TEST METHOD 91

MAXIMUM POWER TEST
(DETERMINATION OF REQUIREMENTS FOR PRODUCTION SETS)

91.1 General. The maximum power of a generator set is a function of the ambient conditions (temperature and altitude) and the mechanical condition of the engine at any particular time.

91.2 Apparatus. None is required.

91.3 Procedure. Unless otherwise specified in the contract, the minimum acceptable corrected maximum power limit shall not be less than 95 percent of the average of the maximum power values of the initial production generator sets (taken prior to endurance test), corrected to standard conditions using the procedure in EGSA 107T , method 220.2, paragraph 220.2.3.

Min Acceptable Max. Power Limit =

Avg. Initial Production Set Max. Power (corrected) X 0.95

91.4 Results. Use the value obtained above as the minimum maximum power requirement in Test Method 92.

91.5 Contract requirements. The following items must be specified in the individual contract:

Minimum acceptable value of maximum power, if other than specified herein.

TEST METHOD 92

MAXIMUM POWER TEST
(PRODUCTION SETS)

92.1 General. The maximum power of a generator set is a function of the ambient conditions (temperature and altitude) and the mechanical condition of the engine at any particular time.

92.2 Apparatus. Instrumentation of measuring load conditions and temperatures shall be as described in EGSA 107T .

92.3 Procedure.

CAUTION: This procedure subjects the generator set to a severe overload which may be damaging if maintained for too long a period of time.

92.3.1 Preparation for test.

a. Connect the load and instrumentation for the voltage and frequency condition specified in the contract.

b. Install appropriate thermocouples to measure the following temperatures.

   1. Lubricating oil sump.
   2. Engine combustion air in (located at the inlet of the intake manifold).

c. Obtain and record the barometric and water vapor pressures.

d. On generator sets having more than one power output system; e.g. high voltage ac and low voltage dc (disregard the battery charging system) or two ac systems of different frequencies, maintain the system with the lowest power rating at rated load for all parts of this test. The load in the system with the highest power rating is then varied as indicated below to determine the maximum power of the set.

e. Bypass the set circuit interrupter if required.

f. Connect the set to a source of fuel containing a specified fuel required by the contract.

92.3.2 Test. Start and operate the generator set and allow the set to stabilize at rated load, rated voltage and rated frequency (speed). During this period, readings of all instruments including thermal instrumentation shall be recorded at minimum intervals of 10 minutes. If necessary, adjustments to the load, voltage and frequency may be made to maintain rated load at rated voltage and frequency. However, adjustments to the voltage and frequency shall be limited to those adjustments available to the operator, specifically adjustments to the voltage or frequency

adjust devices. On generator sets utilizing a droop-type speed control system as the prime speed control, the speed and droop portions of the control may be adjusted. No other adjustments to the voltage and frequency control systems shall be made unless permitted by the contract. Adjustments to load, voltage or frequency controls shall be recorded on both the data sheet and the recording equipment at the time of adjustment. Unless otherwise specified in the contract, stabilization shall be considered to have occurred when four consecutive voltage and frequency recorded readings of the generator line output either remain unchanged or have only minor variations within plus or minus one-half the long-term stability bandwidth with no evident continued increase or decrease in value after the last adjustment to the load, voltage or frequency has been made. Refer to figure 92-I. If this test is performed immediately following another test which has established stabilization values, stabilization will be considered valid once all the previously established values and operating parameters are obtained (initial stabilization readings therefore must include all values needed for subsequent testing).

NOTE: Operation of the set must not be interrupted between this test and the test that established stabilization values.

b. Performed this test using resistive load only (on ac sets remove reactive load after stabilization).

c. For sets with droop-type governors (except turbocharged engine-driven generator sets):

1. Alternately increase the load, voltage and frequency in small increments until the fuel system controls are in the maximum fuel position as permitted by the governor control linkage and the voltage and frequency are within 1 percent of their rated values. The maximum load should not exceed more than 2 percent above the specified maximum power requirement. (**NOTE**: Small increments should be taken to avoid passing the maximum power at the rated voltage and frequency point and to avoid racing or bogging the engine).

2. Hold the conditions in step 1 above for two minutes. However, if the voltage and frequency cannot be maintained within 1 percent of their rated values, the load must be adjusted to the point at which the voltage and frequency can be maintained within 1 percent of their rated values for two minutes.

CAUTION: It may be necessary to reduce the load to a value below the rated kilowatt load for a short period of time to prevent serious overheating or damage to the generator set if the above conditions cannot be readily attained. (Monitor instrumentation).

3. During the two minute period record all instrument readings including thermal instrumentation. (On 3-phase sets it is not necessary to record line-to-line voltages).

4. Reduce the load to rated kilowatt load at unity power factor and allow the generator set to cool for 10 minutes.

5. Repeat steps 1 thru 4 above until three valid sets of maximum power data are obtained.

d. For set with isochronous-type governors (except for turbocharged engine-driven generator sets), perform step c above but do not adjust the frequency.

e. For turbocharged engine-driven generator sets with droop-type governors:

1. Load the set to 125 percent of rated load unless otherwise specified in the contract. Adjust the frequency to the rated value and maintain the load for 5 minutes unless otherwise specified in the contract. (NOTE: Most contracts call for standby ratings where operation in excess of 100% of the rating is not allowed).

2. Record all instrument readings including thermal instrumentation.

f. For turbocharged engine-driven generator sets with isochronous-type governors, perform step e above but do not adjust the frequency.

g. Repeat steps a thru f above as applicable in the contract.

92.3.4 Results.

a. Average the three valid maximum power readings. This average is the observed maximum power value.

b. If the contract specified a corrected value for maximum power then correct the observed maximum power value to standard conditions using the procedures in Test Method 20. This is the corrected maximum power value.
(**NOTE**: The observed maximum power value for supercharged engine-driven generator sets, including turbocharged engines, is not to be corrected to standard conditions).

c. Compare these results with the requirements of the contract.

92.5 Contract requirements. The following items must be specified in the individual contract:

a. Minimum value of maximum power required. (For turbocharged engine-driven generator sets: The value of load and length of time the set is to be operated at this load if other than specified herein). If no value is given, perform Test Method 90.

b. Voltage connection and frequency at which this method is to be performed.

c. Fuel to be used in performing this method, if applicable..

TEST METHOD 93

RIPPLE VOLTAGE TEST

93.1 General. The ripple voltage is the alternating component of the output voltage of a direct current generator. This alternating component is caused by the generator characteristics and may be large enough to cause the generator to be unsuitable for some application.

93.2 Apparatus. Instrumentation for measuring load conditions shall be as described in Test Methods 1- 14. In addition, a low range true rms sensing, ac voltmeter of suitable frequency rating and with an internal resistance of at least 1,000 ohms per volt and a blocking capacitor (non-electrolytic type) with a capacitance of 1 microfarad or greater shall be required.

93.3 Procedure.

93.3.1 Preparation for test.

a. Connect the load instrumentation in accordance for one voltage connection and frequency specified in the requirement document.

b. Connect the low range ac voltmeter in series with the blocking capacitor across the generator set load terminals.

93.3.2 Test.

a. Start and operate the set at rated speed, rated voltage and at no load. Record all instrument readings.

b. Apply 25 percent; 50 percent; 75 percent; and 100 percent of rated load and adjust the generator sets, voltage and speed to rated values at each step. Record all instrument readings at each load condition.

93.4 Results.

a. The ripple voltage is read directly on the low range ac voltmeter under all conditions of load. Convert the value of ripple voltage to percent of rated voltage using the following formula:

$$\frac{V_{rip}}{V_{rated}} \times 100 = \text{Percent of rated voltage}$$

Where: V_{rip} = Observed ripple voltage

V_{rated} = Rated voltage

b. Compare these readings with the maximum allowable ripple voltage specified in the requirement document.

650.1.5 Requirement document requirements. The following item must be specified in the individual requirement document:

Maximum allowable value of ripple voltage in percent of rated voltage.

TEST METHOD 94

JUDGING OF COMMUTATION TEST (AC SETS)

94.1 General. Excessive sparking at the exciter commutator or generator slip rings will shorten the life of the brushes and will damage the commutator or slip rings.

94.2 Apparatus. Instrumentation for measuring the load conditions shall be as described in EGSA 107T .

94.3 Procedure.

94 3.1 Preparation for test.

a. Examine the brushes for wear, pitting or other signs of unsatisfactory service. Record these conditions on the data sheet.

b. Connect the load instrumentation for one voltage connection and frequency specified in the contract.

94.3.2 Test.

a. Start and operate the generator set at rated voltage, rated frequency and rated load for at least one hour.

b. Compare the observed sparking of each brush with the chart shown in figure 94-I using at least two observers.

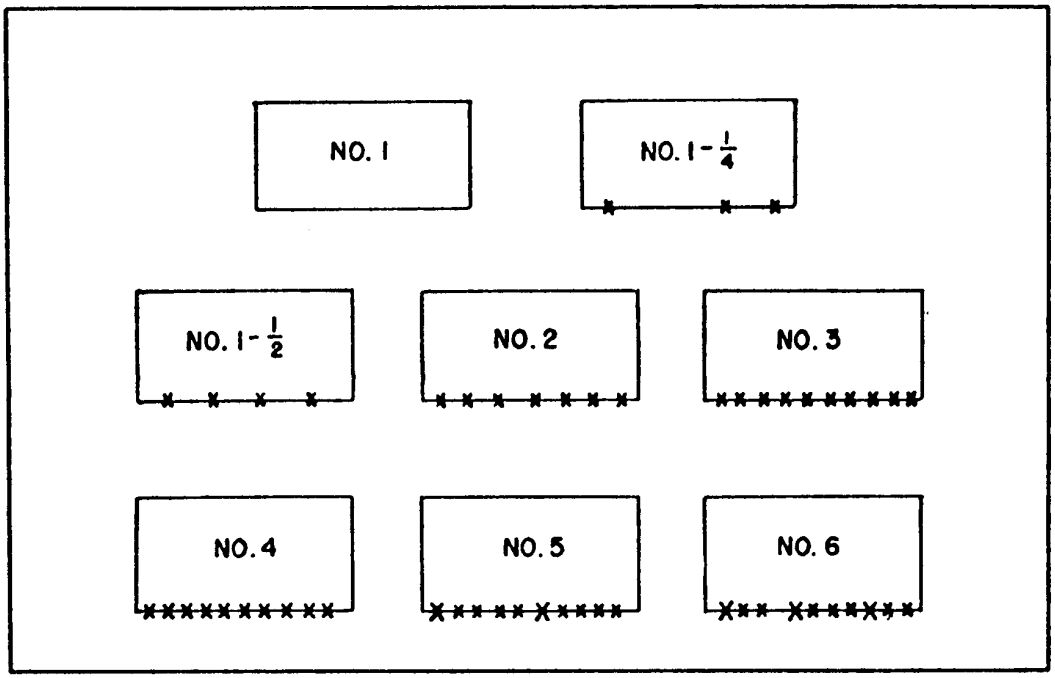
c. Record the chart pattern number which most closely corresponds to the sparking observed at each brush.

d. Repeat steps b and c above at each load voltage connection and frequency condition specified in the contract.

e. After shutdown the commutator, slip rings, and brushes shall be examined for wear, pitting, or other signs of unsatisfactory service.
Record these conditions on the data sheet.

651.1.4 Results. Compare the results with the requirements of the contract.

a. The voltage connection(s) and frequency(ies) at which this method is to be performed.
b. Load conditions at which this method is to be performed.
c. Acceptable values of sparking pattern (see figure 94-I).



1. -BLACK WITH NO SPARK SHOWING

1 1/4 -SLIGHT INTERMITTENT SPARKING

1 1/2 -SLIGHT CONTINUOUS SPARKING

2 -CONTINUOUS SPARKING HEAVIER THAN 1 1/2 STREAMERS JUST BEGIN TO EXTEND FROM THE EDGE OF THE BRUSH

3 -SPARKS HEAVIER THAN 2

4 -SPARKS HEAVIER THAN 3

5 -SPARKS HEAVIER THAN 4

6 -SPARKS- ENTIRE BRUSH COVERED WITH CONTINUOUS HEAVY SPARKS

FIGURE NO. 651.1-I SPARKING CHART FOR USE IN JUDGING OF COMMUTATION

Fig. 94-I SPARKING CHART FOR USE IN JUDGING OF COMMUTATION

TEST METHOD 95

JUDGING OF COMMUTATION TEST (DC SETS)

95.1 General. Excessive sparking at the commutator will shorten the life of the brushes and will damage the commutator.

95.2 Apparatus. Instrumentation for measuring load conditions shall be as described and illustrated in EGSA 107T .

95.3 Procedure.

95.3.1 Preparation for test.

a. Examine the brushes for wear, pitting, or other signs of unsatisfactory service. Record these conditions on the data sheet (see figure 95-II).

b. Connect the load instrumentation for one voltage connection and frequency specified in the contract.

95.3.2 Test.

a. Start and operate the generator set at rated voltage, rated speed and at rated load for at least 30 minutes.

b. Compare the observed sparking of each brush with the chart shown in figure 95-I using at least two observers.

c. Record the chart pattern number which most closely corresponds to the sparking observed at each brush.

d. Repeat steps b and c above at each load voltage connection and frequency condition specified in the contract.

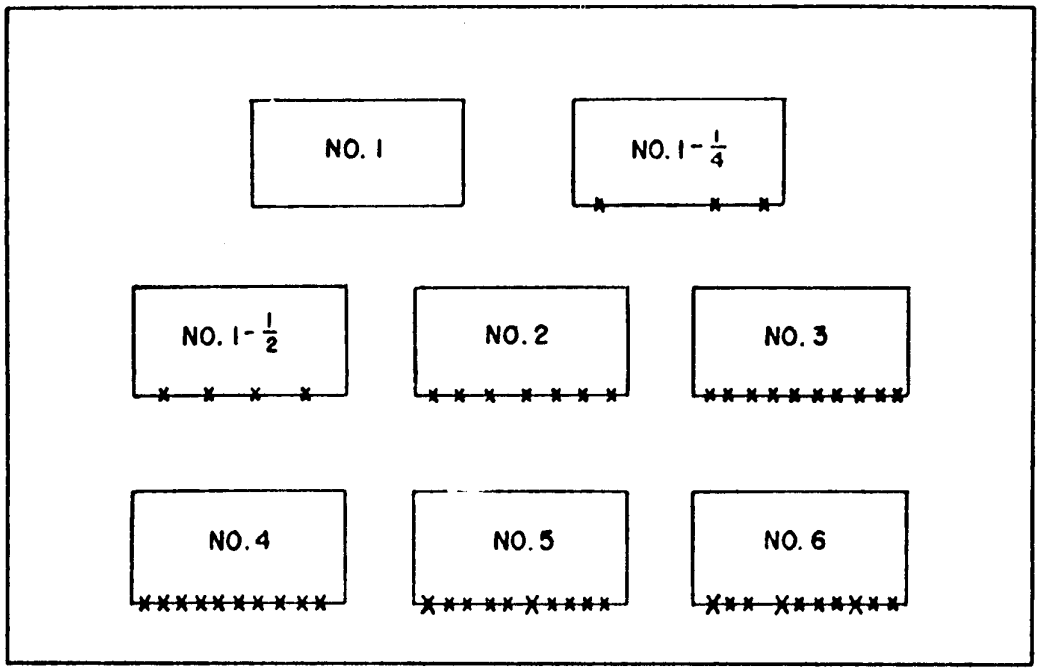
e. After shutdown, the commutator and brushes shall be examined for wear, pitting, or other signs of unsatisfactory service. Record these conditions on the data sheet.

95.4 Results. Compare the results with the contract requirements.

95.5 Contract requirements. The following items must be specified in the individual contract.

a. Load conditions at which this method is to be performed.

b. Acceptable values of sparking pattern (see figure 95-I).



1 - BLACK WITH NO SPARK SHOWING

1 1/4 - SLIGHT INTERMITTENT SPARKING

1 1/2 - SLIGHT CONTINUOUS SPARKING

2 - CONTINUOUS SPARKING HEAVIER THAN 1 1/2 STREAMERS JUST BEGIN TO EXTEND FROM THE EDGE OF THE BRUSH

3 - SPARKS HEAVIER THAN 2

4 - SPARKS HEAVIER THAN 3

5 - SPARKS HEAVIER THAN 4

6 - SPARKS- ENTIRE BRUSH COVERED WITH CONTINUOUS HEAVY SPARKS

FIGURE 95-I. SPARKING CHART FOR USE IN JUDGING OF COMMUTATION

TEST METHOD 96

SHAFT CURRENT TEST

96.1 General. Presence of shaft current will damage the bearings of the generator.

96.2 Apparatus. Instrumentation for measuring load conditions shall be as described in EGSA 107T. In addition, a low resistance ac ammeter or dc millivoltmeter and low resistance loads (one with a probe for contacting the generator shaft, the other with a means of making a low resistance contact with the frame of bearing support) shall be required.

96.3 Procedure.

96.3.1 Preparation for test. Connect the load instrumentation for one voltage connection and frequency specified in the requirement document.

96.3.2 Test.

a. Start and operate the generator set at rated voltage, rated frequency (speed) and at a load condition specified in the requirement document.

b. With the low resistance ac ammeter, or dc millivoltmeter, connected between the shaft and the frame or bearing support, record all instrument readings (see figure 96-I).

c. Repeat steps a and b above for each specified load condition.

96.4 Results. Compare the results with the requirements of the requirement document.

96.5 Requirement document requirements. The following items must be specified in the individual requirement document:

a. Voltage connection(s) and frequency(ies) at which this method is to be performed.

b. Allowable shaft current for each specified load current.

TEST METHOD 97

DC CONTROL TEST

97.1 General. In certain instances, it may be necessary to operate a generator set with a value of dc control voltage other than the nominal rated value.

97.2 Apparatus. Instrumentation for measuring load conditions shall be a described in EGSA 107T. In addition, the test recording as described in EGSA 107T, Test Methods 1 and Test Methods 4 (unless otherwise specified in the contract) for recording voltage and frequency, an digital oscilloscope as described in EGSA 107T, Test Method 6, paragraph 6.2 and a dc voltmeter and ammeter as described in EGSA 107T, methods 1 and 2 will be required.

97.3 Procedure.

97.3.1 Preparation for test.

a. Connect the load and instrumentation for one voltage connection and frequency specified in the contract. Unless otherwise specified, connect the signal input terminals of the test recording equipment to the convenience receptacle of the set or to the generator coil which is used as the voltage sensing input to the voltage regulator.

b. Locate a point in the dc bus which supplies the dc control power for the generator set. Connect a dc ammeter at this point to indicate the total current drawn by the dc control circuitry and place a dc voltmeter to indicate the bus voltage with respect to ground.

   CAUTION: Make sure that the ammeter does not read the starting motor solenoid current or the battery charging current.

c. Disconnect the set batteries.

97.3.2 Test.

a. Using fully charged slave batteries and cable, start the set. Record on the data sheet whether or not the set started (see figure 97-I).

b. If the set is required to have reverse polarity protection, shut the set down, disconnect any belt driven battery charging alternator, and remove the slave cable. Reverse the battery polarity and attempt to restart the set. Record if the set started and whether any damage occurred. If the set is equipped with fuse protection, check the fuse before proceeding with step c below and record if fuse replacement was necessary. Reconnect the belt-driven alternator, if applicable.

c. Reconnect the slave batteries (with correct polarity), then start and operate the generator set at rated voltage, rated frequency and rated load.

d. Operate the test recording equipment (if using recording meter(s) at a minimum chart speed of 6 inches per hour). Use the digital oscilloscope to observe record waveforms on all line-to-neutral voltage waveforms and note whether or not any spikes or notches occur. Read the instrumentation and record the readings along with any observation of spikes or notches in the waveform.

e. With the set operating at rated load, remove the slave cable. Record whether or not the set continues to operate without batteries.

f. With the set operating without the slave batteries or internal batteries and the test recording equipment operating (if using recording meter(s), the chart speed(s) at 12 inches per minute, reduce the load to zero in one step. Record the dc control voltage and current.

g. Apply rated load in one step using the set circuit interrupter. Record the dc control voltage and current.

h. Repeat f and g two additional times and after the third time and with the set operating at rated load, read the instrumentation and record the readings. Using the digital oscilloscope, record waveforms to compare to that observed in d above. Mark the test recording equipment or recording charts corresponding to operation with and without batteries and examine for erratic governor or voltage regulator operation.

i. With the set operating at rated load, adjust the battery charging system voltage to the maximum operating value specified in the contract. On sets with no alternator adjustment, disconnect the batteries and resistively load the battery charging system to achieve the desired voltage.

j. Repeat f thru h above. After repeating f thru h above, return battery charging system voltage to nominal value.

k. With the set operating at rated load, adjust the battery charging system voltage to the minimum operating value specified in the contract.

l. Repeat f thru h above. After repeating f thru h above, return the battery charging system voltage to nominal value.

97.4 Results. The recorded data shall indicate, as a minimum, the following results:

a. Operation of the set using the slave receptacle.

b. Operation of reverse polarity protection device as applicable.

c. Operation at the nominal maximum and minimum dc control voltage as specified in the contract, and its effect on the operation of the set.

d. Maximum dc control current at each of the conditions specified 97.3.2 above.

e. Observed spikes or notches in the generator voltage waveform.

f. Voltage and frequency steady state bandwidth. See method 78 for method of calculation.

g. Compare these results with the requirements of the contract.

97.5 Contract requirements. The following items must be specified in the individual contract:

a. Maximum dc control current.

b. Nominal maximum and minimum voltage limits for the dc control circuitry.

c. Reverse polarity device requirements, as applicable.

d. Allowable discontinuities (spikes or notches) in the generator voltage waveform, if any are allowable.

e. Maximum steady state voltage and frequency bandwidth.

TEST METHOD 98

INCLINED OPERATION TEST

98.1 General. A generator set must be capable of normal operation including filling and draining liquids from the set when it is placed in various inclined positions.

98.2 Apparatus. Instrumentation for measuring load conditions shall be as described in EGSA 107T. In addition, the test recording equipment as described in EGSA 107T, methods 101.1 and 104.1 (unless otherwise specified in the contract) for recording voltage and frequency will be required. Also a means of measuring fuel capacity and a means of positioning the generator set in various inclined positions will be required.

98.3 Procedure.

98.3.1 Preparation for test. Connect the load and instrumentation for the required voltage and frequency condition. Unless otherwise specified, connect the signal input terminals of the recording meter(s) to the convenience receptacle of the set or to the generator coil which is used as the voltage sensing input to the voltage regulator.

98.3.2 Test.

NOTE: For generator sets not equipped with an internal fuel tank(s), it will not be necessary to perform steps a, b, and e below.

a. With the generator set on a level surface and the fuel tank empty, determine the capacity of the fuel tank in gallons. This shall be accomplished by measuring, either by volume or weight, the amount of fuel required to fill the tank. Record on the data sheet the amount of fuel required to fill the tank (see figure 98-I).

b. Drain the fuel tank.

c. With the set on a level surface check the level(s) of the lubricating oil and hydraulic oil (if used) and add or drain sufficient oil to bring the level(s) to the full mark as indicated by the dipstick(s).

d. Using blocks or ramps, raise the front end of the generator set so that the angle between the horizontal and the generator set base is at the maximum angle specified in the contract.

e. Determine and record the quantity of fuel required to fill the fuel tank with the generator set in the inclined position.

f. Read and record the lubricating and hydraulic (if used) oil level(s). Record distance above or below the normal full mark within 1/16 inch.

g. Inspect the set for excess oil around all fittings, tanks and seals. Wipe off any fuel and oil deposits found and note on the data sheet results of inspection.

h. Operate the test recording equipment (if using recording meter(s) at a chart speed of 12 inches per hour).

i. Using the set fuel tank, start the engine and note and record whether or not the engine starts normally. On sets without a set fuel tank use an external fuel source.

j. Unless otherwise specified in the contract, operate the set at rated voltage, rated frequency and rated load for one hour. During this time periodically inspect the set to see if engine lubrication is satisfactory (excessive noises in engine, etc.), that there is no leakage oflubricant and hydraulic oil (if used) from seals and that the fuel system functions satisfactorily and does not leak or spill over. Read and record the load instrumentation at the beginning and the end of the specified period of operation at the inclined position. Also mark the test recording equipment or recording chart to relate to the data sheet. Note and record any unusual modes of vibration.

k. Shut down the set and inspect the set for leaks as in step g above.

1. Allow the set to remain shut down for a minimum of five minutes.

m. Restart the set and note specifically if the set starts normally. Note on the data sheet any difficulty in starting the engine.

n. Shut the set down.

o. Repeat steps b thru n above except that the rear end of the generator set is raised above the horizontal.

p. Repeat steps b thru n above except that the left side of the generator set is raised above the horizontal.

q. Repeat steps b thru n above except that the right side of the generator set is raised above the horizontal.

98.4 Results. The data sheet shall tabulate the following items for each set position:

a. Location of leaks.

b. Location of abnormal vibrations.

c. Excessive noises.

d. Abnormal starting.

e. Amount of fuel required to fill the set fuel tank in each position.

f. Lubricating and hydraulic oil dipstick readings in each position.

g. Load instrumentation readings.

h. Maximum observed steady-state voltage and frequency bandwidth as recorded on the recording meter(s). See Test Method 78 for method of calculation.

i. Compare these results with the requirements of the contract.

98.5 Contract requirements. The following items must be specified in the individual contract:

a. Angle(s) of inclination from the horizontal at which this method is to be performed.

b. Length of time for operation at each inclined position if other than one hour.

c. Voltage connection and frequency at which this method is to be performed.

d. Maximum allowable long-term steady voltage and frequency bandwidth, if applicable.

TEST METHOD 99

AUDIO NOISE TEST

99.1 General. The generator set must satisfy audio noise requirements.

99.2 Apparatus. Instrumentation for measuring load conditions and noise shall be as described in Test Method 99.

99.3 Procedure.

99.3.1 Preparation for test. The test site shall be a uniform flat grass surface, free of ice, snow, or vegetation over 0.15 meter (5.9 inches) tall; it shall be free of reflecting surfaces such as buildings, trees, hillsides, or load bank(s) within a 30 meter (100 ft) radius. Measurements shall not be made at velocities of 20 km/h or more. The generator set or power unit/plant shall be positioned in the center of the test site. An anechoic or semi-anechoic chamber may be substituted for outdoor measurements. Audio Noise Sound Pressure Level (SPL) readings shall be taken with the set(s) not operating (ambient), at no-load and rated-load. The ambient noise level must be at least 10 dB below the sets for a valid test

99.3.2 Steady-State noise. Start and operate the set and allow it to stabilize at rated-load, rated voltage and rated frequency. Stabilization shall be considered to have occurred after the set is operated at rated-load, rated voltage and rated frequency for 10 minutes. The generator set shall be operated at rated-load, 75 percent, 50 percent, 25 percent and no-load (unless specified in the contract). Measurements shall be taken at each load condition. The dB(A) SPL shall be determined by positioning microphones at an elevation above the ground and distance away from the perimeter of the generator set or power unit/plant as specified in herein. The sensing element of the microphones shall be positioned parallel to the ground. The microphone(s) shall be placed or moved in 30-degree increments around the item with the 0-degree location being the center of the operator's control panel.

99.3.3 Hearing protection assessment. The control panel door (if applicable) shall be opened and secured. Position the microphone at the distance from the operator's panel specified herein. The height of the microphone will be equal to the vertical center of the control panel. The generator set shall be operated at rated-load, 75 percent, 50 percent, 25 percent and no-load (unless specified in the contract). Noise level measurements shall be taken at each load condition.

99.3.4 Data required. The following data will be included on the test data sheets for each test condition:

a. Ambient temperature, °C (°F).

b. Wind speed, km/hr (mph).

c. Barometric pressure, millimeters mercury (mmHg).

d. Relative humidity, %.

e. Ambient noise levels versus octave band center frequency (dB and dB(A))

f. A tabulation of the audio noise SPL versus octave band center frequency for rated-load and no-load operation for each measurement (dB).

g. A tabulation of the SPL at each measurement (dB(A)).

h. A measurement of the SPL at the operator's station (dB(A)).

99.3.5 Results. Compare the operator's control panel noise level with the 85 dB(A) criteria for personnel hearing protection.

TEST METHOD 100

FUEL CONSUMPTION TEST

100.1 General. The length of time the generator set will operate at rated load on a specific amount of fuel is vital logistic information. It is also used to provide an indication of engine deterioration during an endurance run.

100.2 Apparatus. Instrumentation for measuring load conditions, field voltage and current and ambient and fuel temperatures shall be as described in EGSA 107T Test Methods 1,2, and 10. In addition, the following apparatus shall be provided.

Balance scale, platform scale or fuel flowmeter
Auxiliary fuel container
Auxiliary fuel lines
Stopwatch (or similar timing device)
Means of accurately measuring the fuel tank capacity
Means of measuring the specific gravity of the fuel

100.3 Procedure.

100.3.1 Preparation for test.

a. Connect the load and field instrumentation in for one voltage connection and frequency specified in the contract.

b. Depending upon which procedure (balance scale, platform scale or flowmeter) is to be used, provide the auxiliary fuel supply as directed in that procedure.

c. Shut off or disconnect the regular set fuel supply and install the auxiliary fuel lines from the fuel container.

d. Connect the temperature measuring devices in accordance with EGSA 107T to measure the ambient temperature and the fuel temperature.

e. If the flowmeter procedure is used, connect the flowmeter in the fuel supply line prior to starting the set.

100.3.2 Test.

a.Start and operate the generator set and allow it to stabilize at rated load, rated voltage and rated frequency. During this period, readings of all instruments including thermal instrumentation shall be recorded at minimum intervals of 10 minutes. If necessary, adjustments to the load, voltage and frequency may be made to maintain rated load at

ratedvoltage and rated frequency. However, adjustments to the voltage and frequency shall be limited to those adjustments available to the operator, specifically adjustments to the voltage or frequency adjust devices.

On generator sets utilizing a droop-type speed control system as the prime speed control, the speed and droop portions of the control may be adjusted. No other adjustments to the voltage and frequency control systems shall be made unless permitted by the contract. Adjustments to the load, voltage or frequency controls shall be recorded on the data sheet. Unless otherwise specified in the contract, stabilization shall be considered to have occurred when four consecutive voltage and frequency recorded readings of the generator line output either remain unchanged or have only minor variations within plus or minus one-half the long-term stability bandwidth with no evident continued increase or decrease in value after the last adjustment to the load, voltage or frequency has been made

b. Perform one of the following procedures.

100.3.2.1 Balance scale procedure.

a. Supply fuel from auxiliary container mounted on a platform balance or other scale.

b. After stabilization has occurred, set the balance weights at any convenient value slightly less than the total weight of the fuel and container.

c. Start the stopwatch when the balance weights fall and record the total weight.

d. Reduce the balance weight a convenient amount and record the amount of the weights removed.

e. Stop the stopwatch when the balance weights fall and record the total weight and the elapsed time.

f. Repeat steps a thru d above until the timed portion of the test exceeds the test duration in table I.

g. From the total elapsed time and total of the weights removed determine the fuel consumption in Fuel Consumption $= \frac{\text{Pounds}}{\text{Hours}}$

h. Using the value obtained in step f above, compute the rate of fuel consumption per kilowatt hour, as follows:

$$\text{Pounds per kWH} = \frac{\text{Fuel Consumption in Pounds per Hour}}{\text{kW Load}}$$

i. Repeat 100.3.2 for each load condition specified in the contract.

j. Determine the capacity of the generator set fuel tank in pounds of fuel.

k. For each specified load, compute the number of continuous hours the generator set will operate on a full tank of fuel. The following formula shall be used.

$$\text{Operating Hours} = \frac{\text{Fuel Tank Capacity (Pounds)}}{\text{Fuel Consumption (Pounds per Hour)}}$$

100.3.2.2 Alternate procedure for weighing fuel.

a. Supply fuel from the auxiliary fuel container, mounted on a platform balance, or other weighing device.

b. After stabilization has occurred, record weight readings every one-half hour for the duration of the test as called for in table I.

c. Determine the average hourly fuel consumption rate in pounds per hour, as follows:

$$\text{Fuel Consumption} = \frac{\text{Pounds}}{\text{Hours}}$$

d. Using the average value obtained in step c above, compute the rate of fuel consumption per kilowatt hour, as follows:

$$\text{Pounds per kWH} = \frac{\text{Fuel Consumption (Pounds Per Hour)}}{\text{kW Load}}$$

e. Repeat 100.3.2 for each load condition specified in the contract.

f. Determine the capacity of the generator set fuel tank in pounds of fuel.

g. For each specified load test, compute the number of continuous hours the generator set will operate on a full tank of fuel. The following formula shall be used:

$$\text{Operating Hours} = \frac{\text{Fuel Tank Capacity (Pounds)}}{\text{Fuel Consumption (Pounds per Hour)}}$$

100.3.2.3 Alternate procedure using flowmeter.

NOTE: Flowmeters may be used to determine the fuel rate. They usually are calibrated in either gallons per hour, or pounds per hour, for a fuel of a definite specific gravity and temperature.

a. After stabilization has occurred record the fuel consumption rate, and continue to record the fuel consumption rate at half-hour intervals for the duration of the test as called for in table I.

b. Determine the average of the readings (correct for fuel specific gravity and temperature). This is the fuel consumption rate and should be converted, if necessary, to pounds per hour.

c. Using the average value obtained in step b above, compute the rate of fuel consumption per kilowatt hour, as follows:

$$\text{Pounds per kWH} = \frac{\text{Fuel Consumption (Pounds per Hour)}}{\text{kW Load}}$$

d. Repeat 100.3.2 for each load condition specified in the contract.

e. Determine the capacity of the generator set fuel tank in pounds of fuel.

f. For each specified load test, compute the number of continuous hours the generator set will operate on a full tank of fuel. The following formula shall be used:

$$\text{Operating Hours} = \frac{\text{Fuel Tank Capacity (Pounds)}}{\text{Fuel Consumption (Pounds per Hour)}}$$

100.4 Results. Compare the operating hours or the fuel consumption rate per kWH with the limits specified in the contract.

100.5 Contract requirements. The following items must be specified in the individual contract.

a. Load condition(s) at which this method is to be performed, if other than as specified herein.

b. Number of hours set must operate at specified load conditions when using set fuel tank.

c. Voltage connection(s) and frequency(ies) at which this method is to be performed.

d. Types of fuel(s) to be used, if other than as specified herein.

e. Duration of test if other than as specified in table I.

TABLE I. DURATION OF FUEL CONSUMPTION TEST

Generator Rated Load	Duration of Test
0 - 3.0 kW	2 hours
3.1 - 15.0 kW	4 hours
Greater than 15 kW	6 hours