

te company

REPORT ON FLAME TEST CONDUCTED ON CABLE AND RACEWAY SYSTEM

October 19, 1977

TEST NO. 77 VG-48-C

Ref. No. 3

I. OBJECTIVE

The objective of this flame test is to demonstrate that the cable and raceway, as tested, will not propagate a fire when exposed to an IEEE 383-74 flame source.

II. CABLE AND RACEWAY TESTED

4/c #12 and 4/c #10, 1 KV, polyethylene insulation, PVC jacketed cable installed in a steel vent tray with a steel rib cover (to simulate vent rib tray). The cables, tray, and cover were coated with Flamemastic.

III. TEST FACILITY

The test was conducted on September 6, 1977 at The Kerite Company Fire Test Facility. An American Gas Furnace Company ten-inch wide ribbon burner was used to provide the flame source. A direct readout Omega pyrometer was used in conjunction with a thermocouple to monitor flame temperature throughout the test. A laboratory timer was used to measure the duration of the test. The test specimen was installed in the 12-inch wide, 11-inch deep, 11-foot high tray. A 240 volt power source was used to monitor the electrical integrity during the test.

IV. TEST PROCEDURE

Two layers of 10 foot lengths of test cable were mounted in the tray with no cable spacings. Each layer consisted of 15 cables, half from each make-up, placed in an alternating sequence, for a total of 30 cables. Six cables were chosen at random, three from each layer, and energized with the 240 volt power source.

The flame source was adjusted so that the temperature was approximately 1500° F and approximately 15 inches in length. Under dynamic conditions, the following panometer readings were recorded for both air and fuel in centimeters of water:

<u>Air</u>	<u>Fuel</u>
4.7	2.8

REPORT ON FLAME TEST
CONDUCTED ON CABLE
AND RACEWAY SYSTEM

2.

TEST NO. 77 VG-48-C

October 19, 1977

These pressures were measured for both air and fuel at the inlet of the mixer.

The flame source was placed on the front side of the tray at a three-inch distance from the cables and allowed to burn for twenty minutes. At the end of twenty minutes, the flame source was shut off and the cables allowed to burn until they self-extinguished or were totally consumed. All pertinent data was recorded. The temperatures indicated in the next section were measured by a thermocouple located 2-7/8" from the burner face.

TEST DATA

Time for specimen to ignite:	Within the first three minutes
Time specimen continued to burn after removal of flame source:	5 minutes
Maximum length of sample damage:	48 inches
Time for electrical breakdown:	9 minutes, 33 seconds (line one to ground)
Heat input	61,300 BTU/hr.

rite company

REPORT ON FLAME TEST
CONDUCTED ON CABLE
AND RACEWAY SYSTEM

3.

TEST NO. 77 VG-48-C

October 19, 1977

E - Test Data - Continued)

<u>Minutes</u>	<u>Flame Impingement Temperature (~ F)</u>
Start	1400
1	1450
2	1350
3	1300
4	1250
5	1250
6	1250
7	1250
8	1250
9	1250
10	1250
11	1250
12	1250
13	1250
14	1250
15	1250
16	1250
17	1250
18	1250
19	1250
20	1250

F. ATTESTATION

The above test was personally witnessed by the undersigned and the data presented above is accurate and complete to the best of my knowledge and belief.

VO:mc

APPROVED

Paul D. Basconi
Paul D. Basconi, Mechanical Eng.

John V. Osborn
John V. Osborn, Technician

Subscribed and sworn to before me this 25 day of October, 1977.

Jane Hill
Notary Public

My Commission
Expires March 31, 1979

**REPORT ON FLAME TEST
CONDUCTED ON CABLE AND RACEWAY SYSTEM**

October 19, 1977

Test No. 77 VG 58-C

Ref. No. 8

A. OBJECTIVE

The objective of this flame test is to demonstrate that the cable and raceway, as tested, will not propagate a fire when exposed to an IEEE 383-74 flame source.

B. CABLE AND RACEWAY TESTED

Seven conductor No. 12 and four conductor No. 10, 1 KV, polyethylene insulation, PVC jacketed cable, installed in a steel vent tray with a vent rib cover (to simulate steel vent rib tray).

C. TEST FACILITY

The test was conducted on September 9, 1977 at The Kerite Company Fire Test Facility. An American Gas Furnace Company 10-inch wide ribbon burner was used to provide the flame source. A direct readout Omega pyrometer was used in conjunction with a thermocouple to monitor flame temperature throughout the test. A laboratory timer was used to measure the duration of the test. The test specimen was installed in a 12-inch wide, 3-inch deep, 11-foot high tray. A 240 volt power source was used to monitor the electrical integrity during the test.

D. TEST PROCEDURE

Two layers of 10 foot lengths of test cable were mounted in the tray with no cable spacings. Each layer consisted of fifteen cables, half from each makeup, placed in an alternating sequence, for a total of thirty cables. Six cables were chosen at random, three from each layer, and energized with the 240 volt power source.

Test No. 77 VG 58-C
Ref. No. 8

The flame source was adjusted so that the temperature was approximately 500°F and approximately 15 inches in length. Under dynamic conditions, the following manometer readings were recorded for both air and fuel in centimeters of water:

<u>Air</u>	<u>Fuel</u>
4.5	2.9

These pressures were measured for both air and fuel at the inlet of the mixer.

The flame source was placed on the front side of the tray at a 3-inch distance from the cables and allowed to burn for twenty minutes. At the end of twenty minutes, the flame source was shut off and the cables allowed to burn until they self-extinguished or were totally consumed. All pertinent data was recorded. The temperatures indicated in the next section were measured by a thermocouple located 2 ⁷/₈" from the burner face.

E. TEST DATA*

- | | |
|---|--|
| 1. Time for specimen to ignite: | Within the first three minutes. |
| 2. Time specimen continued to burn after removal of flame source: | Was not recorded. |
| 3. Maximum length of sample damage: | Cable samples totally consumed. |
| 4. Time for electrical breakdown: | 4 minutes, 45 seconds (Line two to ground)
5 minutes, 1 second (Line one) |
| 5. Heat input | 63,000 BTU/hr. |

Because of the severity of the smoke and fire, the test was halted at 15 minutes.

Test No. 77 VG 58-C
Ref. No. 8

Test Data cont'd)

6.	Minutes	Flame Impingement Temperature (°F)
	Start	
	1	1450
	2	1150
	3	1150
	4	1225
	5	1250
	6	1250
	7	1225
	8	1225
	9	1275
	10	1275
	11	1225
	12	1225
	13	1275
	14	1275
	15	1225
		1300
		1350
		1400
		1450

F. ATTESTATION

The above test was personally witnessed by the undersigned and the data presented above is accurate and complete to the best of my knowledge and belief.

VO/dm

John V. Osborn
John V. Osborn, Technician

APPROVED

Paul D. Basconi
Paul D. Basconi, Mechanical Engineer

Subscribed and sworn to before me this 25 day of October, 1977.

Jane Hill
Notary Public
My Commission
Expires March 31, 1979

APPENDIX C

COMPLIANCE STATUS

DOCKET NO. 50-336

JULY, 1982

<u>FIRE ZONE</u>	<u>CURRENT COMPLIANCE</u>	<u>WILL COMPLY</u>	<u>EXEMPTION REQUESTED</u>	<u>PROPOSED MODIFICATIONS</u>
A-1A	-	✓	-	<p>Spare parts (equipment-cabling) will be stored on site to support necessary repairs that may be required to achieve cold shutdown.</p> <p>Repair procedures will be developed to assure that cables needed to achieve cold shutdown will be repaired promptly.</p>
A-1B	-	-	✓	<p>Provide a 1-hour fire rated enclosure to charging pump cables as shown on drawing 34022 (Charging Pump Train A and A-swing).</p> <p>Stock spare parts (connectors-cabling) required to support post fire repairs to cold shutdown equipment.</p> <p>Repair procedures will be developed to assure that cables needed for cold shutdown will be repaired promptly.</p>
A-2	✓	-	-	None
A-3	✓	-	-	None
A-4	✓	-	-	None
A-5	-	✓	-	<p>Spare parts (connectors-cabling) will be stocked on site to support repair of cables needed for cold shutdown.</p> <p>Repair procedures will be developed to assure that cables needed for cold shutdown can be temporarily repaired.</p>
A-7	✓	-	-	None
A-8	✓	-	-	None

<u>FIRE ZONE</u>	<u>CURRENT COMPLIANCE</u>	<u>WILL COMPLY</u>	<u>EXEMPTION REQUESTED</u>	<u>PROPOSED MODIFICATIONS</u>
A-9	-	-	✓	<p>Provide a fire rated enclosure to charging pump cables Train A and B.</p> <p>Install a curb/dike at front of each charging pump cubicle.</p>
A-14	-	-	✓	<p>A barrier consisting of existing HVAC duct work and Marinite board will be provided.</p> <p>Spare parts (equipment-cabling) will be stored on site to support necessary repairs that may be required to achieve cold shutdown.</p> <p>Repair procedures will be developed to assure that cables/equipment needed for cold shutdown will be repaired.</p>
A-15	-	✓	-	<p>Spare parts (equipment-cabling) will be stored on site to support necessary repairs that may be required to achieve cold shutdown.</p> <p>Repair procedures will be developed to assure that cables/equipment needed for cold shutdown will be repaired.</p>
A-19	✓	-	-	None
A-24	-	-	✓	<p>Sprinkler protection will be installed for this area to provide a water curtain between safe shutdown cables.</p> <p>Provide a fire rated enclosure to diesel Train A cables.</p> <p>Spare parts (equipment-cabling) will be stored on site to support necessary repairs that may be required to achieve cold shutdown.</p> <p>Repair procedures will be developed to assure that cables/equipment needed for cold shutdown will be repaired.</p>
A-25	✓	-	-	None

<u>FIRE ZONE</u>	<u>CURRENT COMPLIANCE</u>	<u>WILL COMPLY</u>	<u>EXEMPTION REQUESTED</u>	<u>PROPOSED MODIFICATIONS</u>
A-26	✓	-	-	None
A-27D	✓	-	-	None
A-28	✓	-	-	None
A-29	✓	-	-	None
A-35	✓	-	-	None
A-36	✓	-	-	None
A-37	✓	-	-	None
A-40	-	-	✓	Extend automatic wet-piped sprinkler system to include diesel power cables Train A. Customized administrative controls will be developed to assure that no flammable liquids are allowed in cable vault.
A-41	✓	-	-	None
A-42	-	-	✓	Customized administrative controls will be developed to assure that no flammable liquids are allowed in control room. Install fire rated damper or equivalent to louvered openings of the main control board and its auxiliary cabinets. Seal all openings between the cabinets and the floor so a spilled flammable liquid would not enter. Install ramps (1/8" to 1') to direct spilled flammable liquid away from required auxiliary cabinets.

COMPLIANCE STATUS WITH APPENDIX R

<u>FIRE ZONE</u>	<u>CURRENT COMPLIANCE</u>	<u>WILL COMPLY</u>	<u>EXEMPTION REQUESTED</u>	<u>PROPOSED MODIFICATIONS</u>
T-4	-	✓	-	Will incorporate an electrical isolation control transfer scheme in required control circuits.
T-5	✓	-	-	None
T-6	✓	-	-	None
T-7	✓	-	-	None
T-8	✓	-	-	None
T-9	-	-	✓	None
T-10	-	✓	-	Provide a fire rated enclosure for service water cables (Z-1). Provide a fire rated enclosure for service water cables (Z-5).
I-1	-	-	✓	Enclose/wrap all cabling/conduit associated with service water pump Train A. Provide dike/curbing around each service pump.
C-1 Trhu C-6	-	✓	-	A radiant energy shield will be installed between redundant pressurizer instrumentation cables.

MODIFICATION RESULTING FROM ASSOCIATED CIRCUITS REVIEW

Provide AC-independence for the discharge valves associated with the auxiliary feedwater system. Details are provided in the W. G. Council letter to D. G. Eisenhower dated December 31, 1981.