WSDOT Test Method T 425

Test Method for Traffic Controller NEMA and 170 Type Environmental Chamber Test

1. SCOPE

This test method is intended to evaluate the traffic signal controller to the temperature and environmental extremes as defined in the NEMA TS-1 Standard. This procedure will cover temperatures from minus 30ºF (-34ºC) to 165ºF (74ºC) and voltages from 95 VAC to 135 VAC with a power interruption as defined in NEMA TS-1.

2. REFERENCE DOCUMENTS

NEMA Publication TS-1
FHWA Publication IP-78-16
Caltrans: Traffic Signal Controller Equipment Specification

3. SAFETY

The environmental chamber provides extreme temperatures. Caution should be exercised to avoid injury.

4. APPARATUS

A suitable chamber in which the traffic controller can be subjected to the specified temperatures (-30ºF and 165ºF) and provide safe access to the equipment under test.
A temperature recording device shall record the temperature in the chamber during the test with an accuracy of ± 3ºF. The air inside the chamber shall be circulated so that no more than a 3ºF difference will occur. The chamber control shall maintain constant absolute humidity from 109ºF to 165ºF.

Variable voltage transformer capable of delivering the power required at the voltages defined in NEMA TS-1 (20 amps at 0 to 150 VAC)

Volt-Ohm-Milliamp meter (VOM)

Resistance load device to simulate each traffic signal light (150 ohm 100W wire wound resistors)

5. PROCEDURE

5.1 Low-Temperature Low-Voltage Test:

5.1.1 Test conditions:

a. Environmental chamber door closed

b. Temperature: minus 30ºF

c. Low Voltage: 95 VAC

d. Equipment cabinet door open

e. Humidity control off

5.1.2 Procedure:

5.1.2.1 While at room temperature, adjust the input voltage to 95 VAC NEMA & Type 170 & 2070 ± modified 2010ECL; 102VAC 2070 ± standard 2010ECL and verify that the test unit is operational.

5.1.2.2 With the equipment under test cycling on minimum recall, lower the test chamber to –30ºF at a rate not to exceed 30ºF per hour. With the humidity control off, allow the controller assembly under test to cycle on minimum recall during the time it takes to cool down the chamber.

5.1.2.3 Then operate the test switches listed in TABLE 1 to ensure their proper operation.

5.1.2.4 NEMA only remove power from the controller assembly for a period of 3 hours.

5.1.2.5 Upon restoration of power, the controller assembly shall resume cycling at minimum recall.

5.1.2.6 Upon satisfactory completion of this test proceed to the Low-Temperature High-Voltage Test.

5.2 Low-Temperature High-Voltage Test

5.2.1 Test conditions:

a. Environmental chamber door closed

b. Temperature: minus 30ºF

c. High Voltage: 135 VAC

d. Equipment cabinet door open

e. Humidity control off

5.2.2 Procedure:

5.2.2.1 While at –30ºF and the humidity control off, adjust the input voltage to 135 VAC and allow the controller assembly to cycle on minimum recall.

5.2.2.2 Then operate the test switches listed in TABLE 1 to ensure their proper operation.

5.2.2.3 With the input voltage at135 VAC bring the chamber and test controller assembly to room temperature at a rate no greater than 30ºF per hour.

5.2.2.4 Upon satisfactory completion of this test proceed to the High-Temperature High/Low Voltage Test.

5.3 High-Temperature High/Low Voltage

5.3.1 Test Conditions

a. Environmental chamber door closed

b. High temperature 165 F

c. High voltage 135 VAC

d. Equipment door open

e. Humidity control as given in TABLE 2

5.3.2 Procedure:

5.3.2.1 With the controller assembly cycling on minimum recall, raise the test chamber temperature to 165ºF at a rate not to exceed 30ºF per hour. Check to see that the input voltage is set at 135 VAC.

5.3.2.2 Set the humidity controls to not exceed 95% relative humidity over the temperature range of 40ºF to 110ºF. When the temperature reaches 109ºF readjust the humidity control to maintain constant absolute humidity.

5.3.2.3 Verify that the controller assembly continues to cycle satisfactorily during the period of temperature increase and established levels of relative humidity.

5.3.2.4 Allow the test unit to cycle on minimum recall upon reaching 165ºF at 18% relative humidity. Then operate the test switches listed in TABLE 1 to ensure their proper operation.

5.3.2.5 Allow test unit to cycle for a minimum of 2 hours at 165ºF and 18% relative humidity and 135 VAC.

5.3.2.6 With the test unit at 165ºF and 18% relative humidity, again operate the test switches listed in TABLE 1 to ensure their proper operation.

5.3.2.7 Lower the voltage to 95 VAC NEMA & Type 170 & 2070 ± modified 2010ECL; 102VAC 2070 ± standard 2010ECL. Bring the chamber and controller assembly back to room temperature at a rate no greater than 30ºF per hour.

6. REPORT

Record any response found to be in disagreement with the published standards. Report pass or fail and any corrective actions taken on the test report.

1. Verify function of intersection display panel switches
2. Verify function of police panel switches (on/off, auto/flash)
3. Verify stop time switch function (inside)
4. Verify auto/flash switch function (inside)
5. Reserve for future use
6. Verify function of external logic (NEMA)
7. Verify operation of loop detection panel
8. Verify function of preemption push button on door (NEMA)
9. Verify function of preemption switches on phase selectors
10. Verify operation of emergency indicator light
11. Verify CMU functioning properly

Switches
Table 1

Dry Bulb		Relative Humidity, Percent*	Wet Bulb	
°F	°C		°F	°C
40	4.4	75	37	2.8
50	10.0	80	47	8.3
60	15.6	83	57	13.9
70	21.1	86	67	19.4
80	26.7	87	77	25.0
90	32.2	89	87	30.6
100	37.8	89	97	36.1
110	43.3	90	107	41.7
120	48.9	70	109	42.8
130	54.4	50	109	42.8
140	60.0	38	109	42.8
150	65.6	28	109	42.8
160	71.1	21	109	42.8
165	73.9	18	109	42.8

*For dynamic testing.

Wet-Bulb Dry-Bulb Relative Humidity
at Barometric Pressure of 29.92 in. hg.
Table 2

Performance Exam Checklist

Test Method for Traffic Controller NEMA and 170 Type Environmental Chamber Test
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Participant Name _____ Exam Date _____

Procedure Element	Yes	No
1. Place Traffic Controller into the Environmental chamber.	❐	❐
2. Perform Low-Temperature Low Voltage Test.	❐	❐
3. Perform Low- Temperature High Voltage Test.	❐	❐
4. Perform High- Temperature Low Voltage Test.	❐	❐
5. Perform High-Temperature High Voltage Test.	❐	❐
6. Document test results on report.	❐	❐

First attempt: Pass ❐ Fail ❐ Second attempt: Pass ❐ Fail ❐

Signature of Examiner _____

Comments: