WESTERN FIRE CENTER, INC.
2204 Parrott Way, Kelso, Washington 98626
Phone: 360-423-1400 | Fax: 360-423-5003

Fire Performance of ASTM E119 Evaluation of a Symmetric Non-Load-Bearing Wall Assembly with Protective Joint Reveal

Indicative testing conducted in accordance with the test methodology described in ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials

Summary Report

Conducted For:

CEMCO
13191 Crossroads Pkwy North, Suite 325
City of Industry, CA 91746

WFCi Report #20091s

****The results of this report pertain only to the materials tested****

Test Dates: February 3, 2021

Report Issued: February 11, 2021

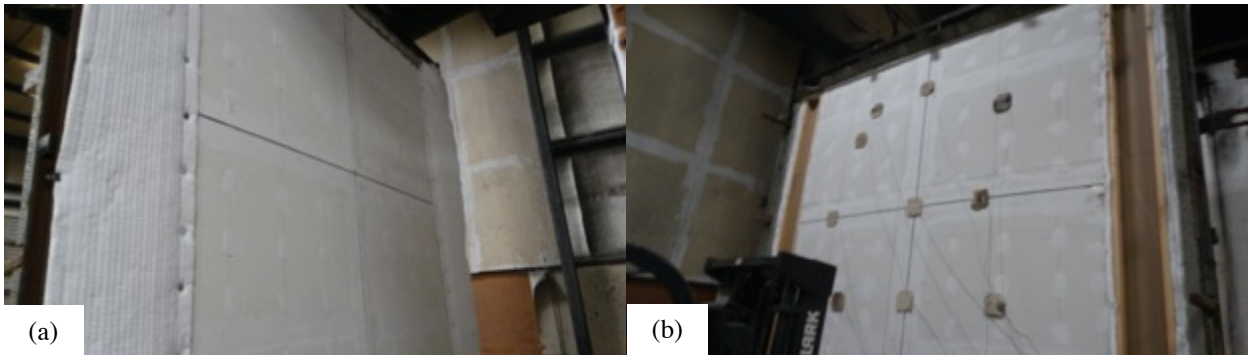
IAS ACCREDITED Testing Laboratory TL-180

INTRODUCTION

This report summarizes the fire resistance test of a symmetric, non-load-bearing wall assembly with protective joint reveal for CEMCO of City of Industry, CA. The steel-stud wall assembly with cross reveal was tested on February 3, 2021, conducted in accordance with ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*. This assembly was intended to pass the fire resistance criteria for a 120-min duration. This report summarizes the full report WFCi Report 20091, where all data are included.

SAMPLE DESCRIPTION

One 10'×10' assembly was constructed at WFCi, intended to pass both the fire-endurance and hose-stream requirements of the test. The symmetric assembly (Figure 1) consisted of a steel frame, two layers of gypsum on each side of the assembly, and an aluminum protective reveal in both horizontal and vertical directions. Specific details of each component of the assembly are found below.



(a) (b)

Figure 1. Overall assembly showing (a) exposed face and (b) unexposed face.

The 10'×10' assembly (Figure 2) was framed 16" on center with 3⅝" deep steel studs, each ¾" short of 10', with corresponding top and bottom track, fastened together at the corners with ½" pan-head screws (floating stud ⅜" on top and bottom). A double stud with a ½" gap between the two were placed at the center of the assembly.

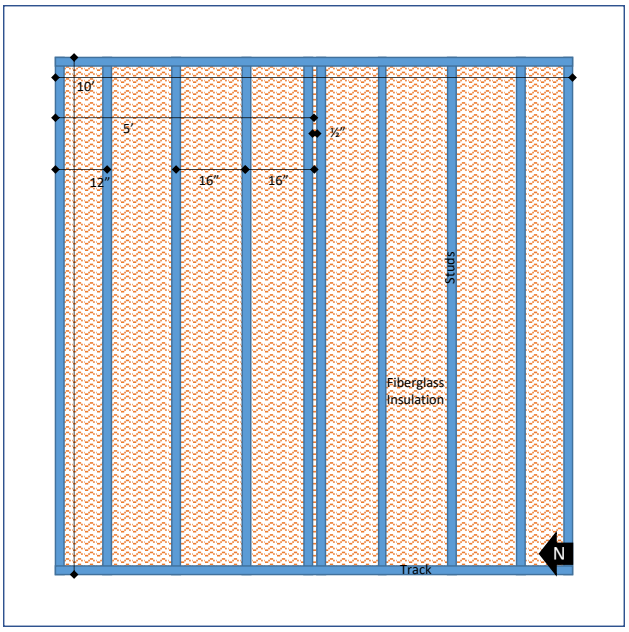


Figure 2. Assembly schematic showing steel stud frame.

Unfaced fiberglass insulation batts (3½") were placed within each stud cavity. Insulation was also placed within the ½" gap between the two center studs.

Two layers of ⅝" Type X gypsum was applied horizontally to each side of the steel frame with a $^{11}/_{16}$" gap at the horizontal and vertical centers of the assembly. Gypsum panels were shipped as 4'×12' boards and cut to appropriate dimensions (see Figure 3), staggered 24" between base and face layers. Sections were symmetric from unexposed to exposed sides. The base layer gypsum was fastened with 1⅛" Type S screws with 8" on center spacing on edge and 12" in the field. The face layer gypsum was fastened with 2" Type S screws with 8" on center spacing on edge and 12" in the field. Fasteners were set back 1" along the board long edge and ¾" along the board cut edge.

The joints and fastener heads were coated with 2 layers of joint compound, including 2" tape over the joints including reveal edges.

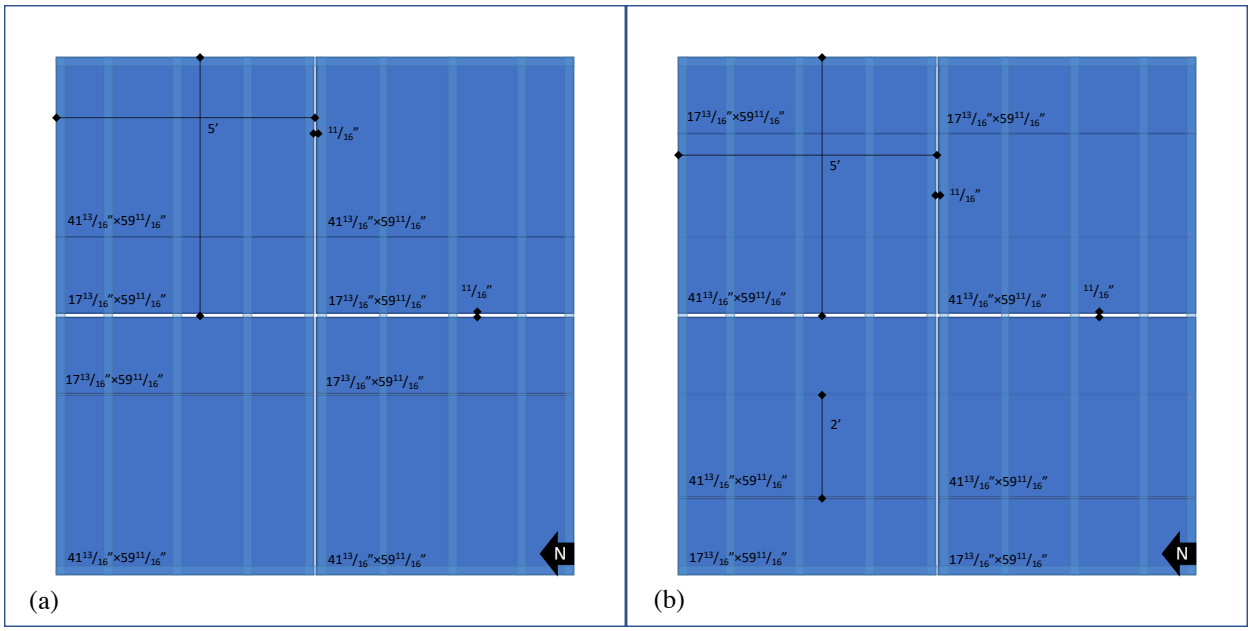


Figure 3. Assembly schematic showing gypsum on (a) base layer and (b) face layer.

An aluminum drywall reveal molding (RatedReveal, ⅝" wide, ⅝" deep, ⅞" flanges) was placed within the $^{11}/_{16}$" groove left in two layers of gypsum (Figure 4a), in both the horizontal and vertical directions. A ⅝" strip of factory-applied intumescent tape (RatedReveal Tape, Figure 4b) was affixed to the back width (toward the stud cavity) of the molding along the full 10' both horizontally and vertically, which provides the thermal protection to the interior of the wall assembly. When exposed to elevated heat, the intumescent expands out from the drywall reveal molding, forming an insulting barrier. The center recessed section of the vertical reveal was notched out to form a cross in the horizontal and vertical reveals, which was sealed with firestop. The reveals were fastened to the gypsum with 2¼" Type S screws at 12" on center spacing.

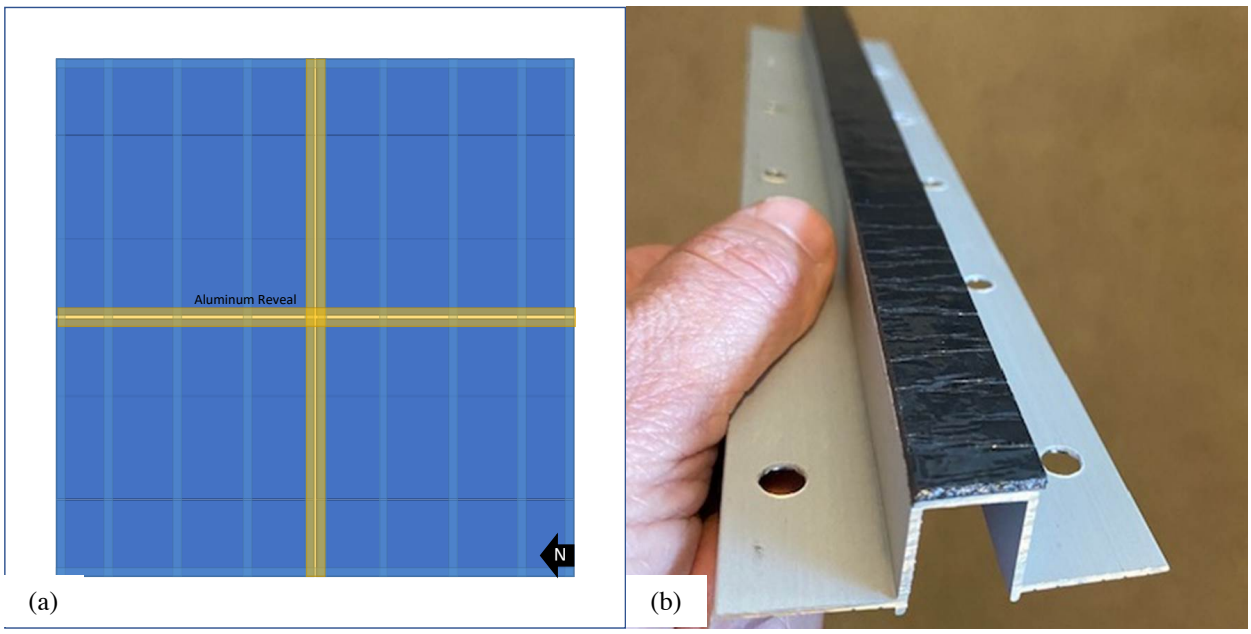


Figure 4. Assembly (a) schematic showing horizontal and vertical reveal and (b) applied tape to reveal

To obtain representative thermal information of the sample during the test, the fire endurance assembly was instrumented with sample thermocouples (TC_S). The TC_S were placed in one group overall group (Figure 5):

- Unexposed TC_S (1-10): Placed at center and quarter points of assembly (TC_S1-5) as well as additional points (TC_S5-10) throughout the assembly. Five (TC_S3,6-9) were placed directly behind the aluminum reveal. All unexposed TC_S were covered with 6" ceramic pads.

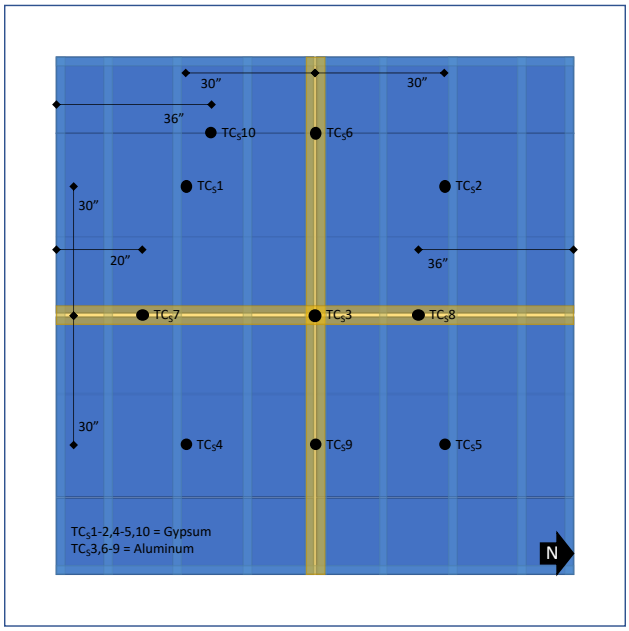


Figure 5. Sample thermocouple locations showing unexposed TC_S.

TEST RESULTS

Testing of the fire resistance wall (including hose-stream) and took place on February 3, 2021. Each assembly was fixed in place within the sample holder and insulated on the perimeter edges with ceramic wool insulation. The furnace temperature, sample temperatures, and furnace pressure, were continuously monitored at 1 Hz until test termination. Also, horizontal deflection was measured every 5 minutes during the test. These data, as well as additional photographs, are presented below.

Test Date & Time: 2/3/21, 8:25 AM

Furnace: Large-scale vertical exposure E119 furnace – 120-min fire exposure followed by hose-stream

Laboratory Conditions: 14°C, 62% RH

Table 1. Observations for fire resistance wall test.

Test Time (hr:mm:ss)		**Event**
00:00		Start test

04:15		Cracking joint compound
12:00		Bowed aluminum reveal
28:00		Melting of aluminum reveal
1:04:00		Fallen sections of reveal on face – some separation of TCs pad due to bowing of wall
1:52:00		No significant change
2:02:33		Furnace off – time-temperature area achieved
~2:04:00		Start hose-stream
~2:06:30		Stop hose-stream – slight trickling of water down assembly – no projection of water (blowout of gypsum or reveal) through assembly

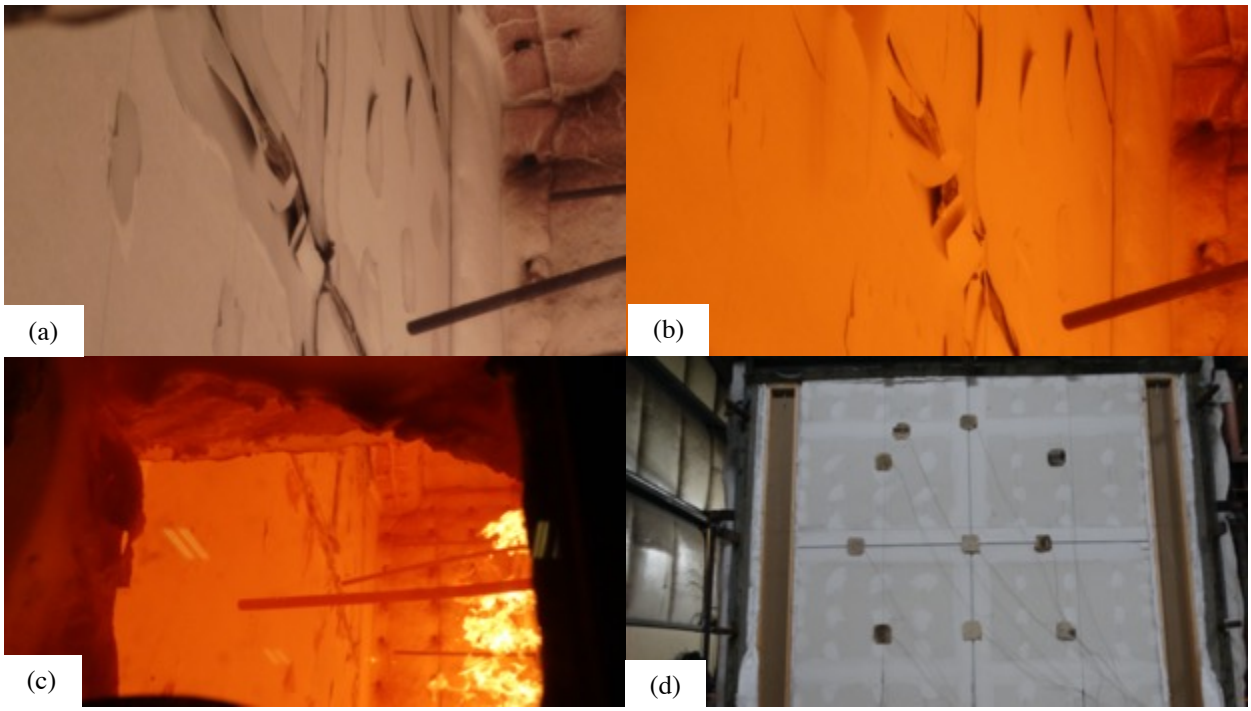


Figure 6. Wall assembly during fire resistance test showing (a) bowing reveal – 12 min, (b) melting aluminum – 29 min, (c) exposed near end of test – 114 min, and (d) unexposed near end of test – 114 min.

The furnace test was terminated at 120 m 33 s, once the area under the time-temperature curve was met. No flames passed through the assembly at that time, giving a wall rating of 120 min, rounding to the nearest integral minute. Thus, this fulfilled the requirement of flames or gases hot enough to ignite cotton waste for the 120-min period.

The temperature profiles for this sample are grouped unexposed TCs as shown in Figure 7 as well as the reveal-only TCs. The average and single-point unexposed temperature thresholds (139°C + ambient & 181°C + ambient) were not surpassed during the test, giving the assembly rating of 120 min, rounding to the nearest integral minute. The average temperature at the end of the test was 61°C. Therefore, this assembly passed the heat transmission requirement for the 120-min duration. The reveal temperatures were approximately the same as the rest of the gypsum temperatures.

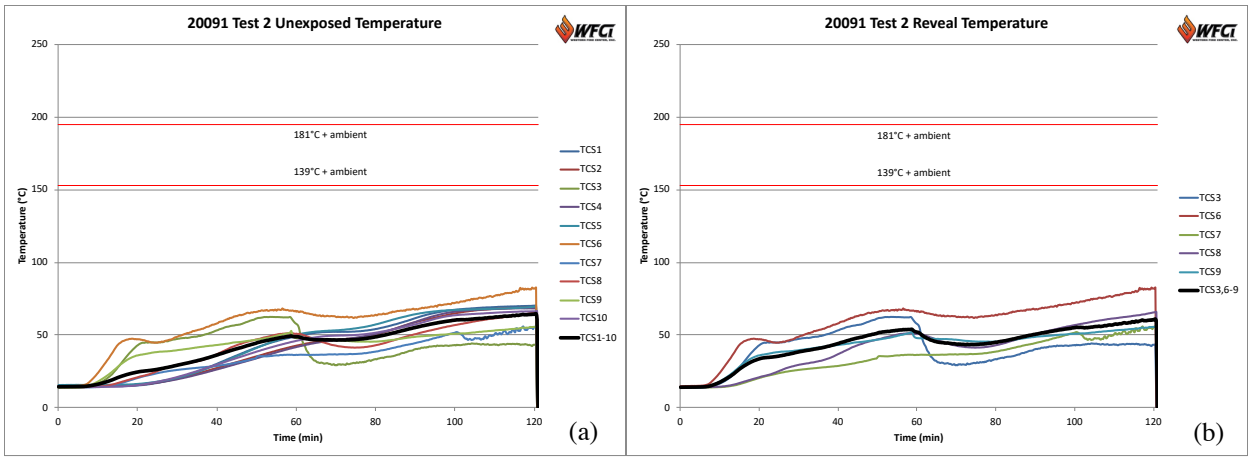


Figure 7. Sample temperatures showing (a) unexposed and (b) reveal-only TCs.

Following the 2-hr furnace exposure, the assembly was backed away from the furnace to perform the hose stream portion. For this portion, a water hose stream was applied at a pressure of 30 psi for 2½ min (2½ min/100 ft² for 120-min resistance, ASTM E2226, *Standard Practice for Application of Hose Stream*). Hose stream application began approximately 3 min following removal from the furnace.

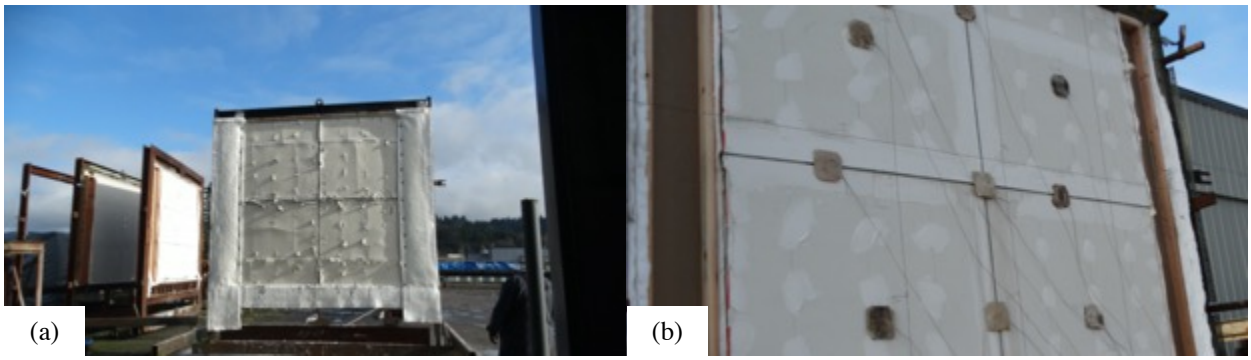


Figure 8. Wall assembly showing (a) after furnace and (b) after test – unexposed.

No holes or penetrations developed in the assembly that permitted the projection of water from the hose stream beyond the unexposed surface, thus fulfilling this hose-stream requirement of the standard. Some water had trickled down from the center of the reveal, but no water projection or blowout of the gypsum or reveal occurred.

CONCLUSION

The symmetric non-load-bearing wall assembly with aluminum reveal as detailed above passed all requirements for the 120-min fire endurance test, according to ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*. The wall assembly did not have hot gases hot enough to ignite cotton material for the 120 m test. The average (139°C + ambient) or single-point (181°C + ambient) temperature thresholds were not surpassed during the test. In addition, this same assembly was subjected to a hose-stream for 2½ min, and did not develop an opening that permitted the projection of water from the hose stream beyond the unexposed surface. Therefore, this assembly can be certified for a 120-min duration.

SIGNATURES

Reviewed and Approved by,

Mike White

Laboratory Manager

Testing performed by,

Brent M. Pickett, Ph.D.

Technical Director

The test specimen identification is as provided by the client, and WFCi accepts no responsibility 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 11, 2021	20091s	Original report