

ELECTRICAL POWER SYSTEMS

For Information

3/4.8.2 D.C. SOURCES

D.C. SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.1 As a minimum, the following D.C. electrical power sources shall be OPERABLE:

- a. Division 1, consisting of:
 - 1. 125 volt battery 1A3.
 - 2. 125 volt full capacity charger 1A4 or 1A5.
- b. Division 2, consisting of:
 - 1. 125 volt battery 1B3.
 - 2. 125 volt full capacity charger 1B4 or 1B5.
- c. Division 3, consisting of:
 - 1. 125 volt battery 1C3.
 - 2. 125 volt full capacity charger 1C4.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2 and 3.

ACTION:

- a. With either Division 1 battery or Division 2 battery of the above required D.C. electrical power sources inoperable, restore the inoperable division battery to OPERABLE status within 2 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
- b. With Division 3 battery of the above required D.C. electrical power sources inoperable, declare the HPCS system inoperable and take the ACTION required by Specification 3.5.1.
- c. With one of the above required full capacity chargers inoperable, demonstrate the OPERABILITY of its associated battery bank by performing Surveillance Requirement 4.8.2.1.a.1 within one hour and at least once per 8 hours thereafter. If any Category A limit in Table 4.8.2.1-1 is not met, declare the battery inoperable. OPERATIONAL CONDITION changes per Specification 3.0.4 are not permitted.

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SURVEILLANCE REQUIREMENTS

4.8.2.1 Each of the above required 125-volt batteries and chargers shall be demonstrated OPERABLE:

- a. At least once per 7 days by verifying that:
 1. The parameters in Table 4.8.2.1-1 meet the Category A limits, and
 2. Total battery terminal voltage is greater than or equal to 129-volts on float charge.
- b. At least once per 92 days and within 7 days after a battery discharge with battery terminal voltage below 110-volts, or battery overcharge with battery terminal voltage above 150-volts, by verifying that:
 1. The parameters in Table 4.8.2.1-1 meet the Category B limits,
 2. There is no visible corrosion at either terminals or connectors, or the connection resistance of these items is less than 150×10^{-6} ohms, and
 3. The average electrolyte temperature of every sixth connected cells is above 60°F.
- c. At least once per 18 months by verifying that:
 1. The cells, cell plates and battery racks show no visual indication of physical damage or abnormal deterioration,
 2. The cell-to-cell and terminal connections are clean, tight, free of corrosion and coated with anti-corrosion material,
 3. The resistance of each cell and terminal connection is less than or equal to 150×10^{-6} ohms, and
 4. The battery charger will supply:
 - a) For Divisions 1 and 2, at least 400 amperes at a minimum of 125 volts for at least 10 hours.
 - b) For Division 3, at least 50 amperes at a minimum of 125 volts for at least 4 hours.

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SURVEILLANCE REQUIREMENTS (Continued)

d. At least once per 18 months, during shutdown, by verifying that either:

1. The battery capacity is ^{or simulated} adequate to supply and maintain OPERABLE status all of the actual emergency loads for 4 hours for Divisions 1 and 2 and 2 hours for Division 3 when the battery is subjected to a battery service test.

2. The battery capacity is adequate to supply a dummy load of the following profile, which is verified to be greater than the actual emergency load, while maintaining the battery terminal voltage greater than or equal to 195 volts.

a) Division 1

- >950 amperes for the first 60 seconds
- >228 amperes for the next 119 minutes
- >399 amperes for the next 60 seconds
- >228 amperes for the next 118 minutes
- >416 amperes for the last 60 seconds

b) Division 2

- >452 amperes for the first 60 seconds
- >221 amperes for the next 119 minutes
- >392 amperes for the next 60 seconds
- >221 amperes for the next 118 minutes
- >278 amperes for the last 60 seconds

c) Division 3

- >76 amperes for the first 60 seconds
- >16 amperes for the next 59 minutes
- >18 amperes for the last 60 minutes

e. At least once per 60 months during shutdown by verifying that the battery capacity is at least 80% of the manufacturer's rating when subjected to a performance discharge test. Once per 60 month interval, this performance discharge test may be performed in lieu of the battery service test.

f. Annual performance discharge tests of battery capacity shall be given to any battery that shows signs of degradation or has reached 85% of the service life expected for the application. Degradation is indicated when the battery capacity drops more than 10% of rated capacity from its average on previous performance tests, or is below 90% of the manufacturer's rating.

For Information

TABLE 4.8.2.1-1

BATTERY SURVEILLANCE REQUIREMENTS

Parameter	CATEGORY A ⁽¹⁾		CATEGORY B ⁽²⁾
	Limits for each designated pilot cell	Limits for each connected cell	Allowable ⁽³⁾ value for each connected cell
Electrolyte Level	>Minimum level indication mark, and < 1/4" above maximum level indication mark	>Minimum level indication mark, and < 1/4" above maximum level indication mark	Above top of plates, and not overflowing
Float Voltage	≥ 2.13 volts	> 2.13 volts ^(b)	> 2.07 volts
Specific Gravity ^(a)	≥ 1.195 ^(c)	≥ 1.190 Average of all connected cells > 1.200	Not more than .020 below the average of all connected cells Average of all connected cells ≥ 1.190 ^(c)

- (a) Corrected for electrolyte temperature and level.
- (b) May be corrected for average electrolyte temperature.
- (c) Or battery charging current, following a battery service or performance discharge test, is less than 2 amps when on float charge.
- (1) For any Category A parameter(s) outside the limit(s) shown, the battery may be considered OPERABLE provided that within 24 hours all the Category B measurements are taken and found to be within their allowable values, and provided all Category A and B parameter(s) are restored to within limits within the next 6 days.
- (2) For any Category B parameter(s) outside the limit(s) shown, the battery may be considered OPERABLE provided that the Category B parameters are within their allowable values and provided the Category B parameter(s) are restored to within limits within 7 days.
- (3) Any Category B parameter not within its allowable value indicates an inoperable battery.

ELECTRICAL POWER SYSTEMSBASESA.C. SOURCES, D.C. SOURCES and ONSITE POWER DISTRIBUTION SYSTEMS (Continued)

The surveillance requirements for demonstrating the OPERABILITY of the unit batteries are in accordance with the recommendations of Regulatory Guide 1.129 "Maintenance Testing and Replacement of Large Lead Storage Batteries for Nuclear Power Plants," February 1978, and IEEE Std 450-1980, "IEEE Recommended Practice for Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Generating Stations and Substations."

Verifying average electrolyte temperature above the minimum for which the battery was sized, total battery terminal voltage on float charge, connection resistance values and the performance of battery service and discharge tests ensures the effectiveness of the charging system, the ability to handle high discharge rates and compares the battery capacity at that time with the rated capacity.

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Table 4.8.2.1-1 specifies the normal limits for each designated pilot cell and each connected cell for electrolyte level, float voltage and specific gravity. The limits for the designated pilot cells float voltage and specific gravity, greater than 2.13 volts and 0.015 below the manufacturer's full charge specific gravity or a battery charger current that had stabilized at a low value, is characteristic of a charged cell with adequate capacity. The normal limits for each connected cell for float voltage and specific gravity, greater than 2.13 volts and not more than 0.020 below the manufacturer's full charge specific gravity with an average specific gravity of all the connected cells not more than 0.010 below the manufacturer's full charge specific gravity, ensures the OPERABILITY and capability of the battery. Exceptions to the specific gravity requirements are taken to allow for the normal deviations experienced after a battery discharge and subsequent recharge associated with a service or performance discharge test. The specific gravity deviations are recognized by and discussed in IEEE 450-1980.

Operation with a battery cell's parameter outside the normal limit but within the allowable value specified in Table 4.8.2.1-1 is permitted for up to 7 days. During this 7 day period: (1) the allowable values for electrolyte level ensures no physical damage to the plates with an adequate electron transfer capability; (2) the allowable value for the average specific gravity of all the cells, not more than 0.020 below the manufacturer's recommended full charge specific gravity, ensures that the decrease in rating will be less than the safety margin provided in sizing; (3) the allowable value for an individual cell's specific gravity ensures that an individual cell's specific gravity will not be more than 0.040 below the manufacturer's full charge specific gravity and that the overall capability of the battery will be maintained within an acceptable limit; and (4) the allowable value for an individual cell's float voltage, greater than 2.07 volts, ensures the battery's capability to perform its design function.

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The simulated emergency load profile used for the battery service test of Surveillance Requirement 4.8.2.1.d is verified to be at least equivalent to the actual emergency load profile and is based on anticipated operations required after an AC power loss during accident conditions as described in the Updated Final Safety Analysis Report (UFSAR). The simulated emergency load profiles for the three divisional batteries are defined and located in the UFSAR Section 8.3.