



WESTERN FIRE CENTER, INC.

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Fire Performance of Research-Scale Wall Assembly

Investigative testing conducted following test methodology described in ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, for a research-scale assembly

Conducted For:

**StanChem Inc.
401 Berlin St
East Berlin, CT 06023**

WFCi Report #20087

Test Date: January 22, 2021

Report Issued: February 1, 2021

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INTRODUCTION

This report documents the fire resistance test of a research-scale assembly for Albi/StanChem. The wall assembly gypsum wall assembly with protected coating applied to the gypsum. Testing was performed on January 22, 2021, and was conducted following principles within ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, though not for a full-scale test. This assembly was tested to pass the fire resistance criteria for a two-hour duration.

SUMMARY OF TEST METHOD

Testing was performed using a vertical fire resistance test configuration employing the fire endurance conditions and standard time-temperature curve described in ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*. The exposed surface of the panel assemblies was subjected to the standard E119 time-temperature curve, with temperature measurements taken inside the research-scale natural gas furnace using 5 thermocouples (TC_F) connected to a computerized data acquisition system. TC_F locations were distributed to show the temperature near (within 6") the exposed face of the test assembly. Since this was a reduced-scale test, a nominal 4'x4' assembly was used to fit the research-scale furnace.

Here are the following criteria to which this test was judged, according to ASTM E119:

- Wall assembly will have sustained the applied load (none) for the indicated time (at least 2-hr) without passage of flame or gases hot enough to ignite cotton waste
- Wall assembly will have not developed an opening that permits the projection of water from the hose stream beyond the unexposed surface (applicable for hose-stream portion of the test). Hose-stream exposure at 30 psi at 2½ min/100 ft² (not performed for this R&D assembly)
- Transmission of heat through the wall will not have risen the temperature on its unexposed side more than 139°C (average) above its initial temperature, or if a temperature higher than 30% (181°C) of the specified limit occurs at any one point (single-point) on the unexposed side of the assembly.

SAMPLE DESCRIPTION

Albi shipped a ready-to-test wall sample (3'11"x4'11", Figure 1) composed of a nominal 2x4 wood frame (16" on center spacing, stud-centered) with one layer of 5/8" Type X gypsum applied to both sides of the frame with appropriate joint compound application. Gypsum was fastened with 1 7/8" Type W screws (8" on center spacing) with a vertical joint along the center stud on both sides. A fire protective coating (Albi Clad FP, 45 mil dry) was applied to each side of the gypsum in multiple coats and allowed to dry at least three weeks prior to testing.

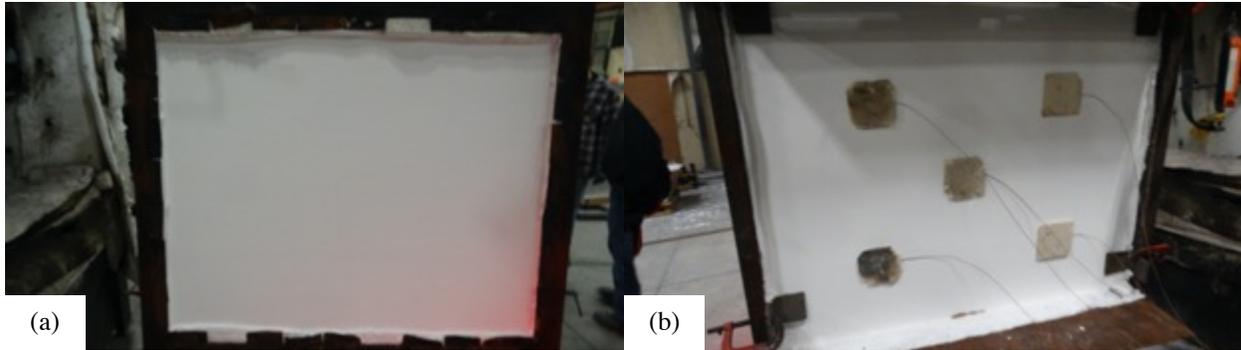


Figure 1. Assembly showing (a) blow-in insulation and (b) assembly in holder.

Temperature

To monitor temperature rise through the assembly, sample thermocouples (TC_s) were placed at the following locations:

- TC_s1-5: Placed on the unexposed side of the assembly (on gypsum) at quarter points and center of panel. Covered with ceramic pads.

TEST RESULTS

Testing of the wall assembly took place on January 22, 2021. The furnace temperature and samples temperatures were continuously monitored at 1 Hz until test termination. These data are presented in the figures below. Additional photographs of the samples during and after each test are also provided.

Test 1 – Fire Endurance

Date & Time: 1/22/21, 9:05 AM

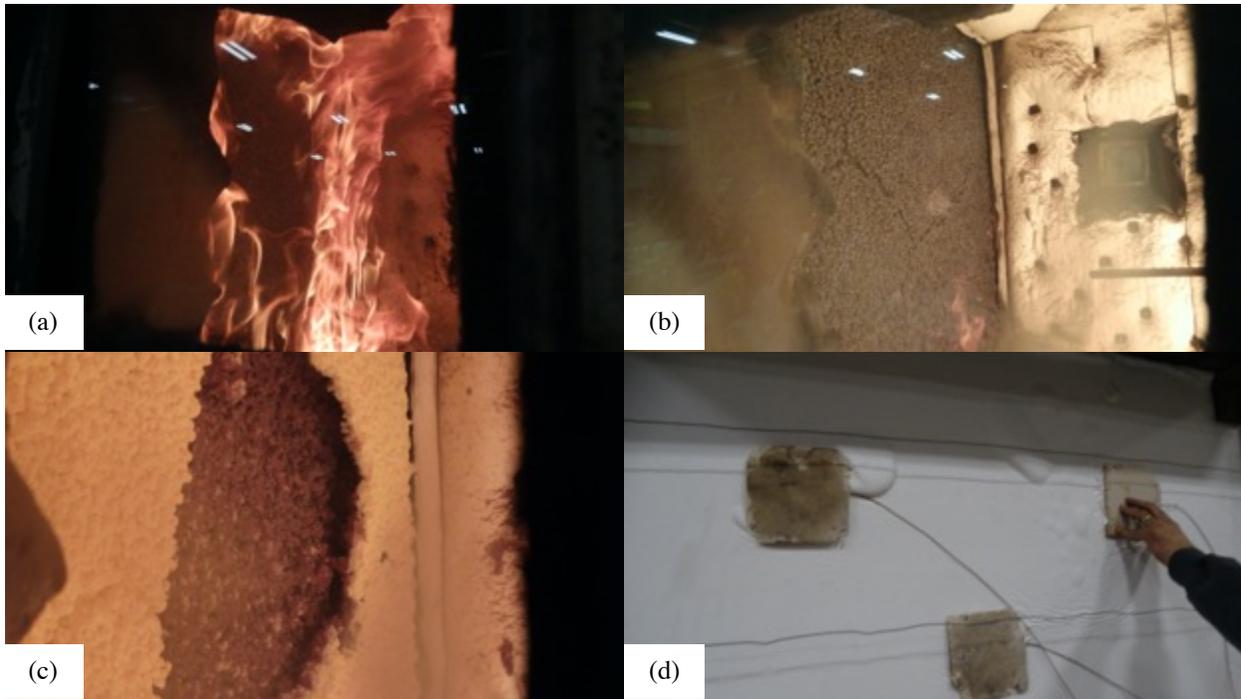
Furnace: Research-scale vertical exposure E119 furnace

Laboratory Conditions: 15°C, 59% RH

Table 1. Observations for Test 1.

Test Time (hr:mm:ss)	Event
00:00	Start test
01:00	Darkening face
01:20	Flames on face
02:20	Flames reduced – bulbous coating on face approximately 1 cm thick
05:40	Cracking on face – flames again
07:00	Bulging coating approximately 2”
18:00	Bulging approximately 4” – flames mainly fromside/bottom
31:00	Section of coating fell – approximately 12”×16” – coating/intumescent still behind fallen section

34:00	Larger section of coating fell
57:00	Slight cracks/opening at vertical center gypsum joint
1:01:00	Light flames from center joint
1:10:00	Bubbling on unexposed side – sagging TCs/coating – fix blocks to hold pads in place
1:11:30	Exposed flames increased from joint
1:20:00	Wrinkling of unexposed coating
1:23:00	Oozing coating on unexposed side
1:35:45	TCS2 > 196°C – single-point unexposed threshold – assembly failure
1:38:25	TCS1-5 > 154°C – average unexposed threshold
1:39:00	Terminate test



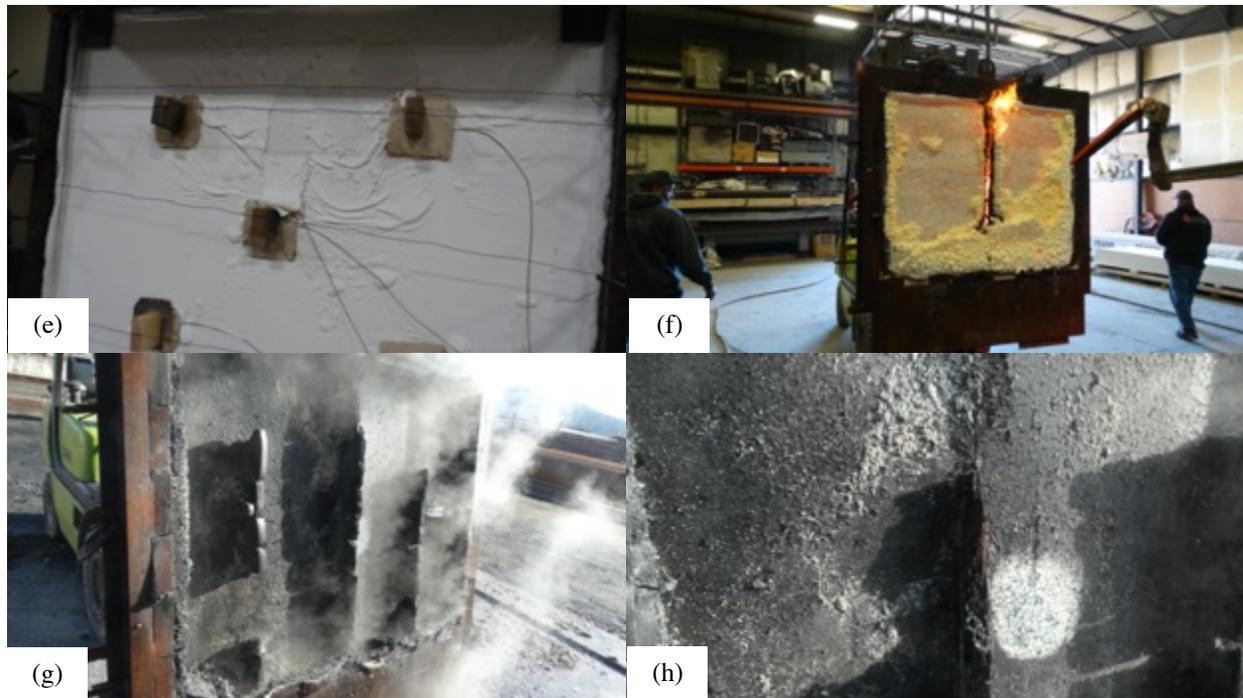


Figure 2. Test 1 wall assembly showing (a) flaming – 2 min, (b) cracking – 6 min, (c) fallen section – 32 min, (d) bubbling – 75 min, (e) oozing – 84 min, (f) from furnace, and (g-h) remaining studs.

The furnace test was terminated at 99 min, after the unexposed temperature thresholds were surpassed. There was no passage of flame or gases hot enough to ignite cotton waste during that time, or 99 min rounded to the nearest integral minute.

The furnace temperature followed the standard time-temperature curve as shown in Figure 3a. A comparison of the area under the time-temperature curve with the standard is also shown in Figure 3b with 0.4% variation at the end of the test, though well below the 7.5% recommended for a test of 2 hours.

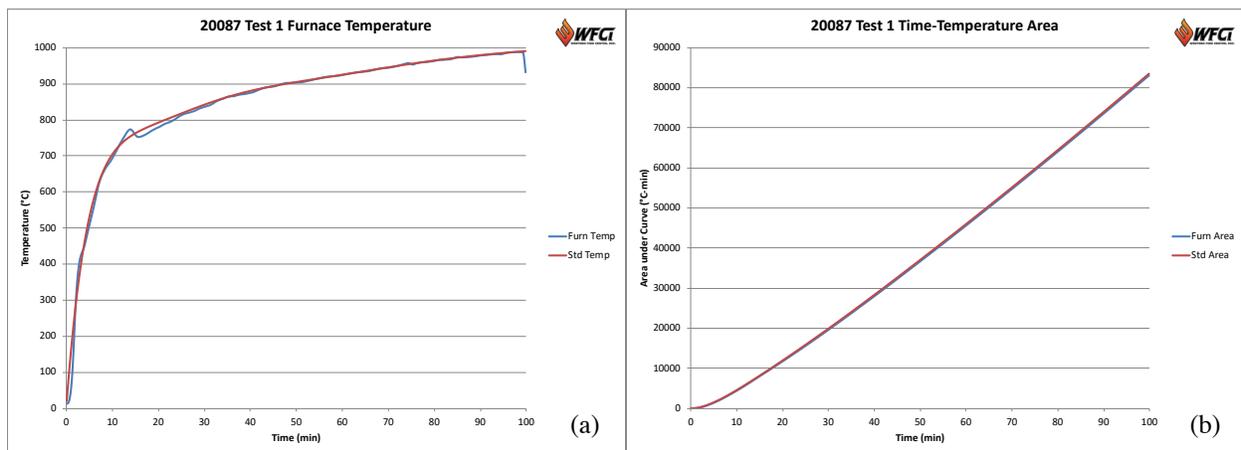


Figure 3. Furnace comparison showing (a) temperature and (b) area under the curve.

The samples temperatures on the unexposed side are shown in Figure 4. The single-point unexposed temperature threshold ($181^{\circ}\text{C} + \text{ambient}$) was surpassed at 95 m 45 s, or 96 min

rounding to the nearest integral minute. The average threshold ($139^{\circ}\text{C} + \text{ambient}$) was surpassed at 98 m 25 s. This gave the assembly an overall rating of 96 min.

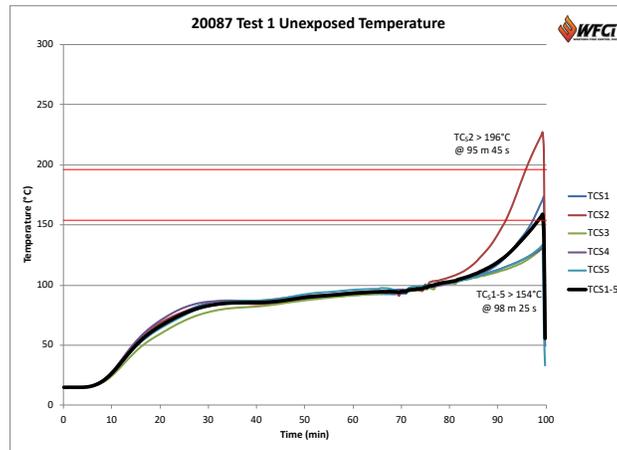


Figure 4. Temperature profiles showing unexposed TC_s.

CONCLUSION

The research and development wall assembly with coating gypsum was exposed to a 99 min fire endurance test, according to ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*. No flames were observed on the unexposed side during the test. However, the unexposed temperature single-point threshold was surpassed at 96 min, rounding to the nearest integral minute. No hose-stream was performed on this assembly. This test was not for ASTM E119 certification purposes, only for specific information to the client.

SIGNATURES

Testing performed by,



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Technical Director

WESTERN FIRE CENTER AUTHORIZES THE CLIENT NAMED HEREIN TO REPRODUCE THIS REPORT ONLY IF REPRODUCED IN ITS ENTIRETY

The test specimen identification is as provided by the client and WFCi accepts no responsibilities for any inaccuracies therein. WFCi did not select the specimen and has not verified the composition, manufacturing techniques or quality assurance procedures.

Version	Date Issued	Document Number	Changes
Original	February 1, 2021	20087	Original report