



**WESTERN FIRE CENTER, INC.**

2204 Parrott Way, Kelso, Washington 98626  
Phone: 360-423-1400 | Fax: 360-423-5003

# 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**

## **TABLE OF CONTENTS**

<b>TABLE OF CONTENTS .....</b>	<b>2</b>
<b>INTRODUCTION .....</b>	<b>3</b>
<b>SUMMARY OF TEST METHOD .....</b>	<b>3</b>
<b>SAMPLE DESCRIPTION .....</b>	<b>4</b>
<b>TEST RESULTS .....</b>	<b>4</b>
TEST 1.....	5
TEST 2.....	6
TEST 3.....	7
<b>SUMMARY .....</b>	<b>9</b>
<b>SIGNATURES .....</b>	<b>10</b>
<b>APPENDIX: SAMPLE DRAWINGS .....</b>	<b>11</b>
TEST 1.....	11
TEST 2.....	13
TEST 3.....	15

## 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/m<sup>2</sup>) on a 1 m<sup>2</sup> 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/m<sup>2</sup>, approximately a 15" distance from radiant heaters to sample face.

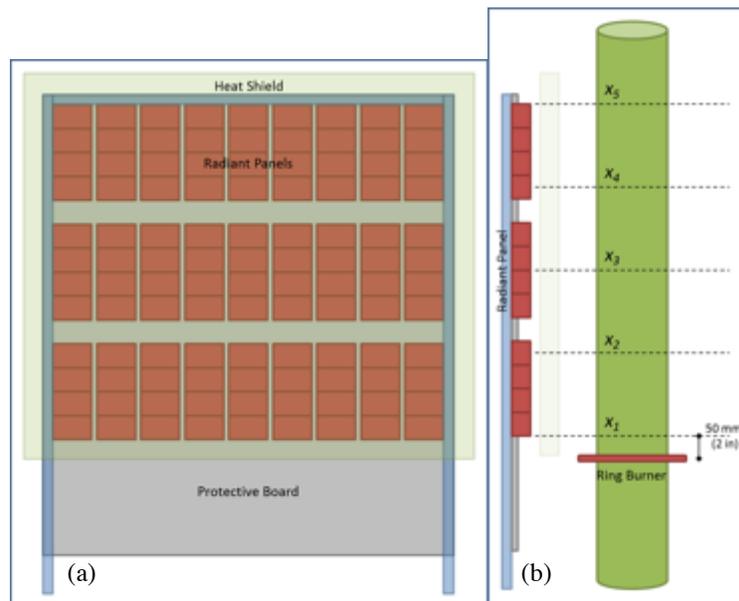


Figure 1. Pole test setup showing (a) radiant panel and (b) pole with ring burner.

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

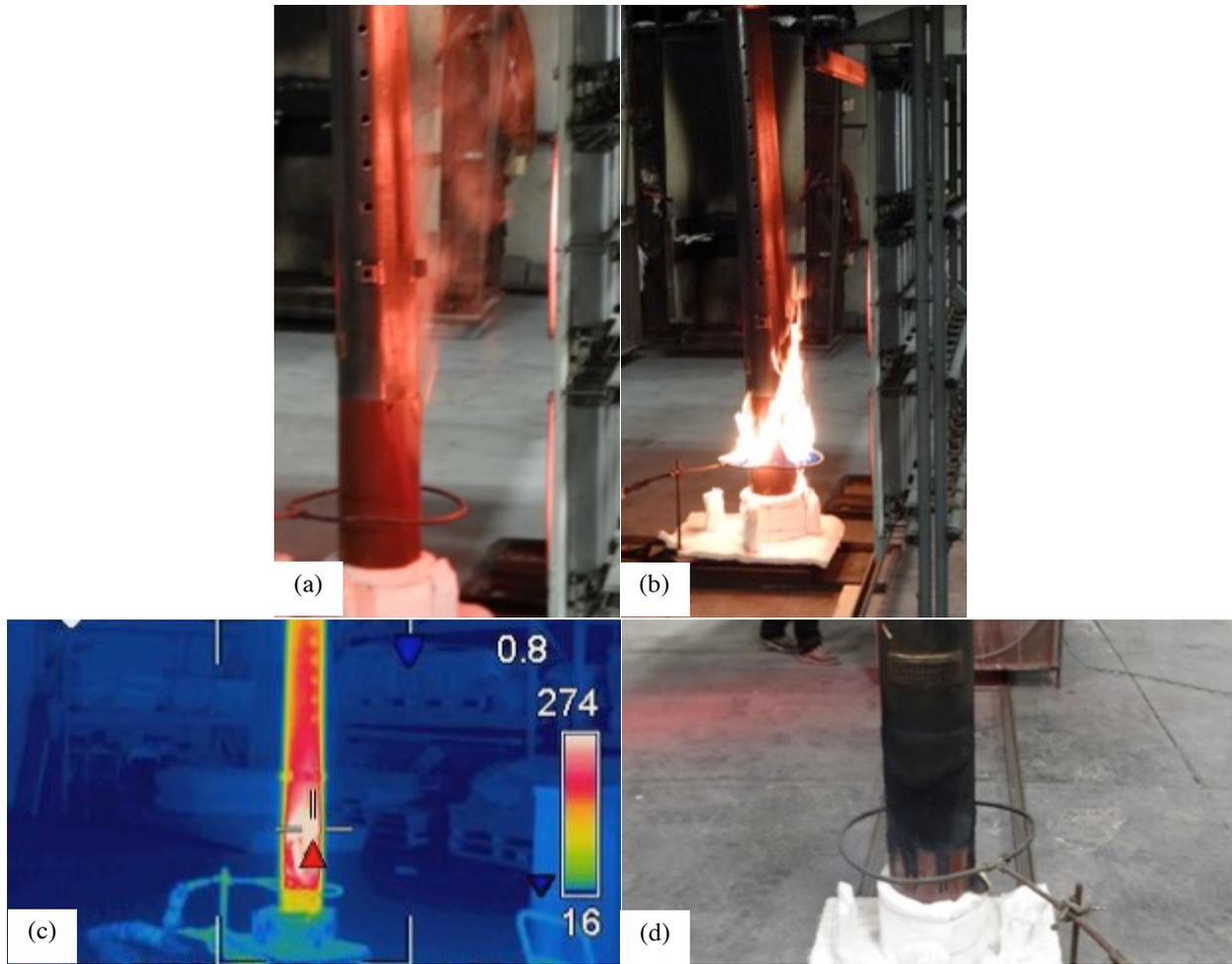


Figure 3. Test 1 showing (a) smoking, (b) ring burner, (c) IR in wind, and (d) after test.

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

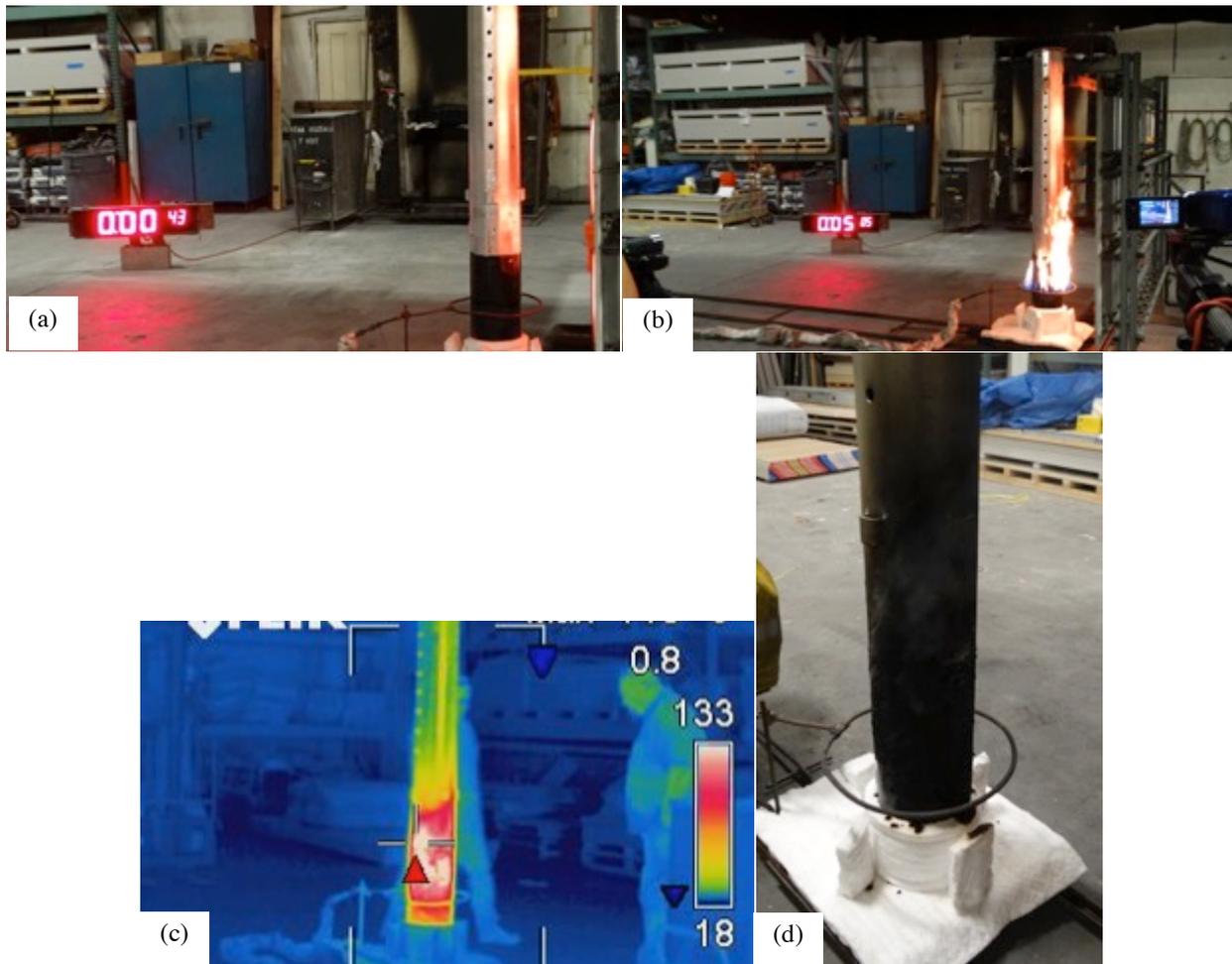


Figure 4. Test 2 showing (a) darkening, (b) ring burner, (c) IR in wind, and (d) after test.

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

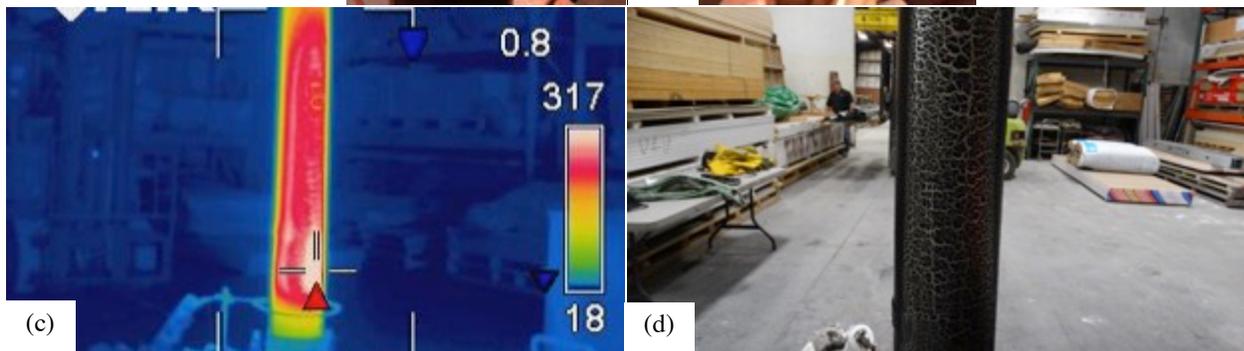


Figure 5. Test 3 showing (a) smoking, (b) ring burner, (c) IR in wind, and (d) after test.

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.

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



7'-0.00"

ELEVATION VIEW  
SEE ASSOCIATION DRAWINGS  
FOR ADDITIONAL DETAILS

BILL OF MATERIAL		QUANTITY	
ITEM NO.	DESCRIPTION	AMOUNT	UNIT
1	SECTION ASSEMBLY		
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			
36			
37			
38			
39			
40			
41			
42			
43			
44			
45			
46			
47			
48			
49			
50			
51			
52			
53			
54			
55			
56			
57			
58			
59			
60			
61			
62			
63			
64			
65			
66			
67			
68			
69			
70			
71			
72			
73			
74			
75			
76			
77			
78			
79			
80			
81			
82			
83			
84			
85			
86			
87			
88			
89			
90			
91			
92			
93			
94			
95			
96			
97			
98			
99			
100			

SEE CATALOG NUMBER

DUPLICATE DRAWINGS DISTRIBUTION: RIDGECREST TEST 7 WEA STEEL POLE ROUND TEST  
DRAW SIZE B CLASS CODE (1) CLASS HAZ. CLASS

TULSA

DATE: 07/27/2017  
DRAWING DESCRIPTION: WEA STEEL POLE ROUND TEST  
PROJECT: WEA STEEL POLE ROUND TEST  
SHEET NO. OF TOTAL SHEETS: 12 OF 12



7'-0.00"

ELEVATION VIEW  
FOR ADDITIONAL DETAILS

NOTE: INSTALL LAMP BEFORE SHIPPING  
P.O. # 18050

**BILL OF MATERIAL**  
 (SHIPPING SUBJECT FOR L&M)

VALUENT NAME	DESCRIPTION	UNIT	QTY
ASSEMBLY	SECTION ASSEMBLY	EA	1

VALUENT PART NAME	DESCRIPTION	GENERAL	SPEC
ASSEMBLY	SECTION ASSEMBLY		

SW CATALOG NUMBER: VMS-007

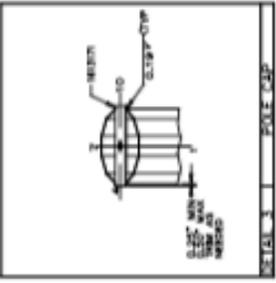
DUPLICATE DRAWING DISTRIBUTION: HELMETS 7, JAW, 3 DEL. FILE, 3 DEL. TEST, CLASS CODE (1), CLASS NO. (2) 18050

REVISION DESCRIPTION: REVISED

DATE: 10/10/18

BY: [Signature]

Test 3



0.25" MIN. WELD  
0.25" MIN. WELD  
0.25" MIN. WELD

DETAIL 1

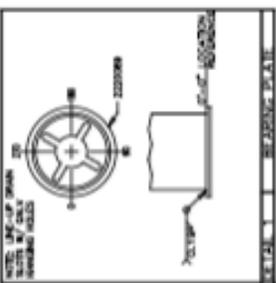


WELD JOINT

WELD METAL ON WELD FOR BEST FIT IF NECESSARY  
INDICATED IN SECTION VIEWS FOR WELDED  
CONNECTIONS. SEE WELDING SYMBOLS AND WELDING  
INSTRUCTIONS IN T.B.S. 1.

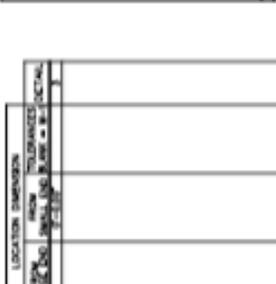
A = MANUFACTURER'S SPEC. (SEE CHARACTERISTICS)  
B = MANUFACTURER'S WELDING SYMBOLS (SEE CHARACTERISTICS)  
C = MANUFACTURER'S WELDING NUMBER (SEE CHARACTERISTICS)  
D = WELDING SYMBOL NUMBER (SEE CHARACTERISTICS)  
E = WELDING SYMBOL NUMBER (SEE CHARACTERISTICS)  
F = WELDING SYMBOL NUMBER (SEE CHARACTERISTICS)

DETAIL 2



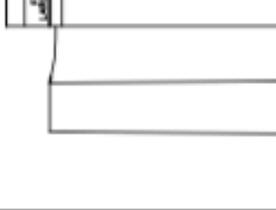
WELD METAL ON WELD FOR BEST FIT IF NECESSARY  
INDICATED IN SECTION VIEWS FOR WELDED  
CONNECTIONS. SEE WELDING SYMBOLS AND WELDING  
INSTRUCTIONS IN T.B.S. 1.

DETAIL 3



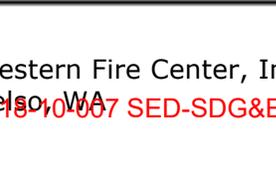
WELD METAL ON WELD FOR BEST FIT IF NECESSARY  
INDICATED IN SECTION VIEWS FOR WELDED  
CONNECTIONS. SEE WELDING SYMBOLS AND WELDING  
INSTRUCTIONS IN T.B.S. 1.

DETAIL 4



WELD METAL ON WELD FOR BEST FIT IF NECESSARY  
INDICATED IN SECTION VIEWS FOR WELDED  
CONNECTIONS. SEE WELDING SYMBOLS AND WELDING  
INSTRUCTIONS IN T.B.S. 1.

DETAIL 5



WELD METAL ON WELD FOR BEST FIT IF NECESSARY  
INDICATED IN SECTION VIEWS FOR WELDED  
CONNECTIONS. SEE WELDING SYMBOLS AND WELDING  
INSTRUCTIONS IN T.B.S. 1.

NOTES:

1. ALUMINUM SEAM WELD JOINT FROM FEATURES.
2. ALL CROSS SECTION VIEWS ARE FROM SMALL END OF TUBE.
3. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
4. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE SPECIFIED.
5. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE SPECIFIED.
6. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE SPECIFIED.
7. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE SPECIFIED.
8. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE SPECIFIED.
9. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE SPECIFIED.
10. ALL DIMENSIONS ARE TO CENTERLINE UNLESS OTHERWISE SPECIFIED.

WELD SEAM LOCATED 8 3/4"

LOCATE FEATURES FOR



POLE ORIENTATION  
SEAM LOCATED ALL DIMENSIONS  
CONSIDERED FROM  
CENTERLINE OF

BILL OF MATERIALS

ITEM NO.	DESCRIPTION	QTY
1	WELD METAL	1
2	WELD METAL	1
3	WELD METAL	1
4	WELD METAL	1
5	WELD METAL	1
6	WELD METAL	1
7	WELD METAL	1
8	WELD METAL	1
9	WELD METAL	1
10	WELD METAL	1
11	WELD METAL	1
12	WELD METAL	1
13	WELD METAL	1
14	WELD METAL	1
15	WELD METAL	1
16	WELD METAL	1
17	WELD METAL	1
18	WELD METAL	1
19	WELD METAL	1
20	WELD METAL	1
21	WELD METAL	1
22	WELD METAL	1
23	WELD METAL	1
24	WELD METAL	1
25	WELD METAL	1
26	WELD METAL	1
27	WELD METAL	1
28	WELD METAL	1
29	WELD METAL	1
30	WELD METAL	1
31	WELD METAL	1
32	WELD METAL	1
33	WELD METAL	1
34	WELD METAL	1
35	WELD METAL	1
36	WELD METAL	1
37	WELD METAL	1
38	WELD METAL	1
39	WELD METAL	1
40	WELD METAL	1
41	WELD METAL	1
42	WELD METAL	1
43	WELD METAL	1
44	WELD METAL	1
45	WELD METAL	1
46	WELD METAL	1
47	WELD METAL	1
48	WELD METAL	1
49	WELD METAL	1
50	WELD METAL	1
51	WELD METAL	1
52	WELD METAL	1
53	WELD METAL	1
54	WELD METAL	1
55	WELD METAL	1
56	WELD METAL	1
57	WELD METAL	1
58	WELD METAL	1
59	WELD METAL	1
60	WELD METAL	1
61	WELD METAL	1
62	WELD METAL	1
63	WELD METAL	1
64	WELD METAL	1
65	WELD METAL	1
66	WELD METAL	1
67	WELD METAL	1
68	WELD METAL	1
69	WELD METAL	1
70	WELD METAL	1
71	WELD METAL	1
72	WELD METAL	1
73	WELD METAL	1
74	WELD METAL	1
75	WELD METAL	1
76	WELD METAL	1
77	WELD METAL	1
78	WELD METAL	1
79	WELD METAL	1
80	WELD METAL	1
81	WELD METAL	1
82	WELD METAL	1
83	WELD METAL	1
84	WELD METAL	1
85	WELD METAL	1
86	WELD METAL	1
87	WELD METAL	1
88	WELD METAL	1
89	WELD METAL	1
90	WELD METAL	1
91	WELD METAL	1
92	WELD METAL	1
93	WELD METAL	1
94	WELD METAL	1
95	WELD METAL	1
96	WELD METAL	1
97	WELD METAL	1
98	WELD METAL	1
99	WELD METAL	1
100	WELD METAL	1

