



INVESTIGATION OF FLAME SPREAD CHARACTERISTICS
OF TWO DECORATIVE WALLBOARDS

for

Westinghouse Electric Corporation
Micarta Division

Project No. 717-2-35
Final Report

March 26, 1959

Department of Engineering Mechanics
Building Research Section

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OF TWO DECORATIVE WALLBOARDS

C. H. Yuill

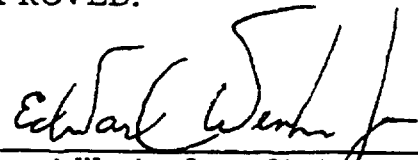
Project No. 717-2-35
Final Report

Prepared for

Westinghouse Electric Corporation
Micarta Division
Hampton, South Carolina

March 26, 1959

APPROVED:

A handwritten signature in dark ink, appearing to read 'Edward Wenk, Jr.', is written over a horizontal line.

Edward Wenk, Jr., Chairman
Department of Engineering Mechanics

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I. INTRODUCTION

This report is a presentation of the results of flame spread tests on two types of decorative wall panels submitted for evaluation by the Micarta Division of the Westinghouse Electric Corporation. The tests were conducted in accordance with the provisions of ASTM Designation E84-50T, "Tentative Method of Fire Hazard Classification of Building Materials."

The report contains a description of the material submitted, the preparation and conditioning of the test specimens, the test method, and the results obtained. It applies only to the materials tested and not to the entire production of these or similar materials.

II. MATERIALS TESTED

The two materials were submitted in sheet form with matching tongue and grooves. Both were similar in appearance having a cellulose type core with a thin, high pressure laminate glued to both sides. The finished surface had a patterned, plastic surface that was hard and smooth. The opposite surface also was hard and smooth but was dark brown in color. The tongue and grooves were unfinished.

One material was identified by the Sponsor as "Asbestos Decorative Panel Wall" and was so labeled. These sheets were 16" wide, 96" long

and 0.586" thick. This material had an average weight of 1.93 lbs. per sq. ft.

The other material was identified by the Sponsor as "Standard Decorative Panel Wall" and was so labeled. These sheets were 16" wide, 96" long and 0.600" thick. This material had an average weight of 1.84 lbs. per sq. ft.

III. PREPARATION AND CONDITIONING OF TEST SPECIMENS

The materials to be tested were nailed to a wood frame in a manner to simulate a section of a wood stud wall. Three specimens of each material were prepared, each 21" wide and 25'4" in overall length. A longitudinal joint extended the length of each specimen. Each test specimen was prepared in two 21" by 12'8" sections for convenience in handling.

The frame was constructed of 2" by 2" and 2" by 4" fir members. The test material was first fastened to one side of the wood frame with 3 d common nails driven through the flanged tongue into the center framing member and spaced approximately 7" on centers. Similarly, nails were driven into the outer framing member. Matching grooved sheets of the test material were interlocked with the tongued sections and nailed only to the opposite side framing member. The tongue and groove configuration did not permit a tight fit but left a surface gap of approximately 0.045" at the center point.

Two calibration and reference specimens were prepared. one with 1/4" cement-asbestos board and the other with 1" x 3" Fordyce red oak flooring.

All finished specimens were stacked in the furnace room so as to provide a free circulation of air. The controlled atmosphere in this room is maintained at between 65° and 75° F temperature and between 35% and 40% relative humidity.

Samples of the test specimens were weighed periodically and were considered ready for test when no further change in weight was recorded.

IV. TEST PROCEDURE

The test procedure followed was that specified in ASTM Designation E84-50T. There were no variations from the standard and no unusual difficulties were encountered during the tests.

A reference flame front of 4' was recorded with the cement-asbestos board specimen. This provided a zero reference. With the red oak specimen the flame front traveled the length of the specimen in 4.75 minutes and this time, with recorded furnace temperature and smoke density, provided a reference point of 100.

After tests of the material submitted, the test specimens were removed from the furnace room and photographed.

V. TEST RESULTS

Test results based upon observed flame front travel, recorded furnace temperatures, photo-cell output, and calculations were as follows:

Test No.	Test Specimen	Flame Spread Rate	Fuel Contributed Factor	Smoke Density Factor
	Cement-asbestos	0	0	0
1	Red Oak	100	100	100
2	*ADPW	49	39	181
3	*ADPW	56	49	152
4	*ADPW	61	49	164
	Average	55	45	166
1	**SDPW	158	106	173
5	**SDPW	158	105	132
6	**SDPW	146	105	119
	Average	154	105	141
* Asbestos Decorative Panel Wall				
** Standard Decorative Panel Wall				

Table I - Test Results

VI. OBSERVATIONS DURING TEST

With both materials, loud popping sounds were heard within the first 15 seconds of the 10-minute test and these sounds continued at a somewhat reduced intensity for the remainder of the tests. Surface cracks and delaminations were observed at approximately 15 seconds.

With the three Asbestos Decorative Panel Wall specimens, the flame front advanced to 8' within 30-45 seconds after the start of the test, receded 1' to 2', and advanced at a slower rate until the end point was reached at between 7-3/4 and 9 minutes.

The furnace temperature increased rapidly with these specimens for 40-45 seconds and then increased at a slower rate for the remainder of the test.

Smoke density with these specimens increased rapidly for 75 to 120 seconds, held at a substantially constant level for approximately 4 minutes and slowly dropped. The peak in smoke density in each case was lower than with the "Standard" specimens.

With the "Standard Decorative Panel Wall" specimens, the flame front advanced to between 20' and 22' in the first minute and a half of the test, dropped back 3' to 4' and then advanced to the end of the specimen at between 3 and 3-1/4 minutes.

The furnace temperature increased rapidly for 1-2/3 to 2 minutes and continued to increase at a less rapid rate.

Smoke density increased rapidly to a sharp peak at from 1-3/4 to 2 minutes and held at this level for approximately 30 seconds.

VII OBSERVATIONS AFTER TEST

In each of the tests with "Asbestos Decorative Panel Wall" the center joint opened due to shrinkage, providing a gap of approximately 1/2" on the 8' section at the fire end of the specimen. This exposed the wood framing and released that side of the specimen that was not nailed. This side dropped at the center line 2-1/2" to 3-1/2" in the first 8' and 1/2" to 1" in the second 8' section. This opening also exposed the back of the specimen on one side to flame with resultant charring.

The exposed laminate lost bond for approximately 8'-11' on the unattached (unnailed) side and for 7'-8' on the attached side of the specimen

measuring from the fire end of the specimen.

The core of these specimens appeared to be completely charred in the area of direct flame impingement with the depth of char decreasing to approximately 1/16" at the end of the specimens.

With the "Standard Decorative Panel Wall" specimens the center joint opened for approximately 20' from the burner end, exposing the center framing member for approximately 15'. This again released the unnailed side of the panel and exposed the back of one side to the flame with resultant charring on the back surface. The exposed laminate burned off the face of the specimens for their entire length.

The core of the "Standard" specimens apparently was completely charred along the entire length although the bond on the back surfacing material was not broken on the section furthest from the flame.

These observations are supported by photographs taken after test and attached hereto (see Figures 1 through 6).

VIII. CONCLUSION

The Asbestos Decorative Panel Wall tested had an average flame spread rate of 55 as compared to cement asbestos board at 0 and red oak at 100.

The Standard Decorative Panel Wall tested had an average flame spread rate of 154 as compared to cement-asbestos board at 0 and red oak at 100.

It should be noted that this material is intended for vertical application on walls whereas it was tested in a horizontal position. With only one side of the center joint nailed to the framing, this provides a more severe condition than would be experienced in wall application.

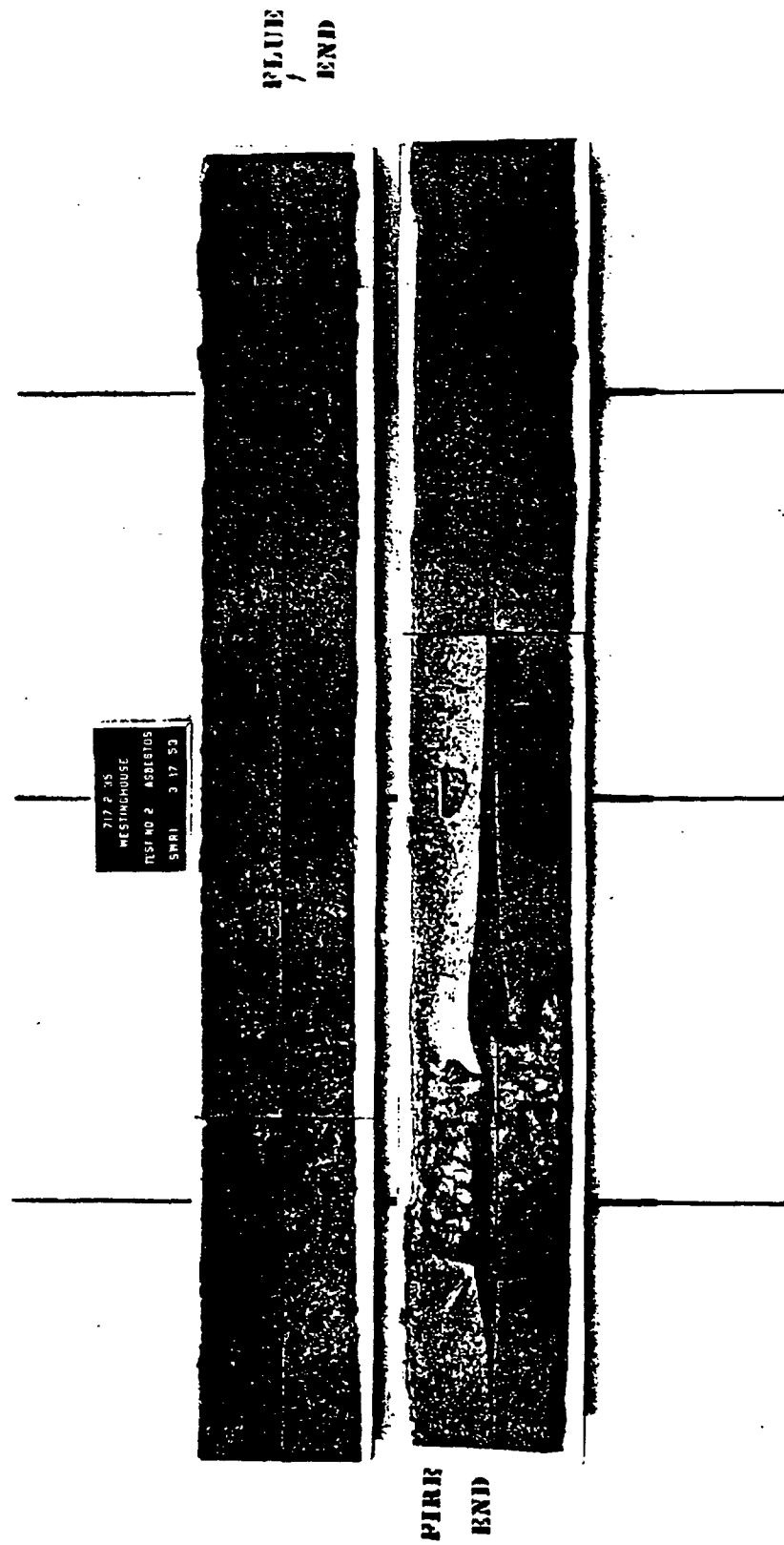


Fig. 1 Test No. 2. Asbestos Decorative Panel Wall after test.

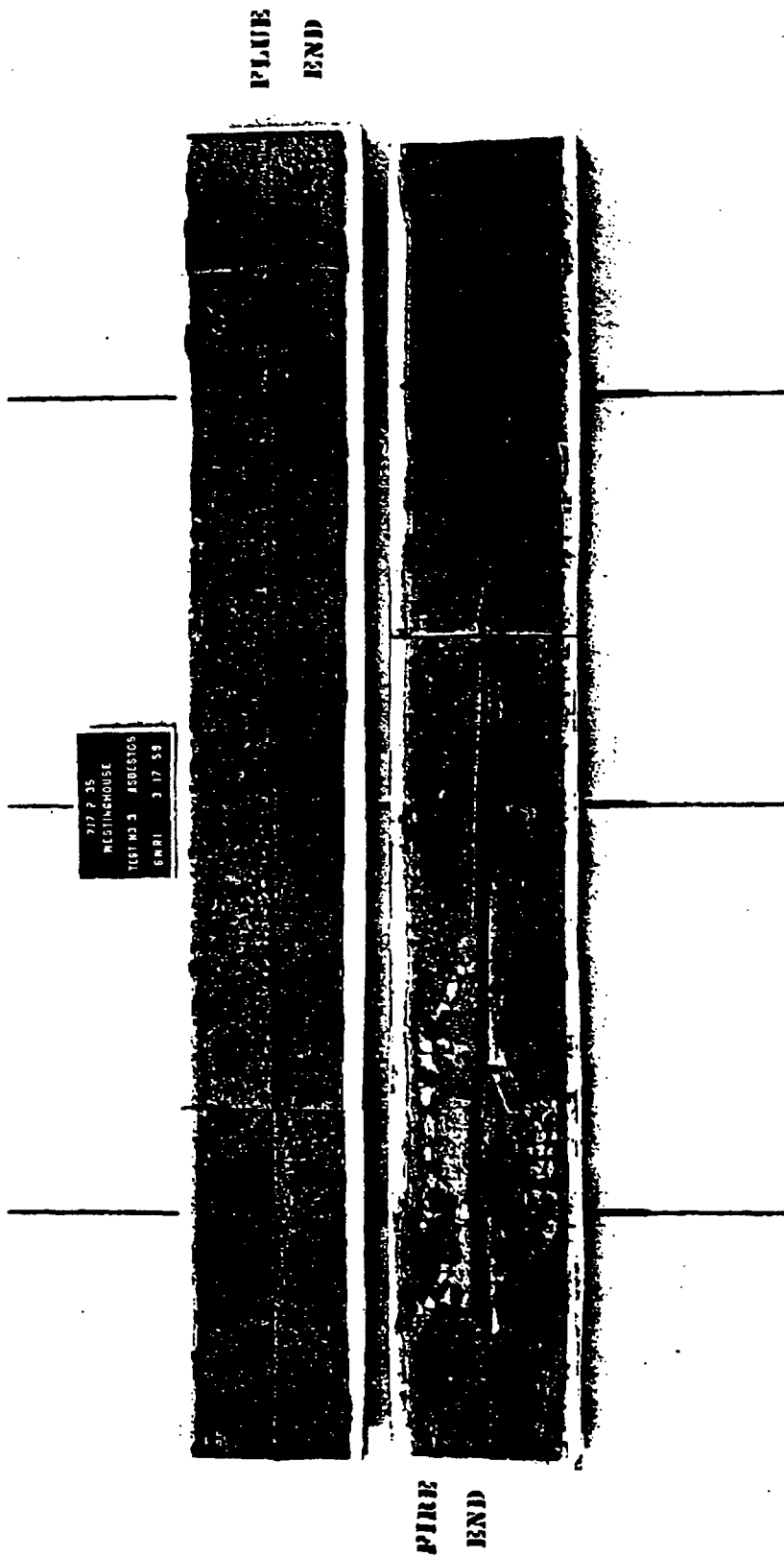


Fig. 2 Test No. 3 Asbestos Decorative Panel Wall after test.

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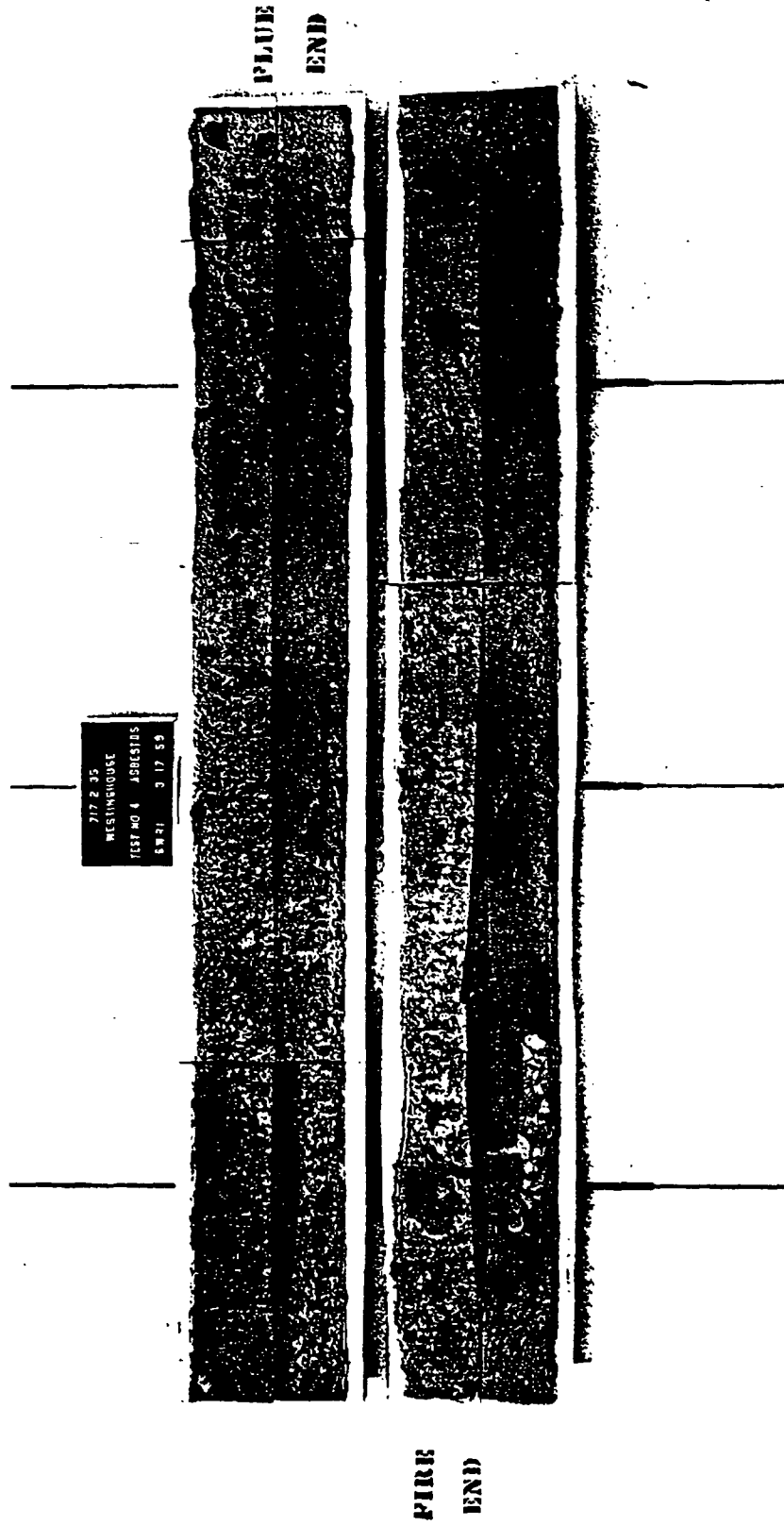


Fig. 3 Test No. 4 Asbestos Decorative Panel Wall after test.

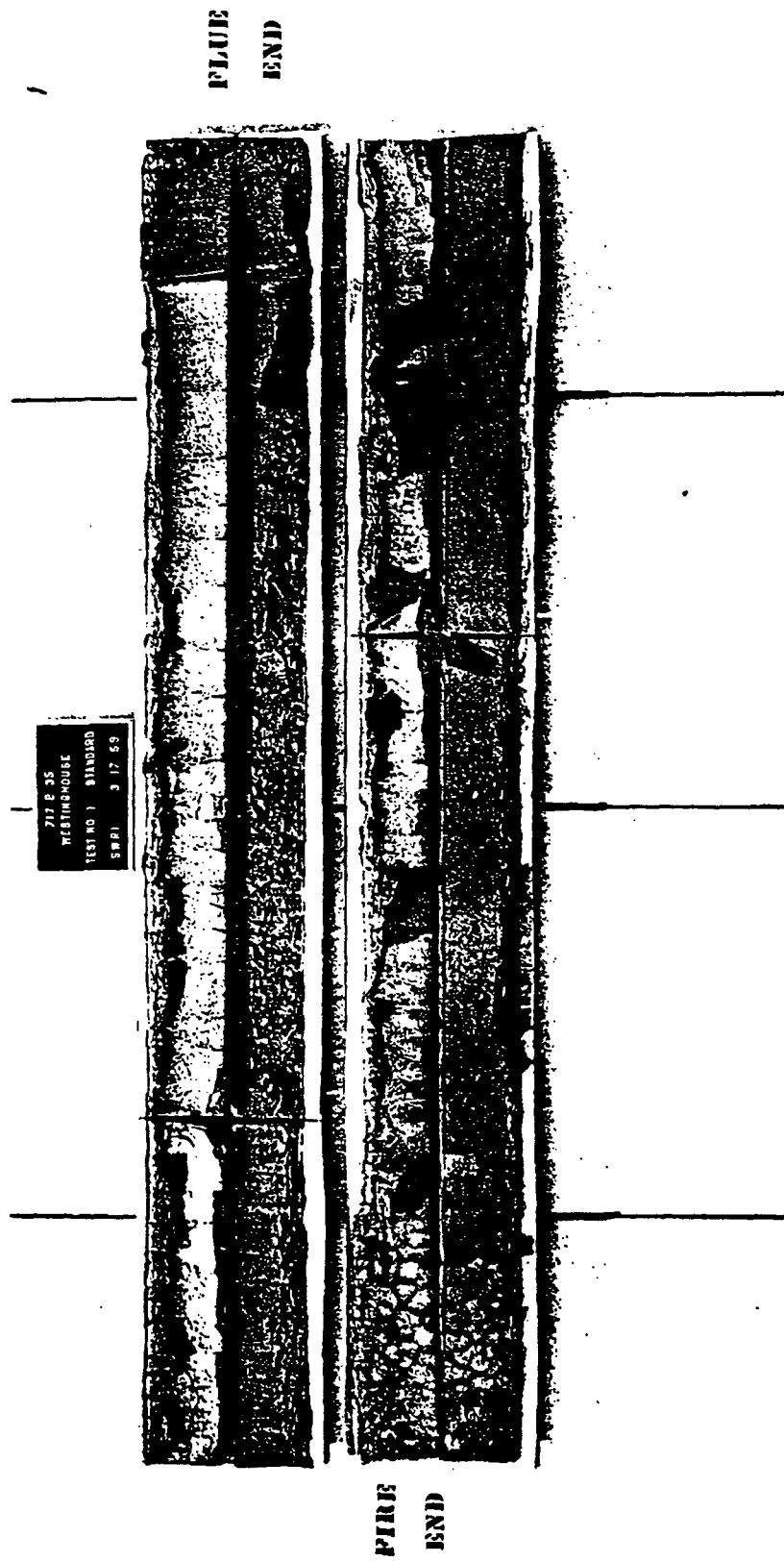


Fig. 4 Test No. 1 Standard Decorative Panel Wall after test.

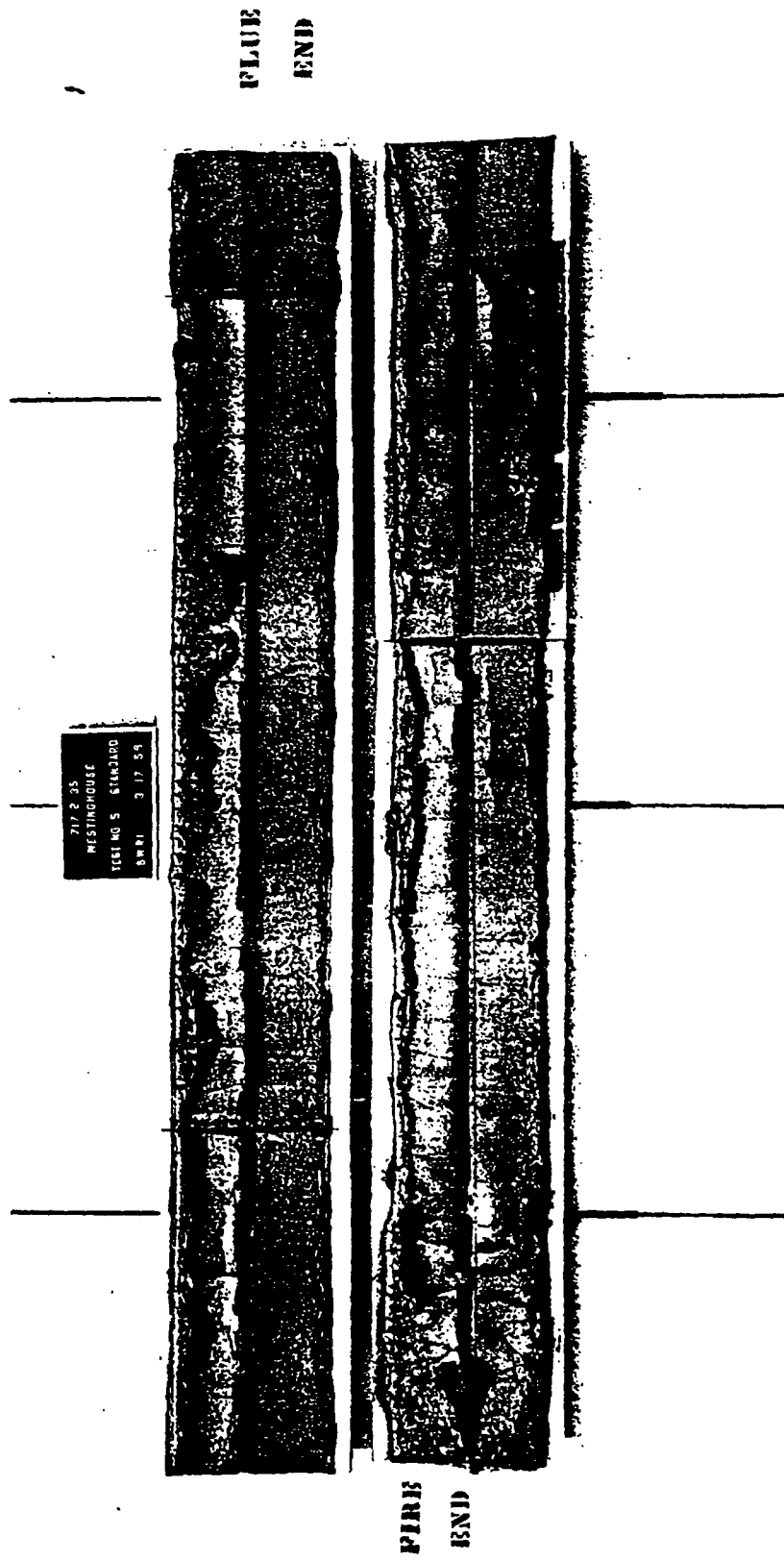


Fig. 5 Test No. 5 Standard Decorative Panel Wall after test.

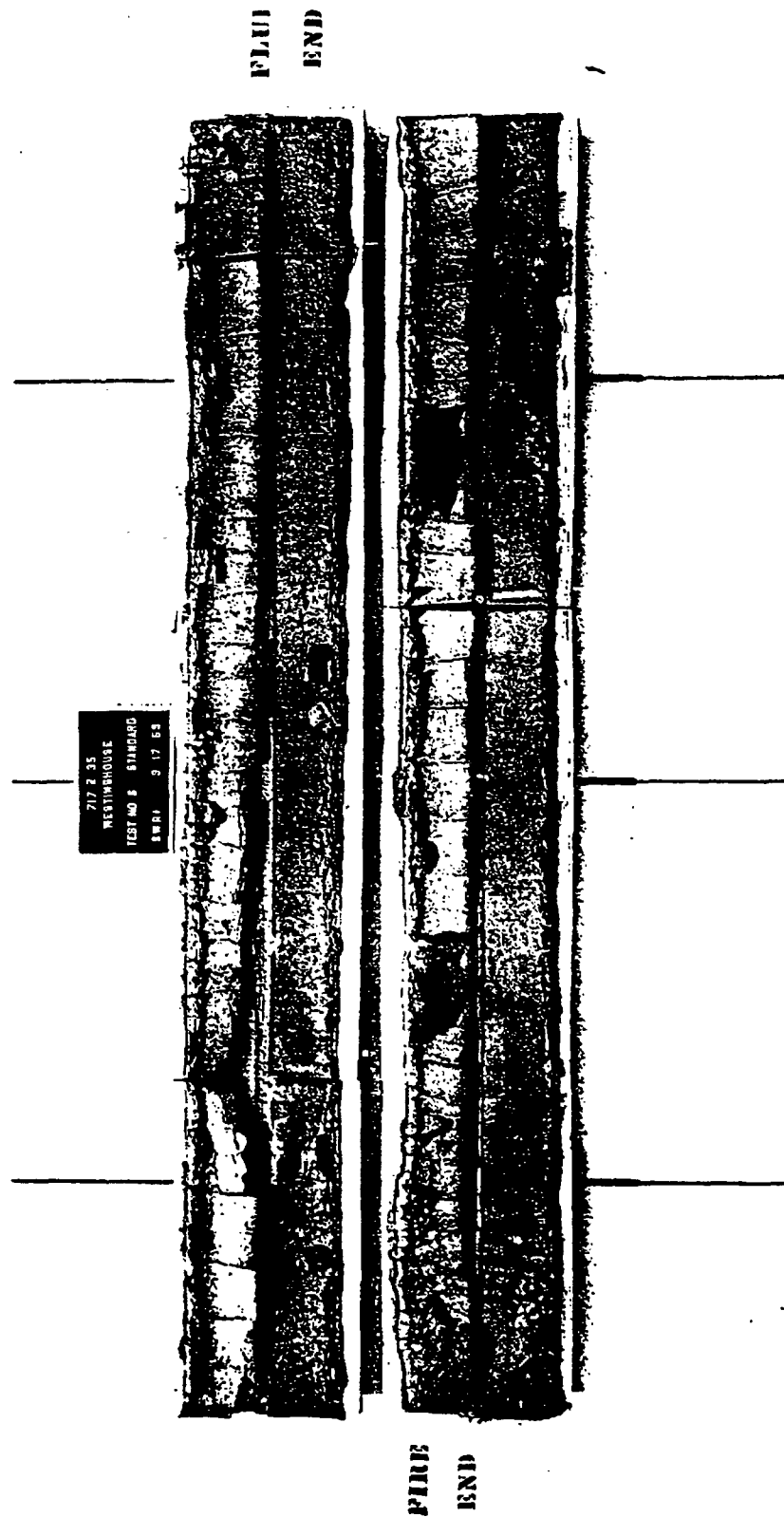


Fig. 6 Test No. 6 Standard Decorative Panel Wall after test.