

November 23, 1992

- TITLE:** ASTM E760 Impact Testing of Pyrocrete 241
- DOCUMENT ACCESS NO.:** 08522
- REFERENCE:** L037-119
- PURPOSE:** Determine the effect of impact on a Pyrocrete 241 coated deck.
- CONCLUSIONS:** Impacting a Pyrocrete 241 coated deck by the ASTM E760 has no effect upon the Pyrocrete 241.
- PROCEDURE:**
- I. System
 - A. Pyrocrete 241 @ 1/2"
 - B. 2' x 12' concrete filled cellular deck.
 1. 2' x 12' x 0.060" noncomposite fluted decking with cells 1-1/2" deep, 6" on center.
 2. 2' x 12' x 0.048" galvanized steel base plate.
 3. Two 4" x 24" x 0.048" galvanized steel end plates.
 4. Two 4" x 12' x 0.048" galvanized steel side plates.
 5. Poured in place concrete with a minimum compressive strength of 3000 psi.
 - II. Application
 - A. Weld the large galvanized steel plate to face of the fluted deck.
 - B. Weld the smaller galvanized plates to the sides of the deck so that they rise 2-1/2" above the top plane of the deck.
 - C. Pour the concrete onto the backside of the deck. Smooth and strike off any excess concrete.
 - D. Spray apply the Pyrocrete 241 @ 1/2" the underside of the deck.
 - E. Cure the Pyrocrete 241 for one month minimum at lab ambient conditions.

From the Carboline Research & Development Laboratory

The technical data furnished are true and accurate to the best of our knowledge
However, no guarantee of accuracy is given or implied.

III. Testing

- A. Prepare a sand filled canvas bag with a total weight of 60 lbs.
- B. Support the deck by its bare ends with the Pyrocrete 241 facing downward.
- C. Hoist the sand filled bag 48" above the specimen, then drop it onto the backside of the deck.
- D. Note the condition of the Pyrocrete 241 and any cracking, spalling or delamination that may have occurred.

RESULTS:

ASTM E760 Impact Testing

There was no damage to the Pyrocrete 241 by impacting the deck with a 60 lb. sand filled bag.



Jon Furlong
Developmental Chemist
Fireproofing Products Division

BRANCH OFFICES:

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Philadelphia, Pennsylvania

International Testing Laboratories, Inc.

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Material Testing and Consulting Engineers
Weighers, Samplers and Assayers

578-582 MARKET STREET

NEWARK, N. J. 07105

PHONES: (201) 589-4772-3-4

REPORT OF TEST

No. 565570

DATE September 19, 1991

From Carboline Company
350 Hanley Industrial Court
St. Louis, MO 63144

Purchase
Order No. : LAB 22525 (Jon Furlong)

SAMPLE : 1. Pyrocrete 241
2. Density : 55 lbs./ft.³
3. Thickness : one (1) inch

PURPOSE : Air Erosion Test in accordance with ASTM-E-859-82.

<u>RESULTS</u>	<u>TEST PERIOD</u>	<u>WT. GAIN FOR EACH PERIOD : GRAMS/FT.²</u>
	1 hour	0.0245
	6 hours	0.0093
	24 hours	0.0410

FINDING : The submitted specimen does NOT meet the requirement of ASTM-E-1042-85 of a weight gain not greater than 0.025 grams/ft.² in the 24 hour period after the initial purging.

To Carboline Company
St. Louis, MO. 63144

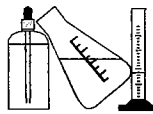


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Our reports pertain to the sample tested only. Information contained herein is not to be reproduced except with our permission.

INTERNATIONAL TESTING LABORATORIES, INC.

DR. M. M. Sackoff



January 8, 1993

TITLE: ASTM E-937 Corrosion Testing of Pyrocrete 241.

REFERENCE: L037-119

DOCUMENT ACCESS NO.: 08530

PURPOSE: Test for corrosion caused by Pyrocrete 241 when tested by the ASTM E-937 "Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members."

CONCLUSION: Pyrocrete 241 tested for corrosion by the ASTM E-937 will cause the following weight losses:

Primed Steel	0.00 g/mm ²
Galvanized Steel	0.00 g/mm ²
Unprimed Steel	0.00 g/mm ²

PROCEDURE:

- I. Systems
 - A. Steel
 - 1. 4-8" x 8" x 0.125" mild carbon steel panels
 - 2. 2-8" x 8" x 0.125" galvanized steel panels
 - B. Carboline 193 LF epoxy
 - C. Pyrocrete 241
- II. Preparation
 - A. Gritblast the mild carbon steel panels
 - B. Record the weights of all of the panels to the nearest 0.1 gram.
 - C. Apply the Carboline 193 LF epoxy to two of the mild carbon steel panels.
 - D. Spray apply 1" of Pyrocrete 241 to one side of the panels.
 - E. Seal the uncoated edges and backsides of all of the panels with Carboline 193 LF epoxy.
 - F. Cure the Pyrocrete 241 at 70°-80°F, 30-80% relative humidity until the panels reach a constant weight (one month minimum).
- III. Testing
 - A. Ambient Panels
 - 1. Remove the Pyrocrete 241 and primer from one of each of the panels.
 - 2. Wire brush any corrosion from the panels.
 - 3. Solvent wipe the panels.
 - 4. Record the weight of each of the panels.
 - B. Humidity Chamber Panels
 - 1. Place the panels into a humidity chamber at 90°F and 70% relative humidity for 240 hours.
 - 2. Remove the panels from the humidity chamber.

From the Carboline Research & Development Laboratory

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tp:da08530



III. Testing (Cont'd)

3. Remove the Pyrocrete 241 and primer from the panels.
4. Wire brush any corrosion from the panels.
5. Solvent wipe the panels.
6. Record the weight of each of the panels.

C. Calculate the weight loss due to corrosion by:

$$D = \frac{(W \text{ initial} - W \text{ final}) \text{ humidity chamber} - (W \text{ initial} - W \text{ final}) \text{ ambient}}{\text{Area}}$$


RESULTS:

See Table 1 for the summary of results.

DISCUSSION:

1. The density of the Pyrocrete 241 applied to the panels was 55 lbs./ft³ when measured by the ASTM E-605 test method for the density of fire resistive materials.
2. Under the ASTM E-937 test procedure, corrosion is given by the difference in weight loss per unit surface area between the panels exposed to the high humidity/temperature chamber and the panels cured under ambient conditions. The accuracy of the weight loss is dependent on how well the Pyrocrete 241 and the primer is cleaned. The wire brush removal of the Pyrocrete and any possible corrosion products combined with the chemical stripping of the primer can cause weighing errors over one gram.

A positive weight loss per unit surface area would indicate that corrosion is occurring under the Pyrocrete 241. A negative weight loss indicates that the panels gained weight but little or no corrosion occurred. The weight gain of the panels is due to weighing errors caused by the cleaning process. A negative weight per unit area is reported as 0.00.


Bruce A. Kröger
Laboratory Technician
Fireproofing Productions Division

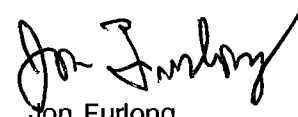

Jon Furlong
Developmental Chemist
Fireproofing Products Division

TABLE 1

SYSTEM	EXPOSURE	PRE-TEST WEIGHT	POST-TEST WEIGHT	WEIGHT LOSS
Primed Mild Carbon Steel	Ambient	1105.6 grams	1106.0 grams	-0.4 grams
Primed Mild Carbon Steel	Humidity Chamber	1104.4 grams	1104.9 grams	-0.5 grams
Galvanized Steel	Ambient	1144.4 grams	1143.9 grams	0.5 grams
Galvanized Steel	Humidity Chamber	1139.2 grams	1136.9 grams	2.3 grams
Unprimed Mild Carbon Steel	Ambient	1104.4 grams	1102.7 grams	1.7 grams
Unprimed Mild Carbon Steel	Humidity Chamber	1095.8 grams	1094.2 grams	1.6 grams

Primed Mild Carbon Steel

$$D = \frac{(-0.5 \text{ g}) - (-0.4 \text{ g})}{41,290 \text{ mm}^2} = \frac{-0.1 \text{ g}}{41,290 \text{ mm}^2} = -0.0000024 \text{ g/mm}^2 = 0.00 \text{ g/mm}^2$$

Galvanized Steel

$$D = \frac{2.3 \text{ g} - 0.5 \text{ g}}{41,290 \text{ mm}^2} = \frac{1.8 \text{ g}}{41,290 \text{ mm}^2} = 0.0000436 \text{ g/mm}^2 = 0.00 \text{ g/mm}^2$$

Unprimed Mild Carbon Steel

$$D = \frac{1.6 \text{ g} - 1.7 \text{ g}}{41,290 \text{ mm}^2} = \frac{-0.1 \text{ g}}{41,290 \text{ mm}^2} = -0.0000024 \text{ g/mm}^2 = 0.00 \text{ g/mm}^2$$

AUG 26 1994

333 Pfingsten Road
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August 22, 1994



Carboline Company
Mr. Chris Magdalin
350 Hanley Industrial Court
St. Louis, MO 63144

Our Reference: File R7209, Project 94NK21927

Subject: UL 723 (ASTM E84) Test On Type 241 Cementitious
Mixture

Dear Mr. Magdalin:

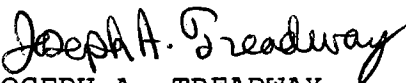
This is in response to our telephone conversation of
August 16, 1994 concerning the above referenced subject.

Type 241 cementitious mixture was tested in accordance with
UL 723 (ASTM E84), during which the flame spread value of 0 and a
smoke developed value of 0 were measured.

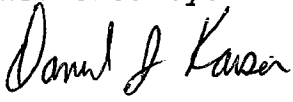
The Classification Marking of Underwriters Laboratories Inc. for
surface burning characteristics on the bags of cementitious
mixtures is the only method provided by Underwriters Laboratories
to identify cementitious mixtures produced under its
Classification and Follow-Up Service.

We trust the above answers your inquiry. However, if you should
have any additional questions, please feel free to contact the
writer.

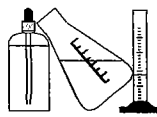
Very truly yours,


JOSEPH A. TREADWAY
Project Engineer
Engineering Services, 411

Reviewed by:


DANIEL J. KAISER
Engineering Group Leader
Engineering Services, 411

JAT:bav/per
FP14A/A:treadway.ltr
C0312-



March 11, 1993

TITLE: ASTM E759 Deflection Testing of Pyrocrete 241

**DOCUMENT
ACCESS NO:** 08554

REFERENCE: L037-119

PURPOSE: Determine the effect of deflection on Pyrocrete 241.

CONCLUSIONS: Deflecting a Pyrocrete 241 coated deck by the ASTM E759 has no effect upon the Pyrocrete 241.

- PROCEDURE:**
- I. System
 - A. Pyrocrete 241 @ 1/2"
 - B. 2' x 12' cellular deck
 - 1. 2' x 12' x 0.060" noncomposite fluted steel decking with cells 1-1/2" deep, 6" on center.
 - 2. 2' x 12' x 0.048" galvanized steel base plate.
 - II. Application
 - A. Weld the galvanized steel plate to the bottom of the fluted decking.
 - B. Spray apply the Pyrocrete 241 @ 1/2" to the underside of the deck.
 - C. Cure the Pyrocrete 241 for one month minimum at lab ambient conditions.

da08554.rm

From the Carboline Research & Development Laboratory

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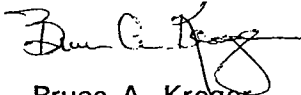
The Carboline logo features the word "carboline" in a lowercase, sans-serif font, enclosed within a horizontal oval shape.

III. Testing

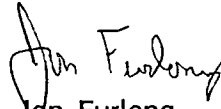
- A. Support the deck by its bare ends with the Pyrocrete 241 facing downward. 10' clear span Pyrocrete coated surface is left between supports.
- B. Apply a vertically centered load to the upper face of the deck until it has deflected 1" (1/120 of the span).
- C. Note the condition of the Pyrocrete 241 and any spalling or delamination that may have occurred.

RESULTS:

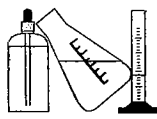
ASTM E759 Deflection Testing: There was no effect on the Pyrocrete 241 by deflecting the deck 1".



Bruce A. Kroger
Laboratory Technician
Fireproofing Products Division



Jan Furlong
Developmental Chemist
Fireproofing Products Division




December 3, 2004

- TITLE:** Modified ASTM E736 Adhesion/Cohesion Strength Testing of Pyrocrete 241 to Smooth Steel
- REFERENCE:** L578-78
- DOCUMENT ACCESS NO.:** 09371
- PURPOSE:** Determine the adhesive/cohesive strength of Pyrocrete 241 to smooth steel.
- SUMMARY OF RESULTS:** The average bond strength of Pyrocrete 241 to smooth steel is 2891 pounds per square foot.
- PROCEDURE:**
- I. Systems
 - A. Smooth mild carbon steel panels 14" x 14" x 1/4"
 - B. Pyrocrete 241
 - C. Bottle screw cap with hook (3-3/4" diameter by 1/2" deep)
 - D. Two component epoxy adhesive
 - E. Instron Model 1122
 - II Application
 - A. Solvent wipe the panels to degrease them.
 - B. Spray apply the Pyrocrete 241 at 3/4" over a 14" x 12" area of each panel.
 - C. Cure panels at 70 – 80°F/ 20 – 70% RH for 30 days.
 - D. Attach hook assembly to the center of each panel
 - 1. Glue the lid to the Pyrocrete.
 - 2. Fill the lid with the epoxy adhesive.
 - 3. Allow the adhesive to cure 24 hours before testing.
 - III. Testing
 - A. Attach each panel to the Instron.
 - B. Put off the lid with the Instron set at a crosshead speed of 0.2 inches/minute. Record force required to pull off the lid and the type of failure.
 - C. Calculate the cohesive/adhesive strength by dividing the force by the area of the lid.

From the Carboline Research & Development Laboratory

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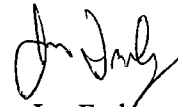

Bond test report PC241 smooth steel 120304

RESULTS:

Panel	Force	Cohesive/Adhesive Strength	Type of Failure
1	98 lbs	1701 psf	Adhesive failure
2	96 lbs	1680 psf	Adhesive failure
3	131 lbs	2273 psf	Adhesive failure
4	247 lbs	4296 psf	Pyrocrete cohesive failure
5	160 lbs	2777 psf	Adhesive failure
6	266 lbs	4617 psf	Pyrocrete cohesive failure
Average		2891 psf	

DISCUSSION:

The ASTM E736-92 "Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members" specifies the use of a spring load scale with a 66 pound capacity to measure the adhesion force. With a maximum 66 pounds force, the highest measurable bond strength is 1145 pounds per square foot. The Instron was used instead of the scale to get the actual adhesive/cohesive strength.



Jon Furlong
Advanced Chemist
Fireproofing Products Division



INDUSTRIAL TESTING LABORATORIES inc.

2350 S. Seventh Street • St. Louis, Missouri 63104-4296

Chemical Analysis
Materials Testing
Environmental Evaluation
314/771-7111
314/771-9573 FAX

Report No. 96-09-03594

September 18, 1996

Determination of the compressive strength of three (3) panels of Pyrocrete 241 submitted 9/9/96.

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

P.O.: 31367 LAB
Attn: Mr. Jon Furlong

TEST REPORT

Sample Description: Pyrocrete 241
Test Method: ASTM E761-81
Instrument: Baldwin Universal Testing Machine,
S/N 472020. Calibration due July, 1997

<u>Sample I.D.</u>	<u>Compressive Strength at 10% Deformation. (psi)</u>
Panel No. 1	816. 860
Panel No. 2	840 820
Panel No. 3	856 712

Respectfully submitted,
INDUSTRIAL TESTING LABORATORIES, INC.

By: *John F. Sharp*
John F. Sharp

LN 274907
JFS/hj

Inv. #88002