

Board of Water and Sewer Commissioners
of the
City of Mobile, Alabama

Update of Standard Specifications
Section 25

Stand-By Generator & ATS
Guideline Specifications

Revised October 2019

PART 1 GENERAL

25.1.01 SCOPE

- A. The work covered by this Section includes furnishing and installing all equipment, material, labor and all operations in connection with the stand-by power generating installation for this project, including the engine/generator assembly and controls, fuel system, exhaust system, engine cooling system, battery charging system, enclosure, automatic transfer switch unit, and accessory items/components, complete and in strict accordance with these specifications and all applicable plans and specifications issued for the project.
- B. The following references shall be followed for the design of the stand-by power generation system:
 - 1. ANSI/NEMA 250: Enclosures for electrical equipment (1,000 volts maximum).
 - 2. ANSI/NEMA MG 1: Motors and generators.
 - 3. ANSI/NFPA: National electrical code.
 - 4. NFPA 110 Level 1.
 - 5. ANSI/NFPA 99: Health care facilities.
 - 6. ANSI/NEMA AB 1: Molded case circuit breakers.
 - 7. NEMA ICS 1: General Standards for industrial Control and Systems.
 - 8. NEMA ICS 2: Standards for Industrial Control Devices, Controllers, and Assemblies.
 - 9. NEMA ICS 6: Enclosures for Industrial Controls and Systems.

25.1.02 REVISIONS

- A. These specifications will be modified and updated as required to keep abreast of current technologies, industry standards, regulatory agency requirements, and best management practices. It shall be the responsibility of the end user of these Specifications to insure the latest and most current revision is applied to the project.

25.1.03 WORK SPECIFIED UNDER OTHER SECTIONS

- A. The system covered by this section of specifications shall have materials and labor furnished in accordance to the applicable portions of other sections of these specifications including “Electrical”, and the “General Conditions”.

25.1.04 INTENT OF PLANS AND SPECIFICATIONS

- A. The intent of the plans and specifications associated with this contract is to provide a completed project which will function as intended and is ready for operation in accordance with the General Conditions. Conformance with, and coordination of, Plans and Specifications shall be in accordance with that set for in the General Conditions of these specifications.

25.1.05 MANUFACTURER’S STATEMENT OF QUALIFICATIONS

- A. The Contractor shall submit to the Engineer a statement of qualification by the generator manufacturer that the unit, or an equal unit, has been designed, built, and successfully testing to start a minimum load of ___KVA with a maximum 20% voltage dip in one step without exceeding any of the design capabilities of the unit, or causing an over-stress of any component within the unit.
- B. The manufacturer shall submit prior to the Engineer’s approval a written statement of proof to show at least one installation of his equipment equivalent to that specified here that has been successfully operated or not less than three years.

25.1.06 CONTRACTOR SUBMITTALS

A. General

- 1. Reference Section 5, Control of Work, of these Standard Specifications for general requirements regarding this subsection. The work delineated here is in addition to other requirements of this Standard Specification.
- 2. Shop drawings are defined as drawings, diagrams, illustrations, schedules, performance charts, brochures and other data prepared by the Contractor which illustrate how specific portions of the work shall be fabricated and/or installed.
- 3. All submittals shall be marked with the Specification Section number containing the item for review.
- 4. To assure that manufacturers and suppliers are aware of the use to which their equipment and products will be subjected, the Contractor shall require the manufacturer to place the following certification on submittal data:

“This is to certify that we have examined the Plans and Specifications for this Project and have ascertained that this equipment or material is suitable for the Purpose and use intended.

Authorized Signature

Printed Name

Company and Job Title

- 5. Shop drawings are not part of the Contract Documents but are a supplementary means of communications to assist in the understanding of what the Contractor proposes to provide and to establish that whatever he intends to install either does or does not conform to the Drawings and Specifications.

B. Catalog Sheets

- 1. For standard manufactured items considered by MAWSS as not requiring special Shop Drawings, the Contractor shall submit six (6) hard copies and one (1) electronic copy on flash drive of manufacturer's catalog sheets showing model numbers and illustrated cuts of the items to be furnished, scale details, sizes, dimensions, performance characteristics,

capacities, wiring and control diagrams and all other pertinent information. This information shall be highlighted on all six (6) copies when appropriate.

2. The Design Engineer will retain two (2) copies and return four (4) copies to the Contractor submitting the catalog sheets.

C. Manuals

1. The Contractor shall submit for review six (6) copies of all requested operating and maintenance manuals with the shop drawing submittals. The materials shall be bound in a 3-ring binder.
2. The Operating and Maintenance manuals shall provide, as a minimum, the following information for any major component of the equipment and the total assembly:
 - a. Installation instructions
 - b. Startup and operating procedures
 - c. Maintenance and lubrication procedures
 - d. Equipment drawings with parts list
 - e. Electrical drawings
 - f. Troubleshooting guide
 - g. Recommended spare parts
3. The Operating and Maintenance manuals shall contain a Project Information sheet with the following information:
 - a. Project Name
 - b. Consultant name
 - c. Consultant project number
 - d. Contractor name
 - e. Date project awarded
4. The Design Engineer will retain two (2) copies and return four (4) copies to the Contractor.
5. Prior to final payment, provide six (6) hard copies of updated operating and maintenance manuals including parts lists along with one PDF copy on a flash drive for MAWSS use.

25.1.07 AS-BUILT DRAWINGS

A. Contractor's Responsibilities

1. Drawings: The Contractor shall maintain one set of blue or black line white prints of the Contract Drawings and Shop Drawings to be used for As-Built Drawings.
2. Preparation: The Contractor shall mark As-Built Prints to show the actual installation where installation varies from that shown originally.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.

3. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings
 - b. Revisions to details shown on Drawings
 - c. Depths of foundations below first floor
 - d. Locations and depths of underground utilities
 - e. Revisions to routing of piping and conduits
 - f. Revisions to electrical circuitry
 - g. Actual equipment locations
 - h. Duct size and routing
 - i. Locations of concealed internal utilities
 - j. Changes made by Change Order or Change Directive
 - k. Changes made following Design Engineer's written orders
 - l. Details not on the original Contract Drawings
 - m. Field records for variable and concealed conditions
 - n. Record information on the Work that is shown only schematically
4. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
5. Mark record sets with red-colored ink or pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
6. Mark important additional information that was either shown schematically or omitted from original Drawings.
7. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
8. Identification: As follows:
 - a. Project name
 - b. Date
 - c. Designation "PROJECT AS-BUILT DRAWINGS"
 - d. Name of Design Engineer
 - e. Name of Contractor
9. Deliver the marked-up As-Built Drawings to the Design Engineer as part of the contract closeout documents as noted in sub Section 5.17 of the Board Standards.

25.1.08 CONSTRUCTION PHOTOGRAPHS

- A. When required as part of the Contract, the contractor shall provide Construction Photographs.
- B. The Contractor shall provide pre-construction views of the entire construction area before any work begins. Views shall be in the form of electronic video and/or 8 inch by 10 inch photographs and/or high-resolution digital photographs at the discretion of the Design Engineer.

- C. The Contractor shall provide the imaging from commencement of Project through completion of all Work. These progress images shall be submitted to the Design Engineer each month in conjunction with the current Monthly Estimate. Interior and/or exterior views shall be made as requested by the Design Engineer.
- D. Each photograph shall have the following information clearly noted on the picture. The information shall be typed or neatly printed on a label and placed on the face of the picture, and not obscure important construction features.
 - 1. Date Photo was taken and photo number
 - 2. Client/MAWSS
 - 3. Project Title and Contract number
 - 4. Contractor
 - 5. Description of what is shown on the photo including direction of field of view
- E. If digital photographs are utilized, both an electronic copy on a flash drive and paper formats shall be submitted.

PART 2 STAND-BY GENERATOR

25.2.01 GENERAL

- A. All material and equipment shall be new and shall be manufactured by a nationally known firm regularly engaged in the manufacture of the equipment herein specified.

25.2.02 ENGINE GENERATOR UNIT

A. General

- 1. The generator unit assembly shall consist of (a) a diesel driven alternator, (b) an engine cooling radiator, (c) control panel (d) a fuel supply system, (e) an engine exhaust system, (f) starting batteries, (g) weatherproof housing with sound attenuation, and (h) accessories required to assemble, install, and operate the facility.
- 2. The following items shall be supplied by and coordinated together through one single manufacturer:
 - a. Engine/Generator Unit with steel skid frame
 - b. Radiator Unit
 - c. Control Panel
 - d. Muffler
 - e. Flexible Exhaust Connection
 - f. Batteries and Rack
 - g. Line Circuit Breaker
 - h. Weatherproof and Sound Attenuated Housing
 - i. Sub-Base/"Pancake" Fuel Tank

3. The engine-generator unit shall be equal to Caterpillar, Cummins, or Kohler.
4. The unit supplied for this contract shall be manufactured by one single company. Submittals covering units assembled by more than one manufacturer of components will not be considered satisfactory.
5. Generator unit installed under this work shall be a factory assembly that has been published as a marketed catalog number or model representing all identical corresponding components by one single manufacturer for at least three years. A prototype, special editions, or otherwise unique assembly will not be considered satisfactory.

B. Engine

1. The engine shall be steel skid mounted with vibration isolators and shall be liquid cooled. The engine shall be four cycle design, shall have ratings published by the manufacturer of not less than _____ cubic inch displacement, and not less than _____ bhp when operated at a governed speed of 1800 rpm. Fuel shall be No. 2 diesel.
2. Engine Auxiliary List:
 - a. Lube Oil Filter, replacement element.
 - b. Intake air filter, washable dry-type element.
 - c. Fuel pressure regulator with by-pass.
 - d. Coolant pump, direct drive.
 - e. Charging alternator, direct drive with voltage regulator.
 - f. Speed governor, 3 Hz max., no load/full load at steady state.
 - g. Coolant drains, accessible and valved.
 - h. Lube oil drains, accessible and valved.
 - i. Coolant heater, 1 each at 3000 W, 240V, single phase, with adjustable direct acting thermostat.
 - j. Instrument Panel:
 - 1) Indicators:
 - a) Fuel Pressure
 - b) Lube pressure
 - c) Coolant temperature
 - d) Running time or revolutions
 - e) Battery charging ammeter
 - 2) Engine Shut-Down Circuits and Alarm Lights, Manual Reset:
 - a) Overspeed
 - b) Low lube oil pressure
 - c) High coolant temperature
 - d) Overcrank
 - k. Panel illumination lights with switch.

3. The unit shall have remote starting and shut-down capability from separate equipment such as an automatic transfer switch.
4. "Off-line" exerciser shall provide regularly scheduled dry-run operation of the engine during normal electrical conditions.

C. Alternator

1. The alternator shall be rated for ____ kW (____ KVA at 130 C° rise) stand-by duty at 0.8 PF, ___ / ___ Volt, 3 phase, 4 wire, 60 Hz, ac. The alternator shall have Class F insulated copper windings, revolving field, drip-proof construction type, with amortisseur windings, and shall be built to latest NEMA standards. Alternator shall include brushless exciter, temperature compensated solid state voltage regulator, and an automatic field flashing relay. Radio interference suppression meeting Commercial Standards shall be supplied. A direct drive centrifugal blower shall provide cooling for a temperature rise with NEMA, IEEE and ANSI standards for continuous duty operation at all output ratings. The alternator shall be single bearing type directly connected to the flywheel housing, with the rotor coupled to the flywheel. A terminal box with copper terminals shall be provided on the exterior of the alternator with ample working space for conductor connections and shall be suitable for entrance as shown on the plans.
 - a. Voltage Adjustment: +/- 5 % of rated voltage.
 - b. Voltage Regulation: +/- ____% of rated voltage, no load/full load.
 - c. Voltage Recovery: 4 second (minimum) one step full load.
 - d. See manufacturer's statement of qualification hereinbefore specified.
2. Controls shall be provided on the generator unit for voltage drop, level, and gain; and meters, or other direct read-out indicators, with phase selection switching shall be provided for voltage, current and frequency.
3. A line circuit breaker shall be provided for the alternator power output circuit rated at _____A, _____V, 3-pole, _____K AIC.

D. Controller

1. The engine generator controller unit shall be in accordance with NFPA 110, Level I specifications, and shall be compatible with all functions of the associated automatic transfer switch. The controller shall have a 16-button operator keypad, a visual data readout window, and LED status indicators.
2. The controller shall have circuitry and terminals for remote data exchange to local "lap-top" computer units and also to off-site PC stations for monitoring operational status, alarms, and diagnostic data for maintenance and repair purposes. The generator controller shall provide "dry" form C contacts to indicate generator running, generator common fault, and low fuel level for monitoring by a SCADA system as directed by MAWSS.
3. The controller shall have RS-232 and RS-485 communication ports for communication with SCADA and alarm equipment.

4. The controller shall maintain event history of all warning alarms up to 32 signals.
5. The controller shall track oil and filter usage and alert operator when replacement is recommended.
6. The controller shall provide the following minimum functions:
 - a. Status indications and monitoring.
 - 1) Engine
 - a) Temperature
 - b) Oil pressure
 - c) Fuel pressure
 - d) RPM
 - e) Battery voltage
 - f) Battery charging amps
 - g) Run time or revolution count
 - 2) Alternator
 - a) Output voltages
 - b) Output currents
 - c) Frequency
 - d) KW
 - e) KVA
 - f) KVAR
 - b. Controls
 - (1) Output voltage adjustments
 - (2) Voltage regulation
 - (3) Cranking cycles
 - (4) Programmed exercising
 - (5) Remote starting and stopping
 - (6) Time delayed starting

(7) Engine cool down cycle

c. Shutdown Features

(1) Over Temperature, Coolant

(2) Over Temperature, Oil

(3) Low Oil Pressure

(4) Low Fuel Pressure

(5) Over Speed

(6) Over Crank

(7) Over Current

(8) Under/Over Voltage

(9) Under Frequency

d. NFPA warnings and shutdowns shall be included as controller functions.

25.2.03 ENGINE COOLING SYSTEM

A. An engine cooling radiator with engine driven blower type fan shall be provided and shall maintain safe engine operation at 110° F maximum ambient temperature.

Coolant flow shall be controlled by automatic in-line thermostats, factory calibrated for the designed engine temperature operation. Radiator air flow restriction shall not exceed 0.5 inches of water. Radiator shall be equipped with a properly calibrated pressure type fill cap, drain valves for completely draining the radiator; and grease fittings shall be provided for fan shaft bearings lubrication. Coolant shall be non-corrosive water solution of 50 % ethylene glycol.

25.2.04 WEATHERPROOF AND SOUND ATTENUATED HOUSING

A. The engine-generator unit shall be provided with an overall weatherproof housing to prevent entrance of rain, sleet, snow and flying debris. The housing shall be louvered to provide an air flow across the alternator and engine and out the radiator grill. Rodent screens shall be provided to prevent insects and animals from entering the interior of the housing at any location. Hinged, latchable, access door shall be provided to allow relatively unobstructed access to the unit for maintenance and routine adjustments. The housing shall be of sufficient dimension to include accessories and enclosed engine starting batteries provided with the engine-generator assembly. Storage facilities for storing tools and spare parts shall be provided. Special structural features shall be provided for supporting items such as exhaust piping, muffler, control panel, etc. The housing shall be sheet steel with deformed strengthening ribs and angle reinforcement frame. The housing shall be a regular cataloged product of the engine-generator supplier. Corrosion protection shall be provided by inside and outside application, after phosphated cleaning, of a minimum of one prime and two

finish coats of enamel paint, "Electrocoat", applied conforming to ASTM D-2794-93 for impact resistance and ASTM B-117-90, D714-87 salt spray resistance.

- B. The housing shall also include sound attenuation on all generators not enclosed within a building. The sound attenuation enclosure shall be critical grade. Noise level 69DBA at 30 feet.
- C. The Contractor shall submit for approval data showing conformance to the above specifications.

25.2.05 ENGINE EXHAUST SYSTEM

- A. The muffler provided for silencing engine exhaust noise shall be sized by the engine manufacturer and shall attenuate the sound to a level for "residential" silencing. Muffler shall be a Maxim Silencer Style M-41 or equal by Kittell with entrance and exit as shown on the plans and shall have a valved condensate drain.
- B. Flexible exhaust connection shall be provided to isolate vibration and engine movement. The flexible connection shall be 304 or 316 stainless steel sized by the engine manufacturer and coordinated with the exhaust piping provided. Supporting brackets shall be provided on the top exterior of the weatherproof housing for securing the muffler and exhaust piping.

25.2.06 BATTERIES

- A. Batteries provided for engine starting and auxiliary equipment operation shall be lead-acid type, heavy duty rated. Batteries shall be secured within the weatherproof housing on a battery rack.
- B. Batteries shall provide sufficient "cold weather" engine cranking for a sustained period of three cranking cycles of 15 seconds cranking followed by 15 seconds rest each at zero degrees F while maintaining 1.2 volts per cell without recharging.
- C. All cables, straps, clamps, etc. shall be provided with proper sizes in order to provide a complete battery to engine electrical system that will function as intended.

25.2.07 BATTERY CHARGER

- A. A battery charger shall be provided and shall be wall or surface mounted type, SCR solid-state type, rated for 120 Volt ac input and 10 amperes (max) output at the engine system battery voltage. Charger shall be $\pm 1\%$ constant regulated voltage suitable for float - equalize full time connection to the system, current limiting type to prevent overloading during engine cranking, temperature compensated, and after attaining full battery charge shall maintain full battery charge by automatic trickle float operation. Unit shall be UL listed and shall have: (a) output voltmeter; (b) ammeter; (c) on-off switch; (c) line fuse; and (d) input power cord with plug.

25.2.08 SUB-BASE/"PANCAKE" FUEL STORAGE TANK

- A. The fuel storage tank shall be double wall "pancake" style _____ gallon capacity rectangular shaped, welded steel construction, manufactured in accordance with Underwriters Laboratories, Inc., Specification UL 142 for storage of NFPA Class II liquids (Diesel Number 2-D). The tank shall be provided as an integral part of the overall assembly

and shall be manufactured for sub-base supporting duty for the generator unit provided unless specified otherwise.

- B. The tank shall bear Underwriters Laboratories, Inc. UL 142 listing mark for indication of manufacturing compliance. The installed tank and lines shall be pressure tested for tightness with 5 psi air pressure for at least 10 minutes as per NFPA 30, 3-8 (1995).
- C. The tank shall have a brass condensate drain valve at the lowest position of the tank. Fuel supply and return lines shall have brass block valves at the tank. A fuel level gauge shall be provided and shall be UL listed, direct reading, float operated type, calibrated to show fuel in gallons. The fill cap shall be a gasketed pad-lockable type. Fuel fill pipe shall have an “overflow prevent device”. The main tank shall have an approved pressure venting valve to prevent overpressure in accordance with API Standard 2000 and shall have a UL approved vent cap. The secondary containment chamber shall be vented and monitored. The tank and steel frame shall be grounded.
- D. The fuel tank shall be supplied with a fuel level transducer capable of providing a 4-20mA output for monitoring by a SCADA system as directed by MAWSS.

25.2.09 FIRE EXTINGUISHER

- A. A fire extinguisher shall be provided and shall be portable, multi-purpose dry chemical, 10-pound charge, complete with wall mounting weatherproof cabinet manufactured for the purpose, and shall be permanently mounted near but not on the generator in a conspicuous and readily accessible location. Fire extinguisher shall be U. S. Coast Guard rated for 2A20BC duty.

25.2.10 FUELING

- A. The Contractor shall provide a full tank of treated fuel after all testing is completed and the unit is accepted as final by the Owner.
- B. Fuel shall be Number 2 Diesel.
- C. Fuel stabilization additive equal to Gold Eagle “Sta-Bil” shall be mixed into the stored fuel for fuel degradation prevention at a dosage rate in accordance with the additive manufacturer’s recommendations. Fuel additive shall be added to the fuel on-site and witnessed by the Owner’s Representative.

25.2.11 AUTOMATIC TRANSFER SWITCH

- A. General
 - 1. The transfer switch unit shall be an integral design to include:
 - a. transfer switch mechanism,
 - b. sensor networks,
 - c. stand-by generator “run” command,
 - d. automatic return with fail safe override,

- e. indications and switches for voltage and current, and
 - f. NEMA 4X enclosure for mounting as indicated on the plans.
2. All busses, contacts, and wiring shall be copper.
 3. The ATS assembly shall be approved by the Underwriters Laboratories, Inc., in accordance with UL-1008. Switching assembly shall be rated in accordance with UL-1008, paragraph 25 for a minimum of 20 times the continuous rating for short circuit duty.
 4. The automatic transfer switch unit shall be fully compatible with the operation of the associated stand-by generator unit.
 5. The automatic transfer switch shall be provided with “dry” form C contacts to indicate both the normal (utility) and emergency (generator) positions of the switch as well as when the utility and emergency sources are available for monitoring by a SCADA system as directed by MAWSS.
- B. The automatic transfer switch shall be open before transition, break before make, and unless otherwise required by the power service characteristics shall be rated at ___ amps, ___/___volts, 3-pole, 4 wire with the following additional features included:
1. Microprocessor based sensor network for system electrical status monitoring and switching control.
 2. In-phase monitoring for source to load transfer connection within 15 percent of synchronism to avoid out-of-phase transfer.
 3. Field adjustable time delay settings for start-up and shut-down.
 4. Automatic restoration to normal utility source.
 5. Off-line engine exerciser set to suit the Owner’s operational schedule.
 6. Status reporting outputs for remote computer monitoring reports.
 7. Internal space heater with thermostat control.
 8. Voltmeter and ammeter indicators with associated switching, monitoring, fuses, etc.
 9. A “test” switch shall be provided for off-line simulation to start the unit without actual transfer.
 10. Internal manual operating handle.
- C. The Contractor shall submit the required sets of shop drawings in accordance with paragraph entitled “Shop Drawings and Submittals” to the Engineer complete and sufficient to show: (1) composite one-line diagram showing ratings, sizes and types of all major components; (2) point-to-point wiring diagram showing each piece of equipment installed; and (3) descriptive literature covering the operation and maintenance of the major components.

- A. All devices, equipment, and materials not definitely specified or noted, that are required for complete installations shall be furnished, shall be manufactured for the purpose intended, and shall be installed in conformance with good accepted practice for the conditions encountered. All hardware such as straps, supports, bolts and nuts, shall be 304 or 316 stainless steel unless otherwise noted.

25.2. 13 PAINTING AND TOUCH-UP

- A. All electrical equipment, cabinets, and items that require protective painting shall be painted in accordance with the item manufacturer's standards except that this shall not be less than a three-coat system suitable for the exposure intended in this project. After installation, items including welded seams shall be thoroughly cleaned of grease, dirt, rust, and foreign matter and repainted or touched-up as required with the same color paint applied at the factory.
- B. Unless otherwise approved by the Engineer, and in addition to the normal approval action, all items with carbon steel enclosures installed out-of-doors, in corrosive areas, or in wet or damp areas shall be thoroughly cleaned of surface films after installation and given one coat of rapid dry epoxy primer and two final coats of 2-part epoxy paint in the color Traffic Blue unless otherwise directed by the Owner.

25.2. 14 WARRANTY

- A. Warranty of the composite unit shall be made by the single manufacturing concern performing assembly of components and not by the component part manufacturer. The warranty shall be unrestrictive as to quality and performance and shall be as approved by the Engineer. Warranty shall be made for the installed in-place unit as shown on the Contract Plans. Warranty claim inspections required by the manufacturer shall be made on site at the unit in questions. Repair and/or replacement costs of warranty work shall be totally borne by the Contractor for a period of no less than two years from completion of the project; including, but not limited to: parts; labor; and shipping costs.

PART 3 EXECUTION

25.3.01 INSTALLATION

- A. Installation of the generator will be performed by the electrical contractor under the supervision of the general contractor.

25.3.02 TESTING

- A. Testing will be performed by a manufacturer's representative. All fuel for the testing procedures shall be supplied by the contractor. After all testing has been completed the contractor shall provide the first full tank of fuel for the generator.
- B. Provide full load test utilizing portable test bank, for four (4) hours minimum.
- C. During test, record the following at 30-minute intervals:
 - 1. Kilowatts
 - 2. Amperes

- 3. Voltage
- 4. Coolant temperature
- 5. Ambient temperature
- 6. Frequency
- 7. Oil pressure

- D. Test **alarm and shutdown circuits by simulating conditions.**
- E. Manufacturer’s representative should be present to prepare, start, test, and adjust systems. Adjust generator output voltage and engine speed.
- F. Equipment manufacturers, or their representative, shall complete the Equipment Certification statement below for those items of equipment noted in paragraphs E above.

“This is to certify that we have examined the installed Equipment for this Project and have ascertained that this equipment is installed correctly and is suitable for the purpose and use intended.

Authorized Signature

Printed Name

Company and Job Title”

- G. Final Inspection: Before acceptance of the generator installation and prior to final payment to the Contractor by MAWSS, a complete inspection of the Work of the Project will be undertaken. Members in attendance of the Final Inspection shall include the Contractor’s Project Supervisor, representatives of the Design Engineer, and representatives of MAWSS. The inspection shall include investigation of all Work for conformance with MAWSS Standards and Practices and those of the Project Contract.
 - 1. All equipment, machinery, valves, electrical, instrumentation, etc. will be operated and checked for proper installation and operation both manually and in automatic modes as applicable.
 - 2. All site work shall be inspected for conformance to the Contract Documents and best construction practices.
- H. The Design Engineer shall complete a Final Inspection Punch List describing all items of defect or omissions detected during final inspection and submit it to MAWSS and the Contractor. The Contractor shall make all corrections within 30 days of receipt of the form and shall mark those items on the form indicating the date completed. The Contractor shall submit a copy of the completed form to MAWSS and the Design Engineer for field review of the work performed before final payment to the Contractor will be authorized by MAWSS.

END SECTION