EC Toolbox

Generator Testing Log

Joint Commission Environment of Care (EC) Standard EC.02.05.07 requires that health care organizations inspect, test, and maintain emergency power systems. (*See* Figure 1 on page 7.) In 2015 this standard was among the top 10 most challenging for ambulatory care (26% noncompliant) and critical access hospitals (31% noncompliant).

Standards Connection

Standard EC.02.05.07

The hospital inspects, tests, and maintains emergency power systems.

Note: *This standard does not require hospitals to have the types of emergency power equipment discussed below. However, if these types of equipment exist within the building, then the following maintenance, testing, and inspection requirements apply.*

Elements of Performance for EC.02.05.07

1. At least monthly, the hospital performs a functional test of battery-powered lights required for egress for a minimum duration of 30 seconds. The completion date of the tests is documented.
2. Every 12 months, the hospital either performs a functional test of battery-powered lights required for egress for a duration of 1½ hours; or the hospital replaces all batteries every 12 months and, during replacement, performs a random test of 10% of all batteries for 1½ hours. The completion date of the tests is documented.
3. Every quarter, the hospital performs a functional test of stored emergency power supply systems (SEPSS) for 5 minutes or as specified for its class (whichever is less). The hospital performs an annual test at full load for 60% of the full duration of its class. The completion dates of the tests are documented.

   Note 1: *Non–SEPSS battery backup emergency power systems that the hospital has determined to be critical for operations during a power failure (for example, laboratory equipment or electronic medical records) should be properly tested and maintained in accordance with manufacturer's recommendations.*

   Note 2: *SEPSS are intended to automatically supply illumination or power to critical areas and equipment essential for safety to human life. Included are systems that supply emergency power for such functions as illumination for safe exiting, ventilation where it is essential to maintain life, fire detection and alarm systems, public safety communications systems, and processes where the current interruption would produce serious life safety or health hazards to patients, the public, or staff.*

   Note 3: *Class defines the minimum time for which the SEPSS is designed to operate at its rated load without being recharged. For additional guidance,* see *NFPA 111*, Standard on Stored Electrical Energy Emergency and Standby Power Systems, *1996 edition*.
4. At least monthly, the hospital tests each emergency generator under load for at least 30 continuous minutes. The completion dates of the tests are documented.
5. The monthly tests for diesel-powered emergency generators are conducted with a dynamic load that is at least 30% of the nameplate rating of the generator or meets the manufacturer's recommended prime movers' exhaust gas temperature. If the hospital does not meet either the 30% of nameplate rating or the recommended exhaust gas temperature during any test in EC.02.05.07, EP 4, then it must test the emergency generator once every 12 months using supplemental (dynamic or static) loads of 25% of nameplate rating for 30 minutes, followed by 50% of nameplate rating for 30 minutes, followed by 75% of nameplate rating for 60 minutes, for a total of 2 continuous hours.

   Note: *Tests for non–diesel-powered generators need only be conducted with available load.*
6. At least monthly, the hospital tests all automatic transfer switches. The completion date of the tests is documented.
7. At least once every 36 months, hospitals with a generator providing emergency power for the services listed in EC.02.05.03, EPs 5 and 6, test each emergency generator for a minimum of 4 continuous hours. The completion date of the tests is documented.

   Note: *For additional guidance,* see *NFPA 110, 2005 edition,* Standard for Emergency & Standby Power Systems.
8. The 36-month diesel-powered emergency generator test uses a dynamic or static load that is at least 30% of the nameplate rating of the generator or meets the manufacturer's recommended prime movers' exhaust gas temperature.

   Note: *Tests for non–diesel-powered generators need only be conducted with available load.*
9. If a required emergency power system test fails, the hospital implements measures to protect patients, visitors, and staff until necessary repairs or corrections are completed.
10. If a required emergency power system test fails, the hospital performs a retest after making the necessary repairs or corrections.

Figure 1: Sample Generator Performance Graph

HOSPITAL
ENGINEERING SERVICES
EMERGENCY GENERATOR OPERATING LOG
2016

Generator Name:	**Generator #1**

Note: Use this sheet to enter generator name and nameplate data, and it will populate to the other months.

Month	**January**	**DATE:**		**PROBLEMS IDENTIFIED**	**ACTIONS TAKEN**
OPERATOR					
START TIME					
STOP TIME					
HOUR METER - START					
HOUR METER - STOP					
ELAPSED RUN TIME					
kW (Nameplate Rating in kW)		750	30% of Nameplate		
kW (Load Under Test)			225		
BATTERIES SPECIFIC GRAVITY READINGS	CELLS # 1 & 2	\			
	CELLS # 3 &4	\			
	CELLS # 5 & 6	\			
PHASE 1	AMPS				
	VOLTS				
PHASE 2	AMPS				
	VOLTS				
PHASE 3	AMPS				
	VOLTS				
ATS 1	ATS 2	ATS 3			
		Acceptable Range	Actual Reading		
ATS Transfer Time		0 - 10 Sec.			
OIL PRESSURE		50 - 100			
WATER TEMPERATURE		150 - 210			
BATTERY AMPERES		2			
COOLANT LEVEL		95% Full			
FUEL LEVEL		50% Full			
OIL LEVEL		85% Full			
FREQUENCY HZ		60			

For standards that require documentation, such as EC.02.05.07, EP 4, the organization will be found noncompliant if it has not documented the required activity—even if it has performed the activity as required. The documentation is essential to compliance and is a component of accreditation survey. As the saying goes, "not documented, not done." In addition to being required for accreditation, documenting the results of the monthly generator test ensures that issues that would affect safety are caught before they can cause harm.

Joint Commission surveyors have created a tool to help organizations document their compliance correctly, to ensure accurate record keeping, and to help organizations prevent a finding of noncompliance with this standard during an onsite survey.

"The biggest issue is tracking the test results from month to month. What testing has the organization actually been doing over the last 12 months? How much load has it put on every month? Does it always meet or surpass the 30% load threshold? These things all need to be documented."

—Michael Vangeli, Life Safety Code *Specialist for The Joint Commission*

How does the tool work?

The generator testing log tool is a multipage, interactive, adaptable spreadsheet. There is a page for each calendar month, a page that compiles data from the monthly pages, and a page that—when used electronically—automatically generates a performance graph based on that data.

Each month's page can be printed out and given to the technician performing the generator test. That person records all the relevant data on the form, such as the following:

- Start and stop times
- Elapsed run time
- Kilowatts (load under test)
- Automatic transfer switch transfer time
- Oil pressure
- Water temperature

(continued on page 10)

(continued from page 7)

- Coolant, fuel, and oil levels
- Frequency

These data are then entered into the spreadsheet. For the first month (January), the user also enters nameplate rating in kilowatts. The spreadsheet automatically calculates the 30% threshold. Both the nameplate rating and the 30% of nameplate data are automatically inserted into the other monthly pages, through the entire year.

"These sorts of graphs can help you see if there's a problem developing. If something varies from month to month, it can signal that the issue needs further investigation."

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The nameplate rating and 30% of nameplate data serve another important role in this tool. The spreadsheet generates a line on the graph that indicates the 30% of nameplate threshold. This makes it easy to determine at a glance whether the generator has ever performed below the threshold, which triggers an annual test (*see* Figure 2, above, right).

According to Michael Vangeli, *Life Safety Code* Specialist for The Joint Commission, "If the graph shows that the generator drops below that 30% load threshold line in any month, then you know you need to do the annual test. If not, then you don't."

How does this tool help?

Vangeli developed this tool in response to his in-the-field experiences with organizations that are found to be noncompliant with this standard. According to him, the biggest challenge in complying with this standard is keeping track of the generator's performance every month (as specified in EP 4) to determine whether the annual test is needed (as required by EP 5).

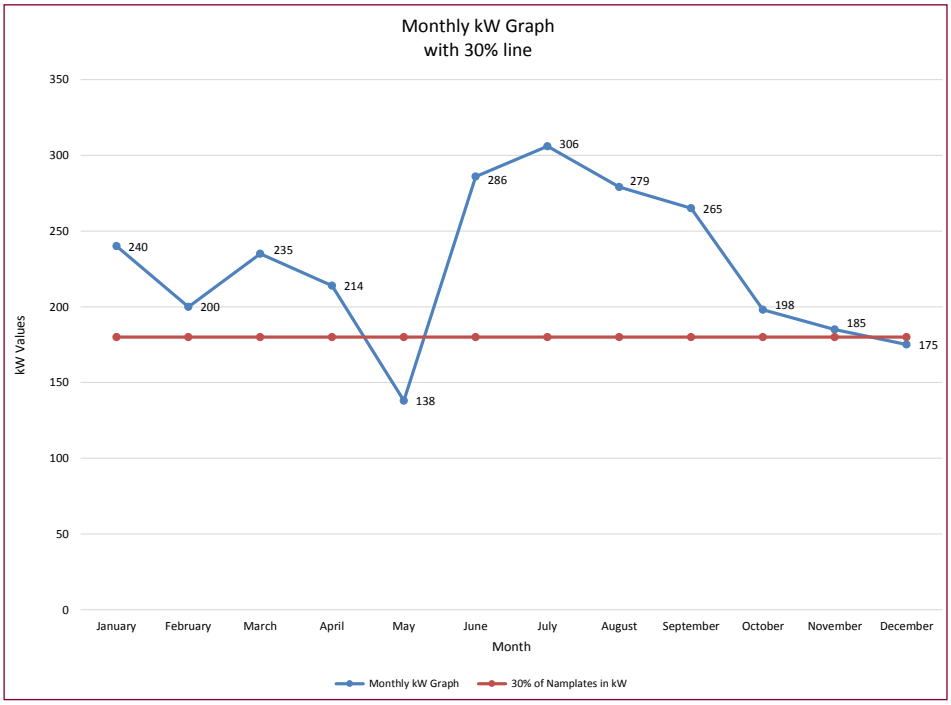
"The biggest issue is tracking the test results from month to month," Vangeli says. "What testing has the organization actually been doing over the last 12 months? How much load has it put on every month? Does it always meet or surpass the 30% load threshold? These things all need to be documented."

This tool can help organizations make that determination and therefore remain in compliance. It does this in several ways. First, it compiles all the necessary information into one place, eliminating the need to juggle 12 different files. Second, the graph function make it easy to determine whether any month dropped below the threshold, which triggers the annual test. Third, a single tool allows the entire generator testing process, from work order through follow-up, to be handled by multiple people without compromising data integrity. Finally, this completed tool satisfies The Joint Commission's documentation requirement for the relevant EPs.

The tool has other benefits as well. It is easily adaptable to meet the individual needs of an organization. For example, it currently follows the calendar year, but the pages can be renamed to match the organization's fiscal year or other schedule. Data points can be added if necessary, and the spreadsheet can be made to generate graphs for any of those data points. For example, it could make a graph to indicate monthly oil pressure readings taken during the test.

"These sorts of graphs can help you see if there's a problem developing," Vangeli says. "If something varies from

Figure 2: Environment of Care Standard EC.02.05.07



This is an example of a graph generated by the generator testing log tool. The horizontal line indicates the 30% of nameplate threshold required by **EC.02.05.07, EP 4**. The graph indicates each month's performance compared to that threshold. In this example, it is easy to see that the generator performed below the threshold in May and December. This would trigger the organization to complete the annual test as required by **EC.02.05.07, EP 5**.

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Using this tool can help organizations develop a baseline history for their emergency backup generators. When new equipment is added to the system or when the usage patterns change, it will show up in the monthly data in this tool. These trends can be tracked and accommodated. This is especially important with older generators that manage a higher load. The organization needs to know what "normal" looks like so it can ensure that new demands do not push the equipment too close to its limit.

Other concerns

Organizations need to consider a few issues when using this tool. The first involves the use of kilowatt data to create the graph. According to Vangeli, current National Fire Protection Association (NFPA) guidelines require newer facilities to use kilowatt readings. However, some organizations may still be reading the amperage and may not have a kilowatt meter on their electrical gear. If this is the case, the tool could be adapted to create a graph that uses amperage data rather than the kilowatt data.

In addition, it is important to note that this tool is based on NFPA 110 Standards 8.3 and 8.4. This is why, in the days of sealed batteries, we see the requirement under 8.3.7 to check the electrolyte levels of batteries. There is an alternative to checking the electrolyte level: battery conductance testing. However, according to Vangeli, this is not a method most organizations would choose. EC