INDUSTRIAL TESTING LABORATORIES inc.

Chemists
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2350 Seventh Blvd. • St. Louis, Missouri 63104 | 314/771-7111

Report No. 79-9-40 September 6, 1979

Determination of Thermal Transmission characteristics of a two-inch thick "Pyrocrete 241" coating.

Carboline Company
350 Hanley Industrial Court
St. Louis, Mo. 63144

Attn: Mr. Chris F. Magdalin
Technical Director
Fireproofing Products DIV.

REF: Public Service Electric and Gas Company

TEST REPORT

A. INTRODUCTION

The purpose of this investigation was to determine the time required for the unexposed side of "Pyrocrete 241" to reach 250° F. above ambient when exposed to the standard ASTM E-119 Time/Temperature curve.

B. MATERIAL DATA

1. System:
   a. Steel plate 2' x 2' (16 gauge).
   b. 3.4 galvanized metal lath wrapped completely around panel.
   c. "Pyrocrete 241."

2 Application:

"Pyrocrete 241" trowel applied to a thickness of two inches.

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3. Cure:

Thirty (30) days at +70° ±5° F. and 50-60% relative humidity.

C. TEST PROCEDURE:

1. Expose "Pyrocrete 241" to the standard ASTM E-119 Time/Temperature curve.
2. Record ambient temperature.
3. Measure the temperature of unexposed uninsulated back side of the steel panel with five thermocouples (thermocouples covered with 2" x 2" insulating refractory).
4. Position of the thermocouples - see Diagram #1.
5. Record that time the average of all five thermocouples reached 250° F. above ambient.

D. SUMMARY

During the fire tests, thermocouple measurements were made of both furnace and specimen temperatures.

According to ASTM E-119, both the furnace control and the area developed under the Time/Temperature curve be achieved by averaging the thermocouple readings within the noted limitations: (1) 10 percent of the corresponding area under the standard curves, Time/Temperature curve, for fire tests of one hour or less fire durations; (2) 7.5 percent for fire duration over

one hour and not more than two hours; (3) and within five percent for tests exceeding two hours.

Examination of the furnace temperature charts (Chart 1) revealed that the requirements for furnace control were achieved.

The specimen temperature was measured by means of five thermocouples positioned as shown on the temperature chart (Chart 2).

Approximately 195 minutes into the fire test, thermocouple #14 started to read slightly cooler than the other four thermocouples. After 210 minutes, thermocouple #4 was 19° F. cooler than the average of the other four; however, there was no indication that the thermocouple was reading incorrectly during the test.

If thermocouple #4 were not to be included in the average, the specimen would have been considered to have failed after 257 minutes.

Examination of the "Pyrocrete 241" at the conclusion of the fire test revealed there to be no cracking or spalling and only a lightly ablated surface.

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E. CONCLUSION

Based on results of tests conducted and observations made, it is our opinion that the two-inch thickness of "Pyrocrete 241" reached 250 ° F. above ambient at 264 minutes.

Respectfully submitted,

INDUSTRIAL TESTING LABORATORIES, INC.

Allan M. Siegel, P.E.
Director

AMS/mn

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TEST DATA:

TABLE 1

Time in Minutes	Average Temp. (°F) of five Thermocouples	Temp. (°F) of Highest Thermocouples	Temp. (°F) of Aug. Furnace	ASTM E-119 Curve (°F.)
5	79	79	1233	1000
10	79	80	1368	1300
15	82	83	1488	1399
30	129	144	1586	1550
45	186	199	1668	1638
60	196	201	1739	1700
75	197	202	1782	1750
90	197	202	1824	1792
105	198	203	1856	1826
120	198	203	1862	1850
135	199	203	1900	--
150	199	204	1910	1888
165	200	204	1932	--
180	200	204	1928	1925
195	202	207	1952	--
210	216	237	1970	1962
225	239	276	1973	--
240	272	311	2002	2000
255	311	340	2004	--
264	327	344	--	2025

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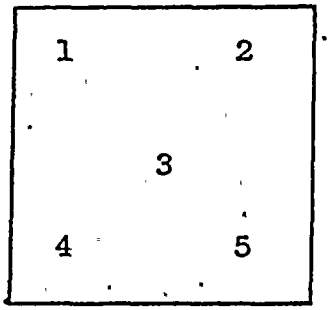
DIAGRAM #1

THERMOCOUPLE POSITIONS OF FURNACE AND THERMAL TRANSMISSION PANEL



1. Unless otherwise specified, furnace thermocouples were positioned to within 12 inches of the test specimen.

2. Furnace thermocouples consisted of 14-gauge Type K single bead ceramic thermocouples in inconel tubes.

3. Panel thermocouples were chromel-aluminel Type K 20-gauge wire with the ends twisted together. They were held against the panel by two pounds of weight separated from the thermocouple by insulation.

4. Panel thermocouple positions were determined by the size of the panel. Number 3 was positioned in the center of the panel with the other four being at the centers of the squares resulting from dividing the panel into four equal areas.