



WESTERN FIRE CENTER, INC.

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Fire Resistance Testing of Metal Utility Poles

Investigative testing conducted following the test methodology similar to that of proposed ASTM standard, Standard test method for fire resistance of wood utility poles

Conducted For:

**Valmont Utility
28800 Ida St
Valley, NE 68064**

WFCi Report #18050ar1

Test Date: November 15, 2018

Original Report Issued: January 16, 2019

Revision Issued: January 31, 2019

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INTRODUCTION

This report documents metal pole fire tests for Valmont Utility following principles contained within the proposed ASTM standard (not yet approved), *Standard test method for fire resistance of wood utility poles*. Though this proposed standard was developed primarily for wood poles, these tests were adapted for the use of metal poles.

The purpose of this testing was to evaluate the effectiveness of the pole by measuring the exposure to radiative heating, convective flames, and wind effects. These test were for preliminary evaluation of the metal poles, to be used for comparative purposes to other pole types.

SUMMARY OF TEST METHOD

This test method uses a combination of heat sources, namely a set of radiant heaters as well as a convective ring burner. The radiant heaters (approximately 935°C [1715°F]) are designed to produce a uniform heat flux (up to 50 kW/m²) on a 1 m² vertical sample (Figure 1). The panel material was placed in a moveable sample holder, which was wheeled into place before testing, being protected from the radiant heaters by a removable heat shield.

The test period began with the removal of the heat shroud. The entire test was carried out under well-ventilated conditions. These particular tests were performed at a heat flux of 50 kW/m², approximately a 15" distance from radiant heaters to sample face.

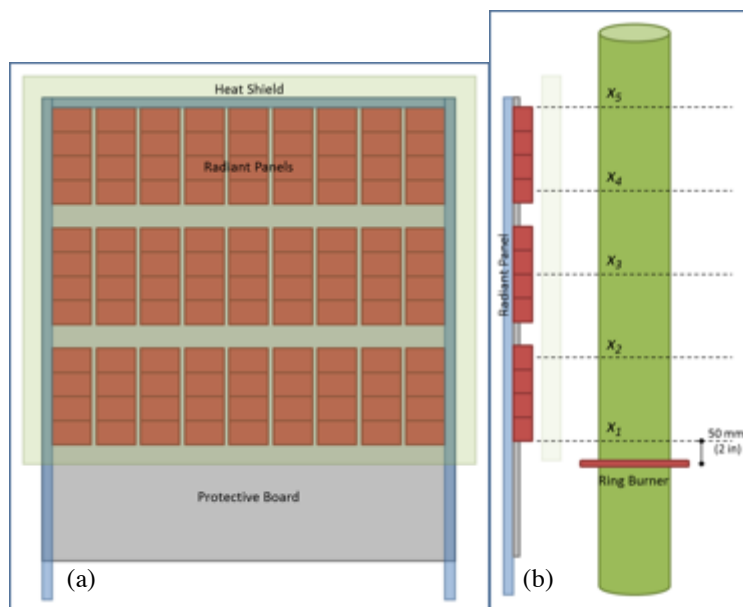


Figure 1. Pole test setup showing (a) radiant panel and (b) pole with ring burner.

After 5 min exposure with the radiant panel, a gas ring burner was ignited to provide an additional convective flame source applied to the pole. The ring burner consisted of 19" diameter metal ring with 26 center-directed holes each 1/8". The burner was placed concentrically around pole, 2" below the bottom of the radiant panel. The gas supplied to the burner produced a net output of 40 kW. This burner was applied to the pole for an additional 5 min (10 min total), after which the burner was turned off and the heat shield for the radiant panel was put back in place.

Following the fire application, the sample was moved away from the radiant panel and within 5 min exposed to a fan with a horizontal wind speed of 2.0 m/s. This fan was applied to the pole

sample for either 4 hr or until the sample temperature (measured by infrared) was below 100°C (maximum temperature).

SAMPLE DESCRIPTION

Three metal pole samples were tested (Figure 2). Each pole was 7' tall and hollow with some sort of cap on the top of each, some vented and some sealed. Specific drawings for each pole are shown in APPENDIX: SAMPLE DRAWINGS. The circumference was measured of each pole at distanced from the bottom of the pole: $x_1 = 16''$, $x_2 = 29\frac{1}{2}''$, $x_3 = 43''$, $x_4 = 56\frac{1}{2}''$, $x_5 = 70''$.

Circumference measurements for each pole sample are as follows:

- Test 1: E AGG166A-01 424052-1-1 SWR Weathering. $x_1 = 24\frac{3}{4}''$, $x_2 = 24''$, $x_3 = 23\frac{3}{8}''$, $x_4 = 22\frac{3}{4}''$, $x_5 = 22\frac{1}{4}''$.
- Test 2: E AGG267A-01 424052-1-1 SW Sided Galvanized. $x_1 = 28\frac{5}{8}''$, $x_2 = 28\frac{3}{8}''$, $x_3 = 27\frac{5}{8}''$, $x_4 = 27\frac{1}{8}''$, $x_5 = 26\frac{3}{4}''$.
- Test 3: B AGG268A 1 424377 6 SWR Powder coat. $x_1 = 32\frac{3}{4}''$, $x_2 = 32\frac{1}{2}''$, $x_3 = 31\frac{7}{8}''$, $x_4 = 31\frac{1}{4}''$, $x_5 = 30\frac{3}{4}''$.

The bottom of the pole was insulated so that edge effects were limited during the fire and wind portions of the test.



Figure 2. Pole samples before test showing (a) Test 1, (b) Test 2, and (c) Test 3.

TEST RESULTS

Tests were performed on November 15, 2018 by WFCi personnel. Individual observations and sample infrared temperatures are detailed for each test below. Various representatives from Valmont and Southern Cal Edison witnessed the tests.

Test 1**Test Date & Time:** 11/15/18, 9:45 AM (18°C, 49%)**Test Apparatus:** ICAL panel under hood calorimeter

Table 1. Observations from Test 1.

Time (mm:ss)	Event
00:00	Open shield – start test
01:45	Smoking at pole base
04:00	Bulging of coating
05:00	Ring burner turned on – ignition of coating
05:30	Dripping material
10:00	Shield closed – ring burner turned off – roll back pole for wind
10:20	Fan turned on
10:30	Flames out
17:00	IR 180°C
22:30	IR 110°C
40:00	IR 59°C – terminate test

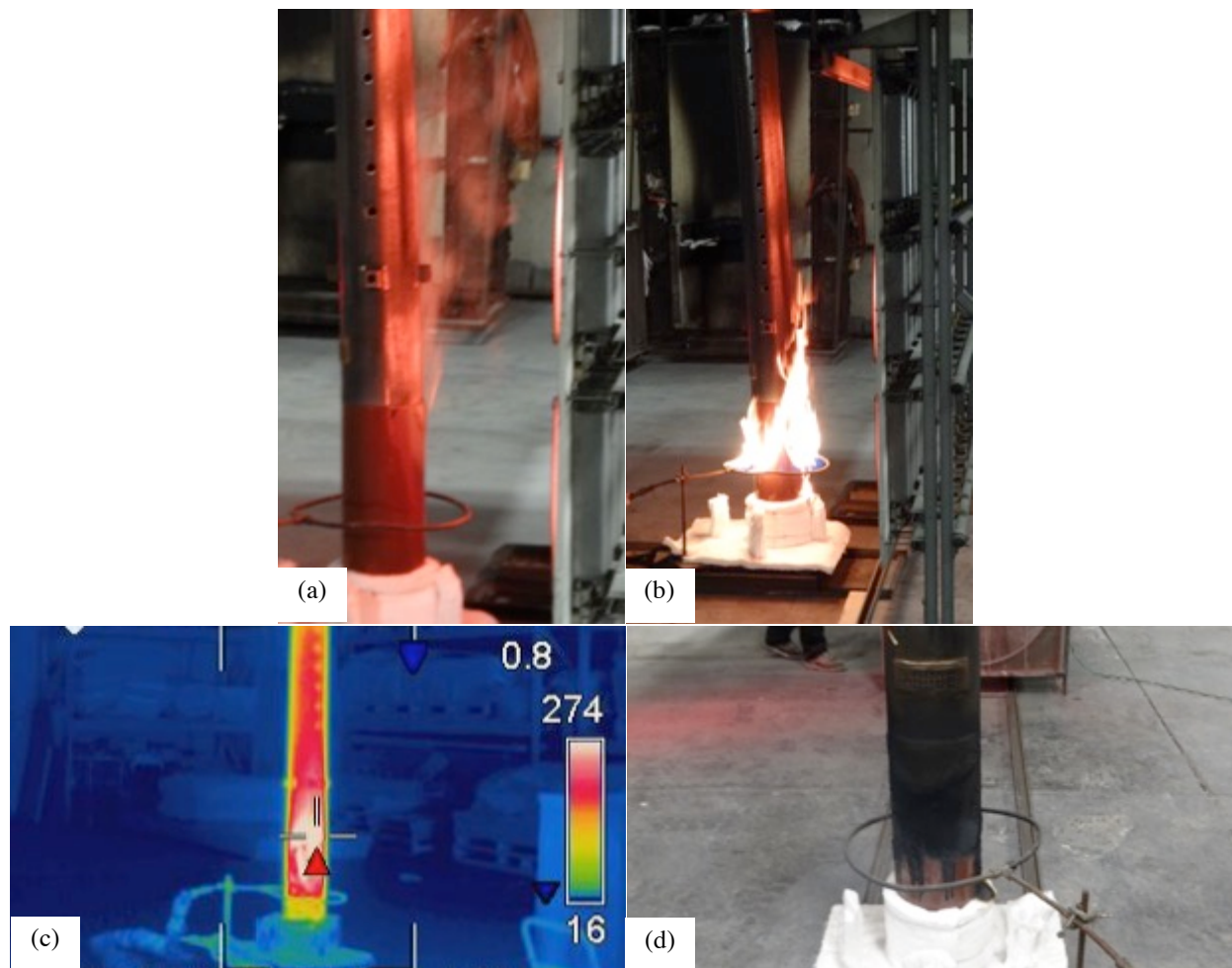


Figure 3. Test 1 showing (a) smoking, (b) ring burner, (c) IR in wind, and (d) after test.

No significant damage was observed of the metal pole. Some of the coating on the lower portion had deteriorated and bulged. The pole was returned to the client.

Test 2

Test Date & Time: 11/15/18, 10:45 AM (19°C, 47%)

Test Apparatus: ICAL panel under hood calorimeter

Table 2. Observations from Test 2.

Time (mm:ss)	Event
00:00	Open shield – start test
00:40	Smoking at pole base
03:00	Increased smoking – bubbling coating
05:00	Ring burner turned on – ignition of coating
10:00	Shield closed – ring burner turned off – roll back pole for wind
10:10	Flames out
10:25	Fan turned on

14:00	IR 260°C
20:00	IR 140°C
31:00	IR 75°C
44:00	IR 60°C
45:00	Terminate test

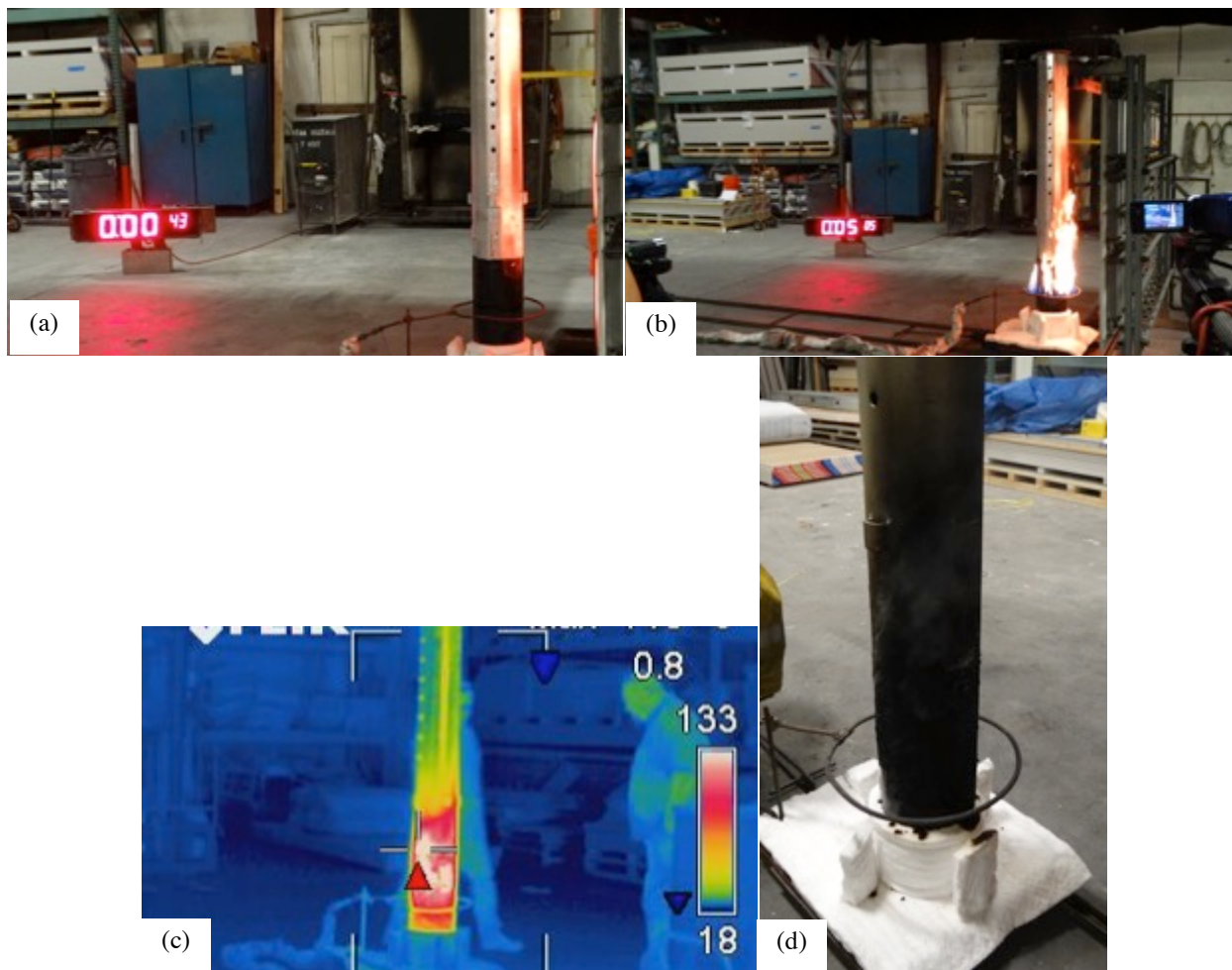


Figure 4. Test 2 showing (a) darkening, (b) ring burner, (c) IR in wind, and (d) after test.

No significant damage was observed of the metal pole. Some of the coating on the lower portion had deteriorated and bulged. The pole was returned to the client.

Test 3

Test Date & Time: 11/15/18, 1:35 PM (20°C, 42%)

Test Apparatus: ICAL panel under hood calorimeter

Table 3. Observations from Test 3.

Time (mm:ss)	Event
00:00	Open shield – start test

02:30	Light smoke from pole base
03:50	Warping of coating – increased smoke
05:00	Ring burner turned on – intermittent flames of coating
05:20	Attached flames near top
06:00	Charred coating – reduced flames
08:30	Minimal flames
10:00	Shield closed – ring burner turned off – roll back pole for wind
10:25	Fan turned on
12:00	IR 360°C
25:00	IR 115°C
39:30	IR 53°C
40:00	Terminate test

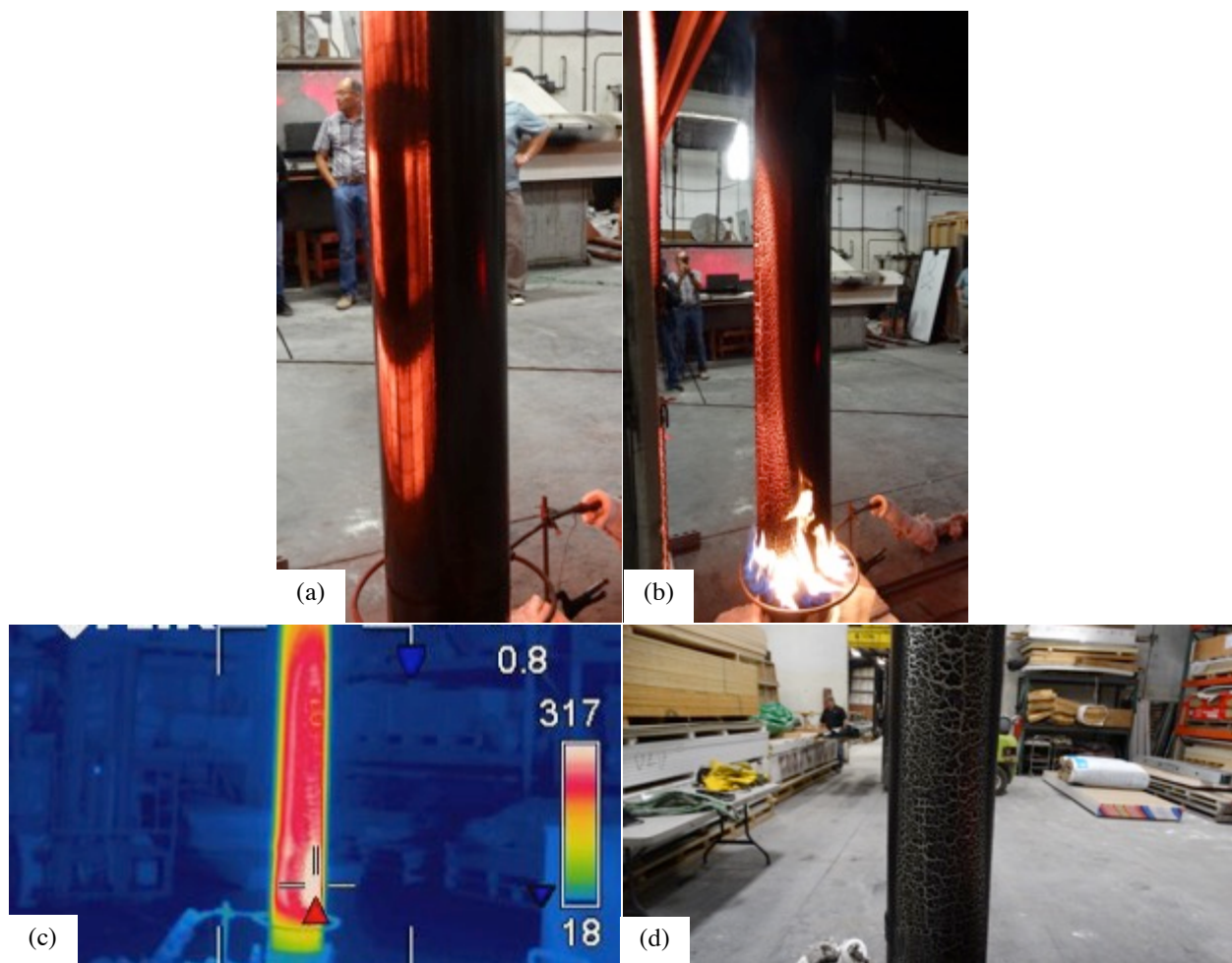


Figure 5. Test 3 showing (a) smoking, (b) ring burner, (c) IR in wind, and (d) after test.

No significant damage was observed of the metal pole. Some of the coating on the lower portion had deteriorated and bulged. The pole was returned to the client.

SUMMARY

Three metal poles were tested according to a proposed standard for utility poles by exposing them to radiative heat, convective flames, and wind. No/little damage was observed to the poles following the tests.

SIGNATURES

Testing performed by,



Brent M. Pickett, Ph.D.

Technical Director

Reviewed and Approved by,



Mike White

Laboratory Manager

**WESTERN FIRE CENTER AUTHORIZES THE CLIENT NAMED HEREIN TO
REPRODUCE THIS REPORT ONLY IF REPRODUCED IN ITS ENTIRETY**

The test specimen identification is as provided by the client and WFCi accepts no responsibilities for any inaccuracies therein. WFCi did not select the specimen and has not verified the composition, manufacturing techniques or quality assurance procedures.

Version	Date Issued	Document Number	Changes
Original	January 16, 2019	18050a	Original report
Revision 1	January 31, 2019	18050ar1	Added panel temperature at request of client

Test 1

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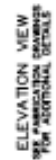
7'-0.00"

ELEVATION VIEW
SEE ASSOCIATION DRAWINGS
FOR ADDITIONAL DETAILS

BILL OF MATERIAL			
ITEM	DESCRIPTION	QUANTITY	UNIT
1	POLE	1	EA
2	BRACKET	1	EA
3	WELD	1	EA
4	FLANGE	1	EA
5	WELD	1	EA
6	FLANGE	1	EA
7	WELD	1	EA
8	FLANGE	1	EA
9	WELD	1	EA
10	FLANGE	1	EA
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97	WELD	1	EA
98	FLANGE	1	EA
99	WELD	1	EA
100	FLANGE	1	EA

Test 2

[illegible]



Test 3

[illegible]

