Item 4

Investigation of Surface Buring Characteristics Of a Solid Silicone Sheet Material, NS-1

SOUTHWEST RESEARCH INSTITUTE
Department of Fire Technology
POST OFFICE DRAWER 28510, 6220 CULEBRA RD. SAN ANTONIO, TEXAS 78284

INVESTIGATION OF SURFACE BURNING CHARACTERISTICS OF:

A SOLID SILICONE SHEET
MATERIAL, NS-1

PROJECT NO. 03-5849-285
FINAL REPORT

By C. A. HAFER

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Prepared for:
BRAND INDUSTRIAL SERVICES, INCORPORATED
1420 RENAISSANCE DRIVE
PARK RIDGE, ILLINOIS 60068

Carl A. Hafer

Carl A. Hafer, P.E.
Project Manager
Standard Testing

I. INTRODUCTION

This report presents the results of a flame spread tunnel test on a solid silicone sheet material, submitted for evaluation by Brand Industrial Services, Incorporated of Park Ridge, Illinois. The report contains a description of the material tested, the preparation and conditioning of the specimen, the test procedure, and finally, the test results. Note that the results only apply to the specimen tested, in the manner tested, and not to the entire production of this or similar materials, nor to this material's performance when used in combination with other materials. All test data are on file and are available for review by authorized persons.

The test was conducted in accordance with the provisions of ASTM Designation E84-79a, "Standard Method of Test for Surface Burning Characteristics of Building Materials." This test method is similar to the test method specified in ANS No. 2.5, NFPA No. 255, UL No. 723, UBC No. 42-1, and ASTM E84-75; however, two improvements have been incorporated in the current E84-79a procedure, i.e., the stack pressure control top has been relocated to a position forward of the burners and the formulae used to calculate the flame spread has been modified--resulting in slightly lower values.

The purpose of the test was to evaluate performance of the test specimen in relation to that of asbestos-cement board and red oak flooring under similar fire exposure. The results are expressed in terms of flame spread, fuel contribution, and smoke development during a 10-minute exposure and are recorded as a ratio with asbestos-cement board 0 and red oak flooring 100.

II. DESCRIPTION OF MATERIALS

On May 27, 1980, four 20 x 75-in. (0.508 x 1.905-m) sheets of a black solid silicone material and 24 tubes of caulk were received from the Sponsor. They were identified as: NS-1, a 3/4-in (19.05-mm) solid silicone sheet material. The caulk was identified as Dow Corning 732 caulk. The material had an average unit weight of 1.421 lb/ft^2 (6.928 kg/m^2).

III. PREPARATION AND CONDITIONING OF TEST SPECIMEN

The specimen was prepared by applying 1/8 to 1/4 in. (3.175 to 6.35 mm) caulk beads with 4-in. (101.6-mm) center lines onto 1/4-in. (6.35-mm) asbestos-cement board. The board was then joined with the four 20 x 75-in. (0.508 x 1.905-m) sheets of silicone material to provide a nominal 21-in. x 25-ft (0.533 x 7.625-m) specimen.

The specimen was conditioned for 6 days in an atmosphere maintained between 68 and 78°F (20 and 26°C) temperature and 45- to 55-percent relative humidity.

IV. TEST PROCEDURE

The test was conducted on June 5, 1980. Reference data were obtained and furnace operation checked by conducting a 10-minute test with asbestos-cement board on the day of the test and by periodic tests with red oak flooring. These tests provided the 0 and 100 references for flame spread, fuel contribution, and smoke density. Ignition over the burners was noted 39 seconds after the start of the test in the most recent calibration with red oak flooring. Each specimen to be evaluated was tested in accordance with the standard procedure.

V. TEST RESULTS

The test results were calculated on the basis of observed flame travel and the measurement of areas under the recorder curves of furnace temperature and smoke density (see Classification Table). To allow for possible variations in results due to limitations of the test method, the numerical results were adjusted to the nearest figure divisible by 5.

Recorded data for flame spread, fuel contribution, and smoke density of the specimen are shown in the figures at the end of this report as a solid line on each graph.

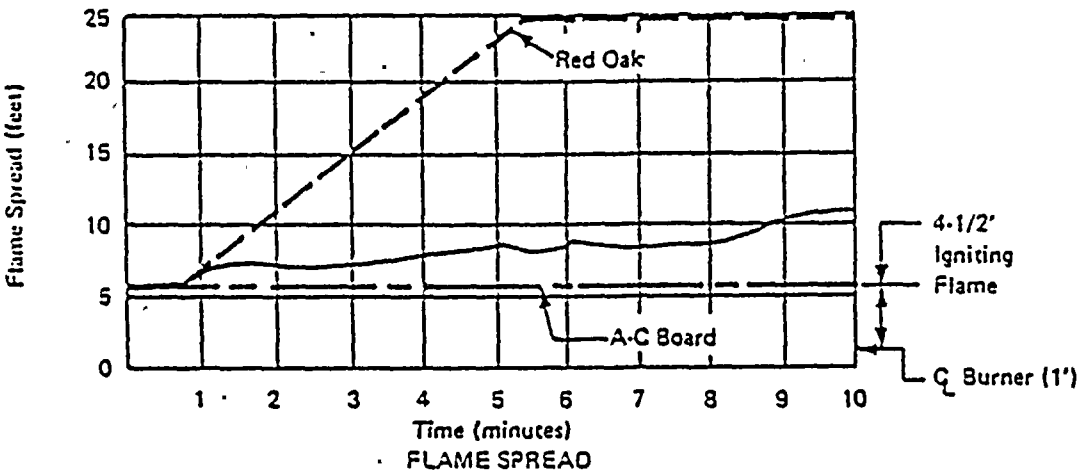
CLASSIFICATION TABLE

Test Specimen	Flame Spread Rate E84-79a	Fuel Contribution	Smoke Density
Asbestos-Cement Board	0	0	0
Red Oak Flooring	100	100	100
Solid Silicone Sheet Material, NS-1	10	5	530

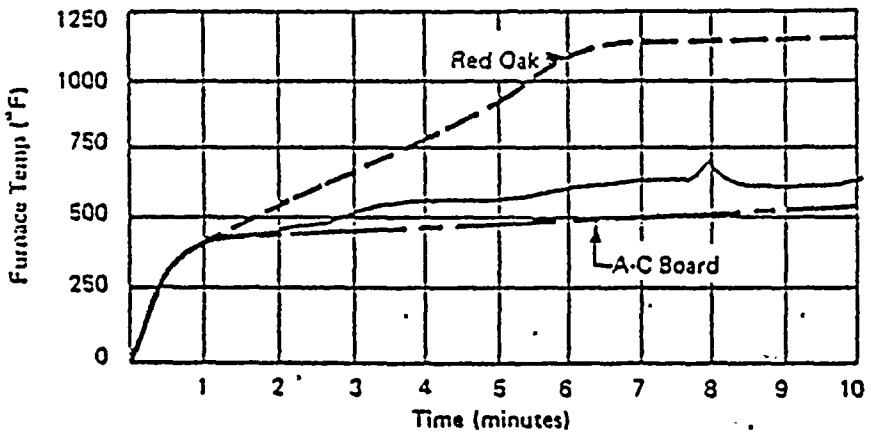
VI. OBSERVATIONS DURING AND AFTER TEST

The observations made during and after the test are summarized as follows: Spotty ignition was observed at 40 seconds, with cracking of the surface at 3:00 minutes. The flame front advanced to 11 ft (3.355 m) at 9:00 minutes. Afterflame persisted for 1:23 minutes.

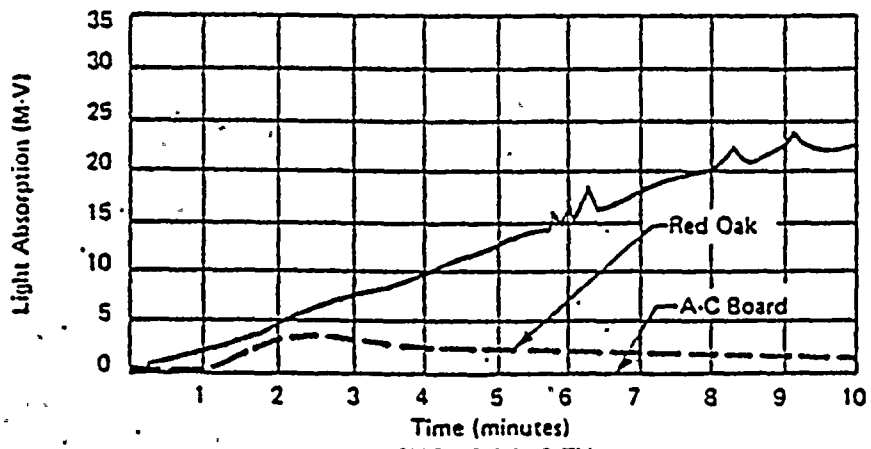
The silicone material cracked to 8-1/2 ft (2.593 m). A white discoloration extended to the end, 25 ft (7.625 m).



FLAME SPREAD



FUEL CONTRIBUTION
(Furnace Temperature)



SMOKE DENSITY
(M-V Depression—Photocell)

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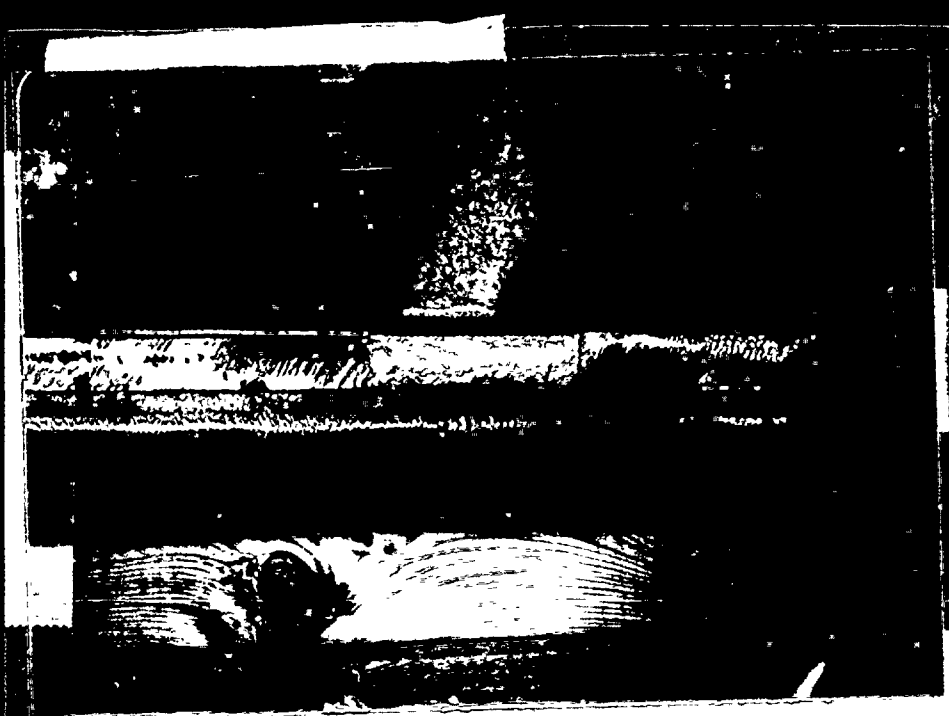
Summary of WNP-2 Mock-up Test Regarding Heat Input to Shield Material

The purpose of the mock-up tests was to qualify the BISCO NS-1 (high density) shield material with respect to heat input during welding. The mock-up test fixture simulated actual wall conditions expected at time of welding, e.g., the joint configuration was the same as that required for the actual circumferential weld repair and the gaps within that configuration ranged from 1/16 x 1/16 to 5/8 x 2-1/2 inches (see picture 1).

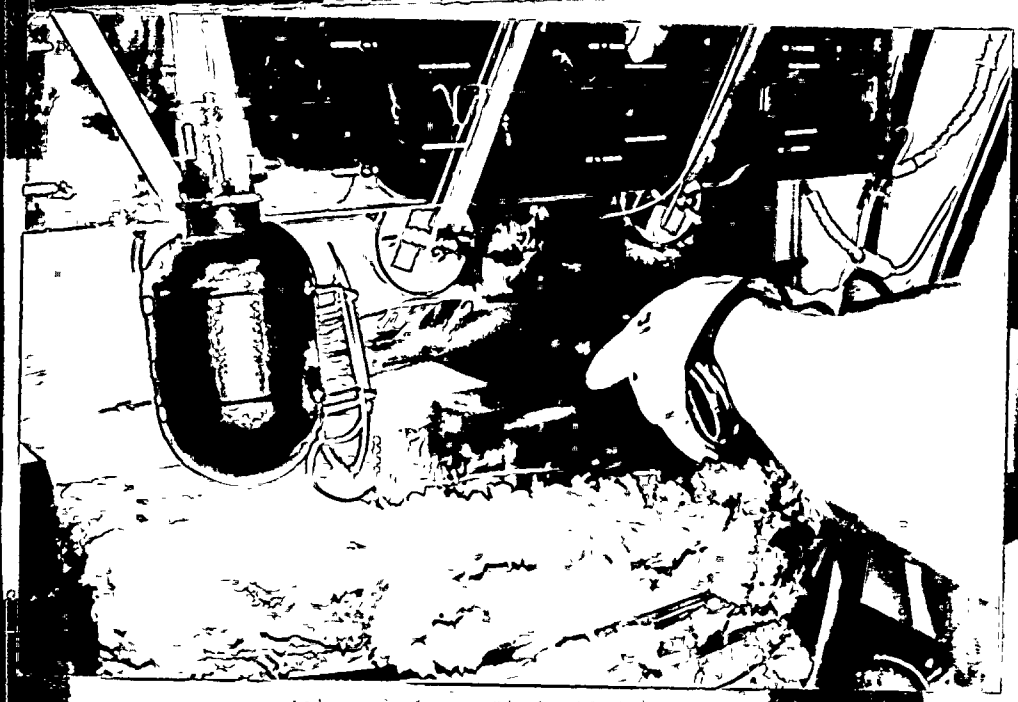
The mock-up fixture gaps were filled with BISCO NS-1 (high density) shielding material to approved procedures that were developed during prototype testing (pictures 2 and 3). The shield material was allowed to cure (picture 4) and then the excess material was ground out (picture 5) to allow room for the insertion of the backing ring prior to welding (picture 6). The joint was welded in accordance with the corrective action plan submitted to the NRC for the plug weld deficiency (picture 7).

All conditions, including material, represented actual conditions of the SSW. It should be noted that the heat input was more conservative for the mock-up test because the mock-up fixture did not have available to it the massive steel/concrete heat sink available to the joint configuration at the 541'-5" elevation of the SSW.

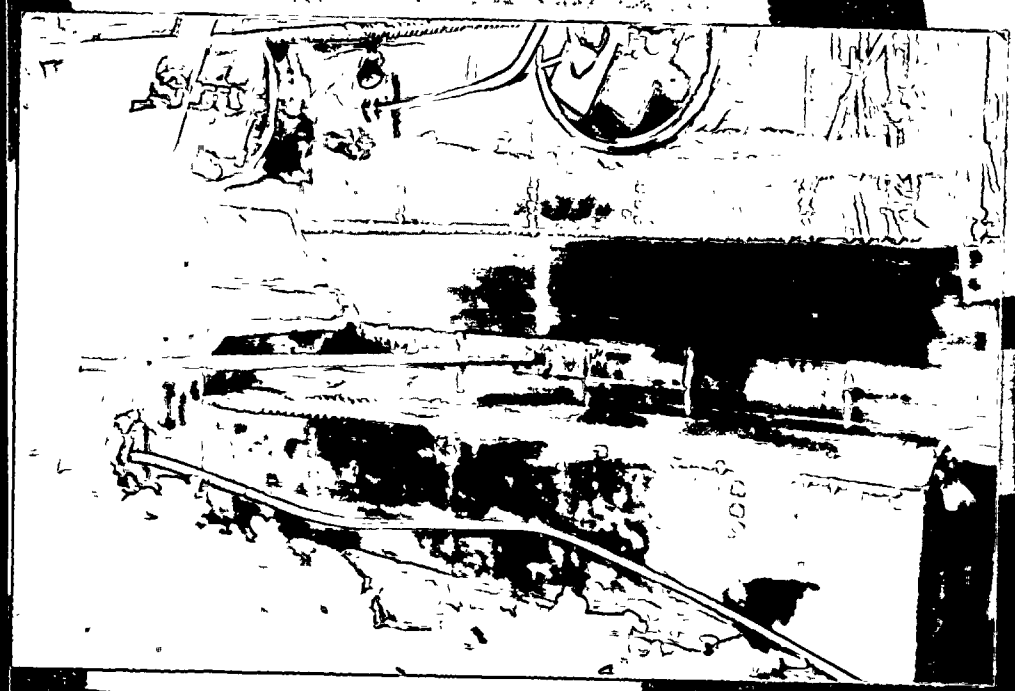
After cooldown, the mock-up fixture was sliced transversely to provide cross sectional views of the gaps filled with the shield material and the weldment (picture 8). There was no deleterious effects observed in either the shield material or the weldment.



Picture 4



Picture 5



Picture 6