



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**

Research-Scale/Small-Scale Test

WFCi Report #22003a1

Test Date: February 17, 2022

Report Issued: March 4, 2022

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INTRODUCTION

This report documents the fire resistance test of a research-scale assemblies for StanChem/Albi. The wall assembly was with protected coating applied to the gypsum. Testing was performed on February 17, 2022, 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 were 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'x5' 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

StanChem shipped a ready-to-test wall sample (3'11"×4'11", Figure 1) composed of a nominal 2×4 wood frame (12" on center spacing, stud-centered) with various layers of gypsum applied to both sides of the frame. 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. Specifics for the test are as follows (exposed to unexposed layers):

Test 1

- 1 layer of 5/8" Type X gypsum (vertical joint on center stud)
 - 45 dry film thickness of Albi Cote DW
 - Level 2 gypsum finish (tape and joint compound)
 - 1 5/8" Type W screws at ~12" on center spacing

- 2x4 wood studs, 3'11"×4'11", 12" on center spacing (stud centered) with alternating blocking. 3" nails (2 per stud).
 - No insulation
- 2 layers of 5/8" Type X gypsum (no joint)
 - No joint compound or tape
 - 2 1/4" (face) & 1 5/8" (base) Type W screws at ~12" on center spacing

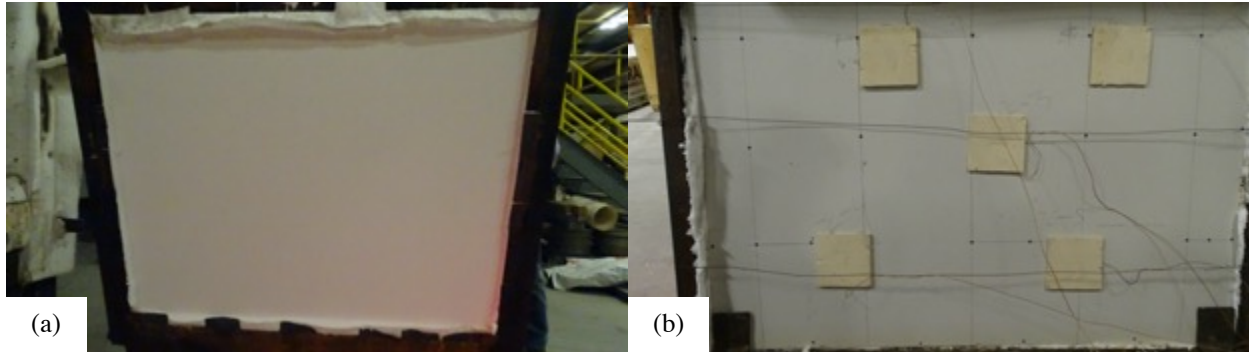


Figure 1. Test 1 assembly showing (a) exposed coating and (b) unexposed gypsum.

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 approximate quarter points and center of panel. Covered with ceramic pads.

TEST RESULTS

Testing of the wall assembly took place on February 17, 2022. 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. Don Long from Albi witnessed the tests.

Test 1 – 2 Layer Unexposed

Date & Time: 2/17/22, 8:35 AM

Furnace: Research-scale vertical exposure E119 furnace

Laboratory Conditions: 13°C, 52% RH

Table 1. Observations for Test 1.

Test Time (hr:mm:ss)	Event
00:00	Start test
00:50	Darkening face – bulbous intumescent
01:30	Flames on face

06:30	Slight cracking on intumescent face
07:00	Increased flames – bulging sections of intumescent layer
11:00	Whitening of intumescent
1:05:00	Intumescent approximately 2” to 3”
1:18:00	No significant change
1:58:00	Flames on face – slight darkening at bottom of unexposed assembly
2:46:00	Continues flames on face
2:57:29	TCs3 > 194°C – single-point unexposed threshold – assembly failure
3:00:00	Terminate test – Intumescent ranged in thickness of 2 ¹ / ₁₆ ” to 5” – no stud remaining

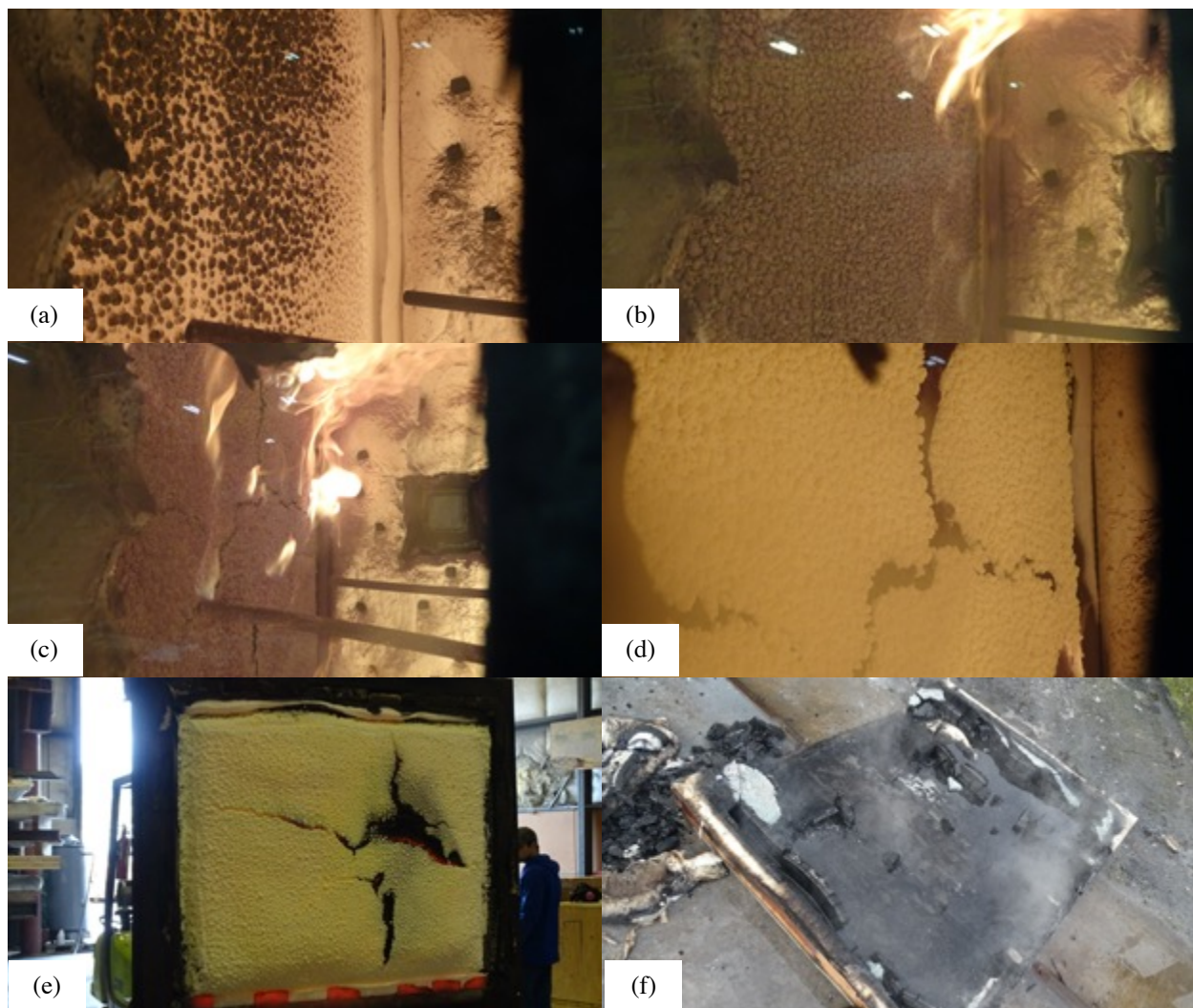


Figure 2. Test 1 wall assembly showing (a) intumescent – 1 min, (b) flaming – 2 min, (c) cracking – 7 min, (d) whitened face – 28 min, (e) from furnace, and (f) remaining studs.

The furnace test was terminated at 180 min, after the unexposed temperature threshold was surpassed. There was no passage of flame or gases hot enough to ignite cotton waste during that time, or 180 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 0.1% variation at the end of the test, though well below the 7.5% recommended for a test of 2 hours.

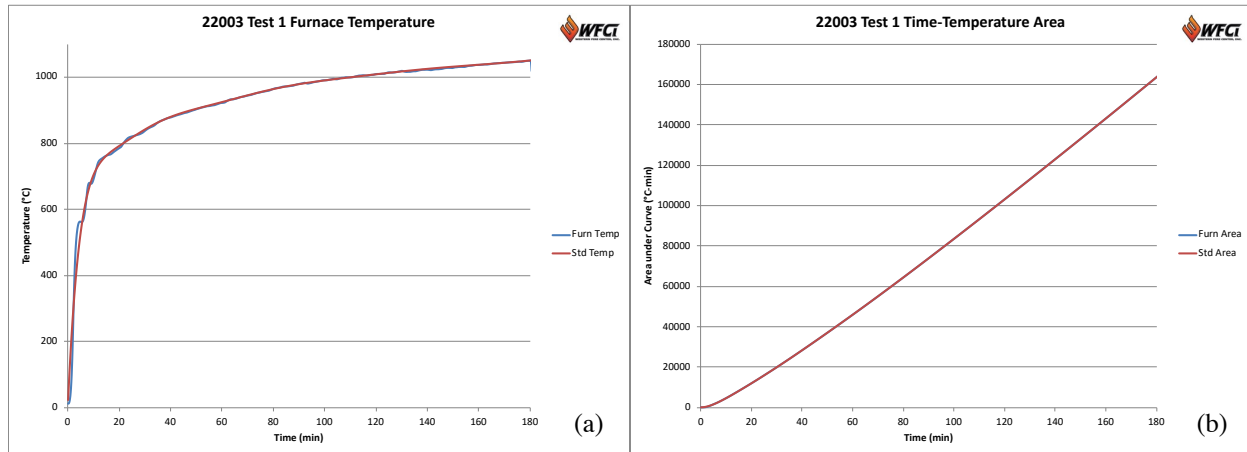


Figure 3. Test 1 furnace comparison showing (a) temperature and (b) area under the curve.

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 177 m 29 s, or 177 min rounding to the nearest integral minute. The average temperature on the unexposed side reached 146°C at the end of the test.

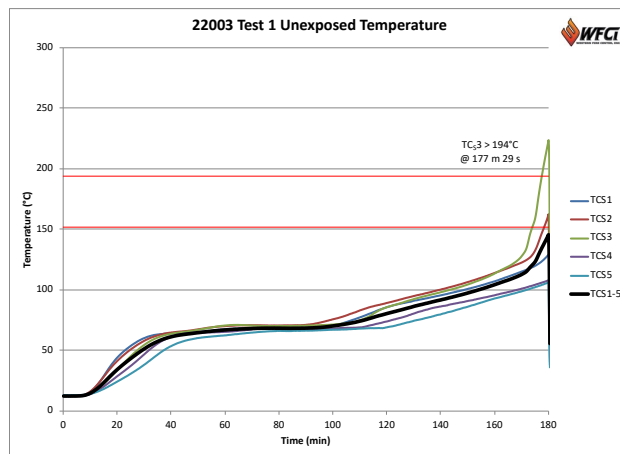


Figure 4. Test 1 temperature profiles showing unexposed TC_s.

CONCLUSION

This research and development wall assembly with coating over gypsum, as detailed above, was exposed to a 180 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 177 min, rounding to the nearest integral minute. No hose-stream was performed on this assembly. This test was not for ASTM E119 certification purposes, but only for specific information to the client, in which case the assembly went 177 min before surpassing the temperature threshold.

SIGNATURES

Testing performed by,



Mike White

Laboratory Manager

Reviewed and Approved by,



Brent M. Pickett, Ph.D.

Technical Director

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