

# **PART II – HEALTH CARE FACILITIES CODE REQUIREMENTS**

**K918**

**Electrical Systems – Essential Electric System Maintenance and Testing**

**Commentary by Paul Harris**

## K-918

### **Electrical Systems – Essential Electric System Maintenance and Testing**

The generator or other alternate power source and associated equipment is capable of supplying service within 10 seconds. If the 10-second criterion is not met during the monthly test, a process shall be provided to annually confirm this capability for the life safety and critical branches. Maintenance and testing of the generator and transfer switches are performed in accordance with NFPA 110. Generator sets are inspected weekly, exercised under load 30 minutes 12 times a year in 20-40 day intervals, and exercised once every 36 months for 4 continuous hours. Scheduled test under load conditions include a complete simulated cold start and automatic or manual transfer of all EES loads, and are conducted by competent personnel. Maintenance and testing of stored energy power sources (Type 3 EES) are in accordance with NFPA 111. Main and feeder circuit breakers are inspected annually, and a program for periodically exercising the components is established according to manufacturer requirements. Written records of maintenance and testing are maintained and readily available. EES electrical panels and circuits are marked, readily identifiable, and separate from normal power circuits. Minimizing the possibility of damage of the emergency power source is a design consideration for new installations. 6.4.4, 6.5.4, 6.6.4 (NFPA 99), NFPA 110, NFPA 111, 700.10 (NFPA 70)

From the time the “Life Safety” circuit breaker is opened, or the test switch (with load) is operated the generator must pick up the load within 10 seconds.

Transfer within 10 seconds has long been a requirement for health care facilities. Now surveyors want to see this confirmed in writing on at least one of your inspection forms or exercise logs. If there is no check box for this, just write it at the top of the form, initial it, and date it. Do this at least annually, but I recommend you note the transfer time every month.

[My example Inspection Report](#)

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NFPA 110, 2010 edition, chapter 8.4.6

Each automatic transfer switch must be tested for 30 minutes (with load) every month when testing the generator, by opening the normal breaker to the ATS or operating the test switch 8.4.6 and 8.4.3

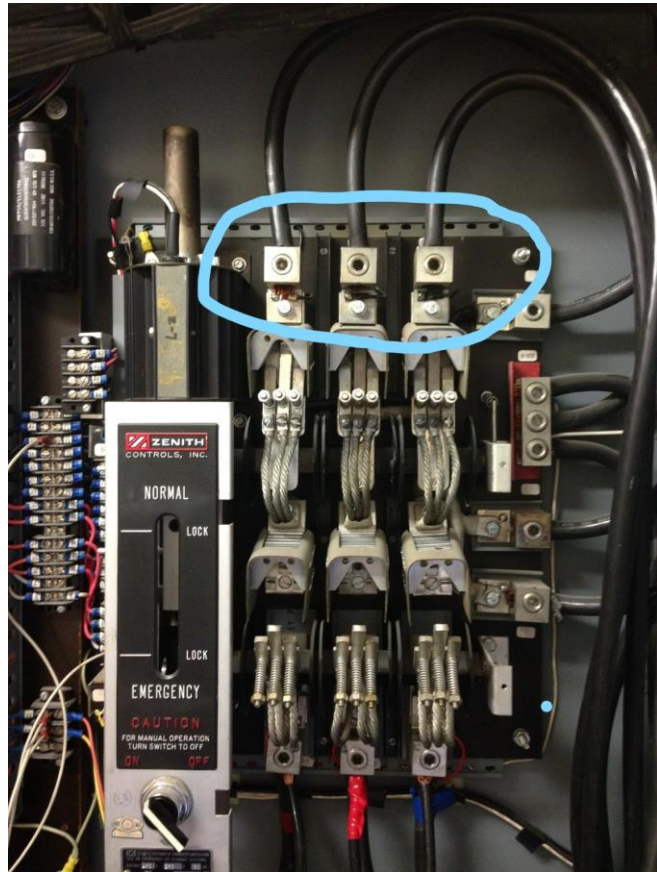
In addition, a maintenance program must be instituted. 8.3.6 This should be done at least annually because you need to follow the manufacturers recommendations. 8.1.1 (1) Most manufacturers recommend annual maintenance. Annual transfer switch maintenance should include the following: 8.3.5

1. Checking of connections. Visually inspect and use an infrared temp gun. A poor connection will be hotter than a good one under load.
2. Inspection or testing for evidence of overheating and excessive contact erosion.  
Again, use the temp gun underload.
3. Removal of dust and dirt.
4. Replacement of contacts when required.

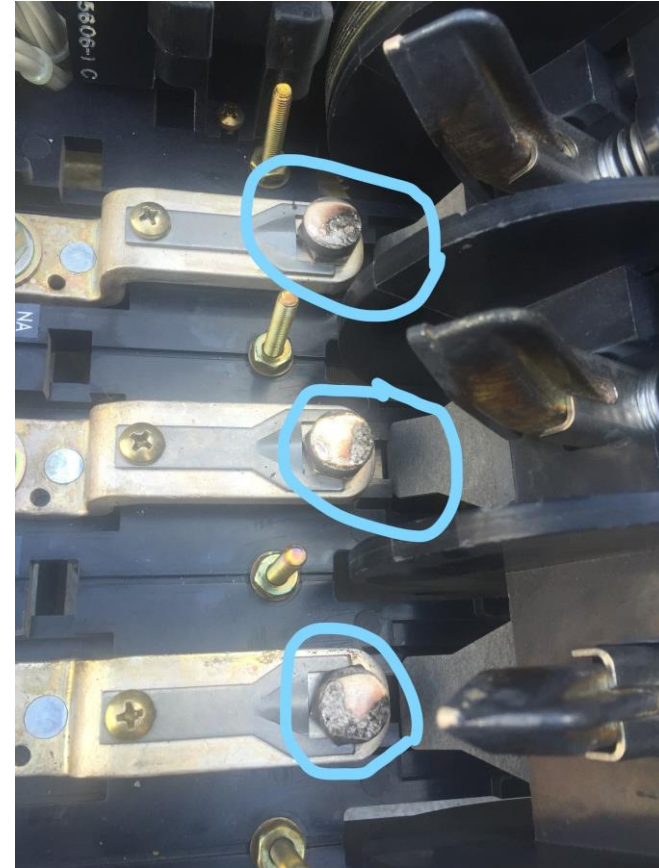
See my example:

[Example ATS Check List](#)

Check for elevated temperature at the connections. Look for loose connections and discoloration.



Contact erosion occurs with each transfer. It causes overheating and failure.



See my video: [Automatic Transfer Switch Annual Service](#)

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## Weekly inspection NFPA 8.4.1

This is as important as the monthly 30-minute test under load.

Check to see if the coolant heater is working. Check the oil, coolant, and fuel level. Also, check the battery voltage, and make sure nothing is living there.

All of this requires a visual inspection. Just letting the automatic exerciser run it is not adequate.

See my video: [Weekly Generator Operational Inspection & Testing](#)



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## Monthly exercise under load

**All** generators **must** be exercised under load for 30 minutes each month. This applies to gas units as well. Diesel generators should reach 30% of their nameplate rating. 8.4.2 (2).

Records must be kept.

However, there is an option. If a diesel cannot reach 30% or if records are not properly kept, then an annual loadbank test **may** be conducted as an alternative. 8.4.2.3.

See my video: [Monthly Generator Operational Inspection & Testing](#)

Also, see [How to Calculate Generator Load PDF](#)

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## The 4-hour load test

The 4-hour load test required every 36 months **is not a loadbank test.**

Many service companies substitute a loadbank test for the required loadtest. These are completely different tests.

The loadtest outlined in 8.4.9 requires all transfer switches be transferred. This not only tests the generator but the **transfer switches, circuit breakers, and emergency distribution as well.**

A loadbank test only tests the generator.

Don't be fooled by a vendors' hesitancy to conduct a proper load test.

See my video: [Every Third Year Generator Operational Inspection & Training](#)

“Scheduled test under load conditions include a complete simulated cold start and automatic or manual transfer of all EES loads, and are conducted by competent personnel.” **Make sure your vendor is competent.**

See my loadtest form. Note the second page.

[Example Load Test Form 3 Year](#)

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## Circuit breaker inspection

A local electrician should be able to do this.

I made a video that shows you the inside of a circuit breaker and why it needs to be serviced. See: [Annual Breaker Exercise](#)

Main and feeder circuit breakers are inspected annually, and a program for periodically exercising the components is established according to manufacturer requirements.

To keep this simple and inexpensive, I suggest the facility hire a **licensed** electrician to annually inspect the main and feeder breakers, remove any debris, and operate the breakers. If a breaker has not been operated in a long time it may malfunction. Therefore, you need someone who can make a repair on hand.

Main Breaker looks like this.



Main distribution panel  
Feeder Breakers look like this.

Automatic transfer switch



Branch distribution panel in hallways or closet feed individual circuits like, lights and motors.



## Marking breakers and panels

EES electrical panels and circuits are marked, readily identifiable, and separate from normal power circuits.

{ NFPA 700.10 (A) }

Most of the facilities we work with have unmarked panels and circuits. This makes it awkward to operate the system during an emergency.

The generator may not be arranged to energize all circuits in a facility during an outage. It is essential for the facility personnel to know which outlets to use in case of a power outage as well what parts of the building will have lights and heat.



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I suggest a set of records be kept in hard copy as well as another set be kept electronically.

Most paperwork should go back 2 years. The 4-hour load tests required every 3 years should have records going back past 2 tests, or 6 years.

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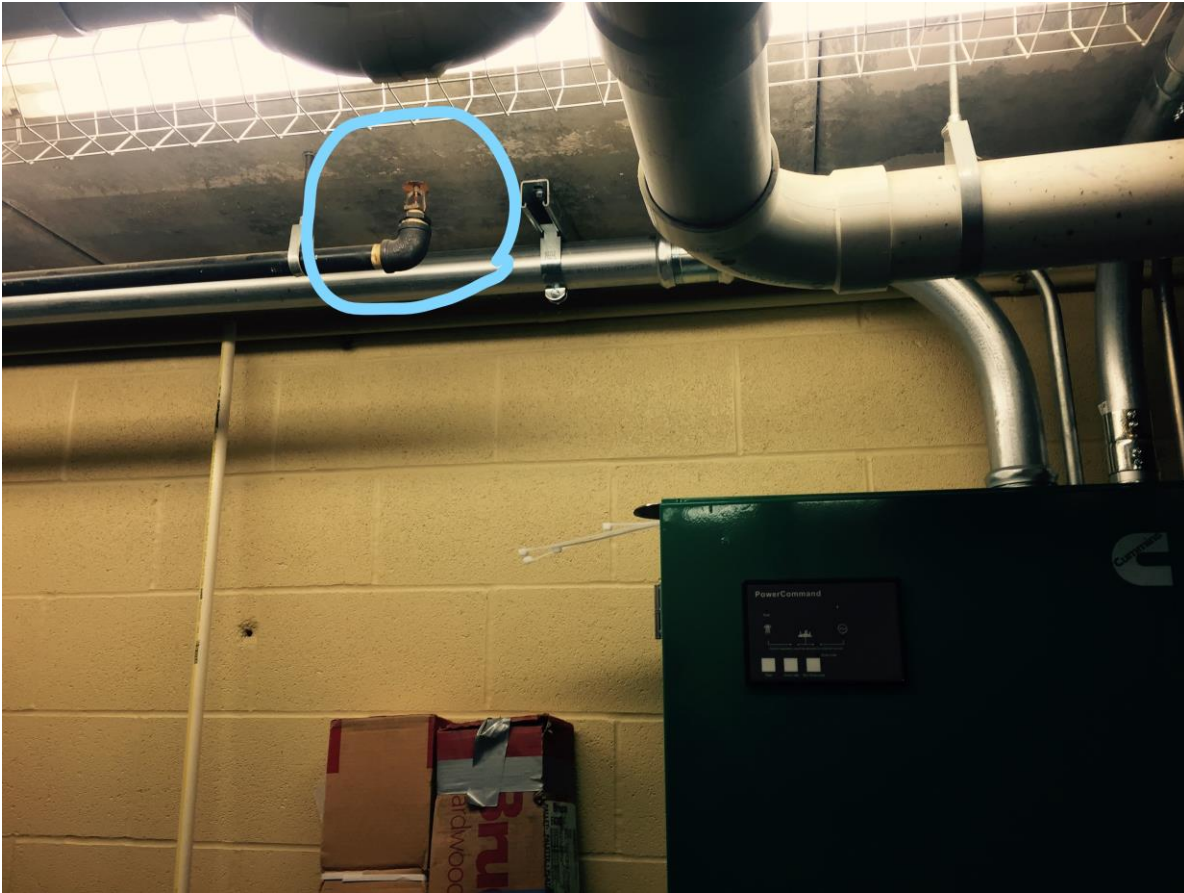
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## Preventing damage

Most of K-918 concerns chapter 8 of NFPA 110. Damage prevention involves installation. I have listed a few suggestions below:

- Lightning protection
  - If mounted outside, surge suppressor need to be used. **NFPA 110, 2010 edition, chapter 7.11.14**
- Protection from water damage **NFPA 110, 2010 edition, chapter 7.2.3**
  - This includes any source. Equipment must be protected from water-based fire protection and weather. See my video: [Transfer Switch Weather Protection](#)
- Minimum temperature
  - Ambient air temperature around the generator whether mounted inside or outside needs to be maintained at a minimum of 40 degrees Fahrenheit. **NFPA 110, 2010 edition, chapter 7.7.6.**



Sprinkler head above transfer switch



- Outside with the wrong enclosure
- Needs to be NEMA 3R or better
  - Conduit entered from the top destroys integrity allowing water in.

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