all parameters within the generator set controller can be used in addition to additional inputs and outputs.
2. Instruments: Located on the control and monitoring panel and viewable during operation.
    a. Engine lubricating-oil pressure gage.
    b. Engine-coolant temperature gage.
    c. DC voltmeter (alternator battery charging).
    d. Running-time meter.
    e. AC voltmeter, for each phase.

f. AC ammeter, for each phase.
g. AC frequency meter.
h. Digital generator-voltage-adjusting feature to allow plus or minus 5 percent adjustment.

3. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm and pre-alarm indication as required by NFPA 110 for Level 1 system, including the following:
   a. Cranking control equipment.
   b. Run-Off-Auto switch.
   c. Control switch not in automatic position alarm.
   d. Overcrank alarm.
   e. Overcrank shutdown device.
   f. Low water temperature alarm.
   g. High engine temperature pre-alarm.
   h. High engine temperature.
   i. High engine temperature shutdown device.
   j. Engine exhaust temperature.
   k. High engine exhaust temperature alarm.
   l. Overspeed alarm.
   m. Overspeed shutdown device.
   n. Low-fuel main tank.
      1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for the duration required for the indicated EPSS class.
   o. Coolant low-level alarm.
   p. Coolant low-level shutdown device.
   q. Coolant high-temperature prealarm.
   r. Coolant high-temperature alarm.
   s. Coolant low-temperature alarm.
   t. Coolant high-temperature shutdown device.
   u. EPS load indicator.
   v. Battery high-voltage alarm.
   w. Low-cranking voltage alarm.
   x. Battery-charger malfunction alarm.
   y. Battery low-voltage alarm.
   z. Lamp test.
   aa. Contacts for local and remote common alarm.
   bb. Low-starting air pressure alarm.
   cc. Low-starting hydraulic pressure alarm.
   dd. Remote manual-stop shutdown device.
   ee. Generator overcurrent-protective-device not-closed alarm.
   ff. Generator overspeed.
   gg. Generator over and under voltage.
   hh. Dead bus.
   ii. Reverse power.
   jj. Ground fault control.

E. Common Remote Panel with Common Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

F. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489. Two (2) 200A, 100% Rated Circuit Breaker; one (1) main breaker and one (1) for load bank testing only. NO EXCEPTIONS.
   1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   2. Trip Settings: Selected to coordinate with generator thermal damage curve.
   3. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:
   1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.
   2. Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
   3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
   4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

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

C. Electrical Insulation: Class H or Class F.

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

E. Range: Provide limited range of output voltage by adjusting the excitation level.

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

G. Enclosure: Dripproof.
   1. Ingress Protection Rating (IP): Follow IEC 60529 and IP23.

H. Instrument Transformers: Mounted within generator enclosure.

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

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Subtransient Reactance: 15 percent, maximum.

2.9 VIBRATION ISOLATION DEVICES

A. As recommended by the manufacturer to meet the following site requirements:
   1. Maximum Vibration Transmission: 30 mm/s.
   2. Based on ISO 8528-9 for vibration.

B. Comply with requirements in Section 232116 "Hydronic Piping Specialties" for vibration isolation and flexible connector materials for steel piping.

C. Comply with requirements in Section 233113 "Metal Ducts" for vibration isolation and flexible connector materials for exhaust shroud and ductwork.

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

2.10 FINISHES

A. Indoor Enclosures and Components: Powder-coated finish over steel enclosure.
   1. Components: Liquid paint.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.
   1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
   1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
   2. Test generator, exciter, and voltage regulator as a unit.
   3. Full-load run.
   4. Maximum power.
   5. Voltage regulation.
   6. Transient and steady-state governing.
   7. Single-step load pickup.
   8. Safety shutdown.
   9. Provide 14 days' advance notice of tests and opportunity for observation of tests by BBARWA's representative.
   10. Report factory test results within 5 days of completion of test.
      a. Report factory test results within 48 hours of completion of a customer witness test at the factory.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by BBARWA or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
   1. Notify BBARWA no fewer than two working days in advance of proposed interruption of electrical service.
   2. Do not proceed with interruption of electrical service without BBARWA's written permission.

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

A. Tests and Inspections:
   1. Acceptance Tests: Perform tests required by manufacturer and 2hr building load test.
   2. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
      a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
      b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
      c. Verify acceptance of charge for each element of the battery after discharge.
      d. Verify that measurements are within manufacturer's specifications.
   3. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
   4. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.
   5. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg(120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
   6. Exhaust Emissions Test: Comply with applicable government test criteria.
   7. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.

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

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

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

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

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

3.4 DEMONSTRATION

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

END OF SECTION 263213.13