CA-22 (a)
Attachment B

Maintenance Standard MST001 Test Procedure for the Battery Capacity Test

NEWFOUNDLAND POWER
A FORTIS COMPANY

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TEST PROCEDURE
BATTERY CAPACITY TEST

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Battery capacity is usually given in ampere-hours for an eight hour discharge. This will be the maximum amps it can discharge for eight hours at a temperature of 77°F, to a minimum voltage of 1.75 volts per cell. See MSR001-3 for the affects of battery temperature on battery capacity.

Materials Required for a Capacity Test

a) Portable load box;
b) Spare battery bank;
c) Jumper cables to remove batteries from service;
d) A digital voltmeter;
e) An electrolyte thermometer;
f) An hydrometer;
g) Battery Discharge Test forms;
h) An instruction manual for the charger.

Procedure for a Battery Capacity Test

1. An equalizing charge must be given at least 3 days and not more than 7 days before a test.[1] Ensure that the charger is set at the correct float and equalize voltage at this time.

2. Make sure all battery connections are clean, tight and free of corrosion.

3. While the battery is on float, read and record the specific gravity, the voltage of each cell, the temperature of the pilot cell and the battery terminal float voltage. Voltage readings should be taken with a digital voltmeter capable of reading accurately to two decimal places.

4. If it is necessary to maintain DC, substitute the spare battery bank for the unit to be tested. Isolate the unit to be tested.

5. The correct value of discharge current for a three-hour discharge test can usually be found in MP2; the manufacturer's specifications; or in case neither source lists the required information we can use a rule of thumb (i.e. 3-hour discharge rate = 2 x 8-hour discharge rate).

6. Set up the Broman Model 123 portable load box as per the manufacturer's instructions to apply a load equivalent to the temperature corrected 3-hour discharge rate.

   Temperature correction formula to obtain the correct discharge current:

   $I_t = I_d - I_d \times [(0.06 \times (T_s - T_e)) / 100]$

   Where: I_t = temperature corrected discharge current
   I_d = discharge current at rated temperature
   T_s = standard temperature, usually 77°F
   T_e = temperature of the electrolyte[2]

   Readings should be recorded as per the Battery Discharge Test Form (MSF017) at 15-minute intervals.

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7. Measure the voltage drop across the intercell connecters. This should be about 7mV.

8. When the voltage of any cell falls below 1.75 volts, the test must be interrupted while the cell is removed from the circuit. The time duration of this interruption must be subtracted from T_a when doing the capacity calculation.

9. The test shall be terminated when the average voltage of the remaining cells falls below 1.75 volts per cell or when the 3 hours are up.

10. Battery capacity is calculated as follows:

    % Capacity at 25°C (77°F) = (T_a x 100) / T_s

    Where: T_a = actual time duration of test (hours)
    T_s = rated time duration of test (hours)

    The available ampere-hours will vary with age and history (charging cycles) of the battery. In normal service the battery, when new, will have as little as 85% of its full rating. After one to two years of service, it will reach a maximum condition of 100% and thereafter will decline. Since the main purpose of a station battery is to provide a highly reliable power supply, the battery will be discarded when it declines to 80% capacity.

11. Set the current limit on the charger.

12. Recharge the battery using an equalizing charge.[1]

[1] - **Not applicable to Gelled Electrolyte Batteries.**
[2] - **The temperature inside a maintenance free battery can be found by putting a thermometer on the post.**