NERC Testing

What is NERC? How does it affect my battery maintenance practices?

Founded in 1968, NERC was first known as the National Electric Reliability Council. NERC was created in response to the 1965 blackout, where 30 million people lost power.

The standards NERC produced were voluntary at this time. In 1981 NERC changed its name to North American Electric Reliability Council, due to Canadian Participation.

In 2003 North America experienced its worst blackout ever. Fifty million people lost power in the U.S. and Canada.

Following this, in 2005 the U.S. Energy Policy Act of 2005 authorized the creation of a self-regulatory "electric reliability organization", with oversight from the Federal Energy Regulatory Commission (FERC). Compliance with reliability standards would now be mandatory and enforceable.

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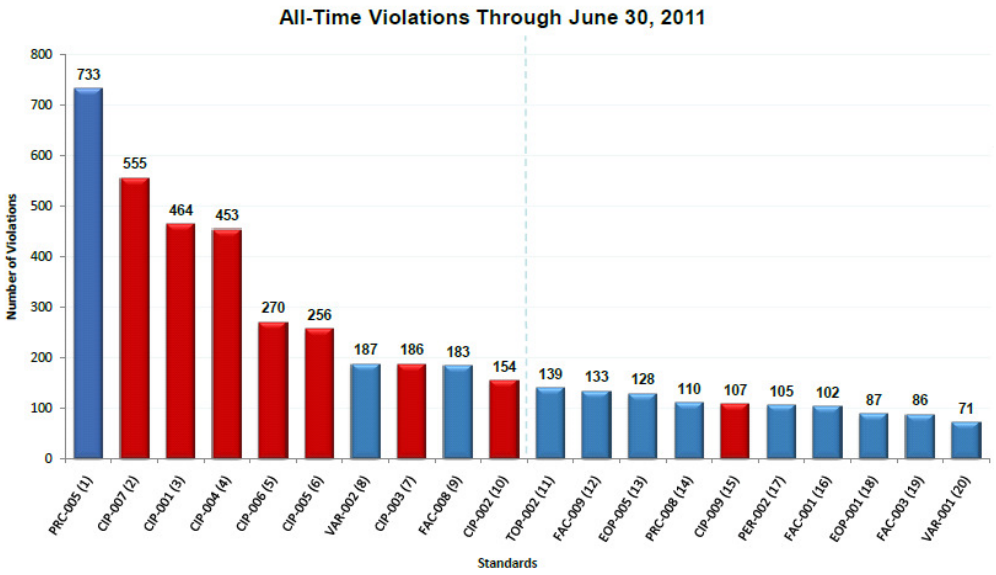
In 2007 FERC approved 83 NERC Reliability Standards, the first set of legally enforceable standards for the U.S. bulk power system. Compliance with approved NERC Reliability Standards is now mandatory and enforceable in the United States.

The NERC reliability standard PRC-005-2 gives the minimum maintenance requirements for protective relays, DC supplies, DC control circuits, current and voltage sensing devices, stationary battery backup strings and associated telecommunications equipment.



Since this time the number of NERC standards violations has increased. The majority of these are violations of the PRC-005-2 standard.

It is important to understand that the NERC PRC-005-2 standard defined the **minimum** testing / maintenance requirements for VLA (Vented Lead Acid) batteries, VRLA (Valve Regulated Lead Acid) batteries and NiCAD batteries. This level of maintenance does not guarantee high reliability in critical applications. For critical applications please reference IEEE recommendations.

Flooded Lead Acid (VLA) Minimum Battery Maintenance Requirements

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Component Type – Protection System Station DC supply using Vented Lead-Acid (VLA) Batteries Excluding distributed UFLS and distributed UVLS		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Protection System Station DC supply with Valve Regulated Lead-Acid (VRLA) batteries not having monitoring attributes of Table 1-4(f)	4 Calendar Months	Verify: Station DC supply voltage Inspect: Electrolyte level Check for unintentional grounds
	18 Calendar Months	Verify: Float voltage of battery charger Battery continuity Battery terminal connection resistance Battery intercell or unit-to-unit connection resistance Inspect: **Cell condition of all individual battery cells where cells are visible – or measure battery cell/unit internal ohmic values where the cells are not visible** Physical condition of battery rack
	18 Calendar Months –or- 6 Calendar Years	Verify that the station battery can perform as manufactured by evaluating cell/unit measurements indicative of battery performance (e.g. **internal ohmic values or float current**) against the station battery baseline –or- verify that the station battery can perform as manufactured by conducting a performance or modified performance capacity test of the entire battery bank.

The maintenance cycle for the VLA battery comes in two cycles: a 4-month cycle and an 18-month cycle.

Required Maintenance Every 4 Months

1. Verify station DC supply voltage
2. Inspect electrolyte levels
3. Check for unintentional grounds

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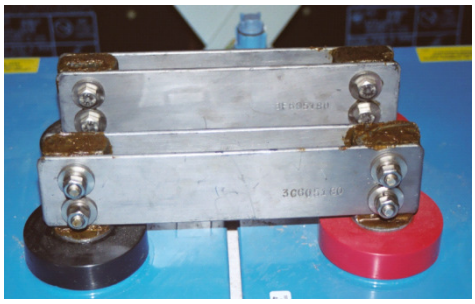
These checks need to be documented. The Power DB LITE software supplies a section to do just this. All required parameters can be documented as proof of compliance.

BATTERY INSPECTION					
INTER-CELL/JAR CONNECTION TORQUE:		Inch Pounds	DOES THE UNIT RUN:		
POSITIVE TO GROUND:		NEGATIVE TO GROUND		NOTES / COMMENTS	
RACK CONDITION					
VERIFY BATTERY JARS ARE NOT DEFORMED, CRACKED OR LEAKING					
VERIFY ELECTROLYTE LEVELS ARE CORRECT					
VERIFY THERE IS NO CORROSION ON THE CONNECTIONS					
VERIFY THERE IS NO GROUND FAULT PRESENT					

Required Maintenance Every 18 Months



1. Measure the battery float voltages and verify they are within the battery manufacture recommendations.
2. Verify the string continuity. Verify current can pass through the entire string.
3. Measure the battery terminal connection resistance. This is the resistance from the post to the inter-cell connection or strap.
4. Measure the battery inter-cell resistance.
   If you can take the measurement directly from the post of the battery, then both the terminal connection resistance and the inter-cell resistance is done at the same time. This is the recommended method per IEEE450.
5. Perform a cell Inspection where visible. Look for cell deformations, leaking electrolytes, corrosion or other nonconformities. **If the cells are not visible then an ohmic test is required.**
6. Perform a battery rack inspection. Verify the rack is stable, secure and not corroding.
7. Perform an internal ohmic test of the batteries or measure the float current against a baseline.
8. All tests need to be documented and saved.

NOTE: It is highly recommended to perform the internal ohmic test to the battery. Measuring float current will only prove the batteries are fully charged. There is no correlation between float current and battery capacity.

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NERC standards also allow for a discharge test to be performed once every 6 years instead of performing ohmic testing every 18 months. All other maintenance must still be performed. Batteries can fail in that 6 year period, so it is not recommended to only perform discharge testing without ohmic testing.

BATTERY TESTS	BITE2	POWER DB
Visual Inspection		
Save and Report Inspection Data		✓
String Continuity	✓	
Float Voltage	✓	
Float Current		
Ohmic Testing	✓	
Terminal and Inter-cell Resistance	✓	
Save and Report Test Data		✓

Nickel-Cadmium (NiCD) Minimum Battery Maintenance Requirements

Component Type – Protection System Station DC supply using Nickel-Cadmium (NiCad) Batteries **Excluding distributed UFLS and distributed UVLS**		
Component Attributes	**Maximum Maintenance Interval**	**Maintenance Activities**
Protection System Station DC supply Nickel-Cadmium (NiCad) batteries not having monitoring attributes of Table 1-4(f)	4 Calendar Months	Verify: Station DC supply voltage Inspect: Electrolyte level Check for unintentional grounds
	18 Calendar Months	Verify: Float voltage of battery charger Battery continuity Battery terminal connection resistance Battery intercell or unit-to-unit connection resistance Inspect: Cell condition of all individual battery cells where cells are visible – or measure battery cell/unit internal ohmic values where the cells are not visible

NERC Testing

		Physical condition of battery rack
	18 Calendar Months – or- 6 Calendar Years	Verify that the station battery can perform as manufactured by evaluating cell/unit measurements indicative of battery performance (e.g. **internal ohmic values or float current**) against the station battery baseline,or verify that the station battery can perform as manufactured by conducting a performance or modified performance capacity test of the entire battery bank.

Required Maintenance Every 4 Months

1. Verify - Station DC Supply Voltage
2. Inspect Electrolyte Levels
3. Check for Un-Intentional Grounds

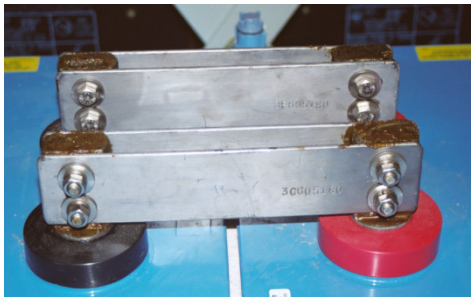
These checks need to be documented. The Power DB LITE software supplies a section to do just this. All required parameters can be documented as proof of compliance.

BATTERY INSPECTION

INTER-CELL/JAR CONNECTION TORQUE:		Inch Pounds	DOES THE UNIT RUN:	
POSITIVE TO GROUND:		NEGATIVE TO GROUND		NOTES / COMMENTS
RACK CONDITION				
VERIFY BATTERY JARS ARE NOT DEFORMED, CRACKED OR LEAKING				
VERIFY ELECTROLYTE LEVELS ARE CORRECT				
VERIFY THERE IS NO CORROSION ON THE CONNECTIONS				
VERIFY THERE IS NO GROUND FAULT PRESENT				

Required Maintenance Every 18 Months

1. Measure the battery float voltages and verify they are within the battery manufacture recommendations.
2. Verify the string continuity. Verify current can pass through the entire string.
3. Measure the battery terminal connection resistance. This is the resistance from the post to the inter-cell connection or strap.
4. Measure the battery inter-cell resistance.
5. If you can take the measurement directly from the post of the battery then both the terminal connection resistance and the inter-cell resistance is done at the same time.



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Perform a cell Inspection of all visible cells. Look for cell deformations, leaking electrolyte, corrosion or other nonconformities.

6. Perform a battery rack inspection. Verify the rack is stable, secure and not corroding.
7. All tests need to be documented and saved.

Required Maintenance Every 6 years

1. Conduct a performance or modified performance capacity test of the entire battery bank.

BATTERY TESTS	BITE2	POWER DB	TORKEL
Visual Inspection			
Save and Report Inspection Data		✓	
String Continuity	✓		
Float Voltage	✓		
Float Current			
Terminal and Inter-cell Resistance	✓		
Save and Report Test Data		✓	
Capacity Test			✓
Save and Report Discharge Data		✓	