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**EVALUATION CENTER**  
INTERTEK TESTING SERVICES NA LTD.  
1500 BRIGANTINE DRIVE  
COQUITLAM, BC V3K 7C1

**RENDERED TO**

SAGE MANUFACTURING, LLC  
111 SW 5<sup>th</sup> Avenue #3150  
Portland, OR. 97204

PRODUCT EVALUATED: The R Stud – 25ga  
EVALUATION PROPERTY: Fire Resistance

Report of Testing Steel Stud Gypsum Partition for compliance with the applicable requirements of the following criteria: ASTM E119-12a Standard Test Methods For Fire Tests of Building Construction and Materials.

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# TEST REPORT

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REVISION SUMMARY		

## 2 Introduction

Intertek Testing Services NA, Inc. (Intertek) has conducted testing for Sage Manufacturing LLC using their 3-5/8 inch “R-Stud” product to construct a drywall partition and evaluate fire resistance. Testing was conducted in accordance with ASTM E119–12a Standard Test Methods for Fire Tests of Building Construction and Materials – July 15 2012 Edition.

The initial Fire test and Hose Stream test (as per ASTM E110-12a Section 7.6.3 Optional Program) was conducted on March 4<sup>th</sup>, 2015 and was completed the same day. The fire test was repeated on March 10<sup>th</sup> 2015 on a duplicate test specimen (in accordance with ASTM E119-12a Section 7.6.2.1) to qualify the specimen to the hose stream requirements of the standard.

## 3 Test Samples

### 3.1. SAMPLE SELECTION:

Intertek representative, Adam Mantei, sampled and witnessed the manufacture of the steel stud product on October 28, 2014. The sample selection process and witnessing was conducted at GK Machine Inc., 10590 Donald Road NE, Donald, OR, 97020, USA. Products were selected in accordance with recognized independent sampling procedures, and were received at the Evaluation Center on January 5, 2015 (Coquitlam ID# VAN1501221003-001).

### 3.2. SAMPLE AND ASSEMBLY DESCRIPTION:

The specifications for the components used in construction of the test wall samples and the component suppliers are listed in Table 1.

Table 1. Wall Component Specifications and Manufacturers	
Component	Specification
Steel Studs	Sage Manufacturing, LLC – The R Stud 3-5/8” (25 ga), G40 galvanized per ASTM A653
Drywall	USG Sheetrock - 5/8” Type-X Gypsum Panels (Firecode® Core) <b>Weight:</b> 5/8in. – 2.2 lbs/sf. <b>Thermal Resistance “R”:</b> For 1/2in. thickness: 0.45°F x ft.2 x h/Btu (0.08K x m2/W) <b>Thermal Coefficient of Expansion: Unrestrained:</b> 40-100 °F (4-38 °C): 9.0 x 10–6 in./in./°F (16.2 x 10–6 mm/mm/°C) (16.2 μm/m/°C). <b>Hygrometric Coefficient of Expansion: Unrestrained:</b> 5-90% r.h. 7.2 x 10–6 in./in./% r.h. (7.2 x 10–6 mm/mm/% r.h.) (7.2 μm/m/% r.h.). ASTM C1396 Compliant. Product Information Source: <a href="http://www.usg.com/content/dam/USG_Marketing_Communications/united_states/product_promotional_materials/finished_assets/sheetrock-gypsum-panels-regular-firecode-cores-submittal-WB1473.pdf">http://www.usg.com/content/dam/USG_Marketing_Communications/united_states/product_promotional_materials/finished_assets/sheetrock-gypsum-panels-regular-firecode-cores-submittal-WB1473.pdf</a>
Steel Track	3-5/8” (25 ga)
Fasteners	1-½ inch self-tapping fine thread drywall screws
Insulation	Roxul 3 inch thick R-13 insulation bats (2 x 4 ft)
Joint filler & Paper Tape	Synco – Redi-Filler All Purpose Drywall Compound & Synco 50mm wide Joint Tape

The materials (drywall, fasteners, insulation and jointing compound/tape) chosen by the laboratory to construct the partition wall were sourced depending on availability.

### 3.3. SAMPLE CONSTRUCTION METHOD:

#### Framework:

The partition frame was constructed using 3-5/8 inch 25 ga. Steel stud (R-stud) fixed 24 inches on center to 3-5/8 inch tracks at the top and bottom using ½ inch flat head self-tapping screws. The finished framework spanned 12 x 10ft (width x height).

#### Facings/drywall:

5/8 inch thick Type X gypsum panels 4 x 10ft (w x h) were fixed to both faces (exposed/unexposed) of the framework using 1-½ inch self-tapping screws. The screw fasteners were located 12 inches on center in the field and at the top and bottom horizontal perimeters. Screw fasteners were also fixed 8 inches on center along the vertical perimeters and joints.

#### Insulation:

The cavity of the wall was filled using 2 x 4ft (w x h) 3 inch thick R-13 insulation bats that were placed end to end along the vertical plane in between studs.

#### Jointing and Taping:

Drywall mud/jointing compound was applied to all visible screw heads and along all vertical joints. Jointing tape was then applied to all vertical joints and a second coat of drywall compound was applied over the joint tape thereby covering the tape.

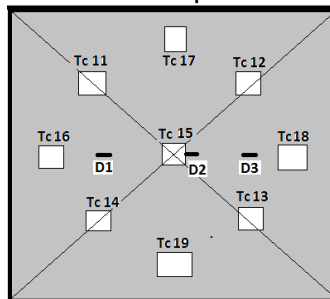
## 4 Testing and Evaluation Methods

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### 4.1. INSTRUMENTATION

Unexposed face temperatures were recorded using Type K thermocouples (See Appendix B) and were attached to the specimen as follows (see below illustration):

5 thermocouples were attached, 1 to the center of the specimen and 4 to the center of each of the four quadrants (Tc 11 – 15). 4 additional thermocouples were added to the unexposed face at a distance no closer than 12 inches from the perimeter of the test sample (Tc 16 – 19).



Deflections were recorded for the entire duration of the test. Deflection points were located along mid height of the sample (5 feet up from the simulated finished floor level) spaced along the horizontal plane. (see above illustration and Appendix B for deflection data)

The 0 pressure plain was maintained at the head of the sample and was slightly negative in accordance with ASTM E119-12a Section 7.6.2.1 (see Appendix B).

#### 4.2. TEST STANDARD

The test was conducted in accordance with the requirements of ASTM E119–12a Standard Test Methods for Fire Tests of Building Construction and Materials July 15 2012 Edition.

## 5 Testing and Evaluation Results

### 5.1. RESULTS AND OBSERVATIONS (Test 1 with Optional Program)

The test was initiated on March 4<sup>th</sup> 2015. The client was not present to witness the test. The ambient laboratory temperature at the time of the test was 50.4°F and the relative humidity was between 47% - 52%. The unexposed face average temperature at the start of the test was 54.1°F (calculated using the average of all 9 unexposed face thermocouples).

Unexposed face average temperature limit = Initial t (54.1°F) + 250°F = 304.1°F

Unexposed face single point temperature limit = Initial t (54.1°F) + 325°F = 379.1°F

Observations made during Test 1:

Time (min:sec)	Observation(s)	
	Exposed Face	Unexposed Face
0:00	Start of test	
2:00	Paper face burning off discolouration observed.	
10:00	Specimen stable	Deflection observed. No other change.
15:00	Cracks appearing and screw heads are now visible.	Specimen deflecting towards the furnace.
22:10	Large cracks observed on the surface of the drywall board.	
30:00	Insulation visible. Some of the drywall has fallen away exposing the cavity of the wall system.	All temperatures are still within the limits.
45:00	Almost all exposed face drywall board has fallen away.	
55:00	No change.	Specimen stable. Continues to deflect towards the furnace. Temperatures are within limits.
<b>60:00</b>	<b>End of test declared.</b>	

Immediately after the fire test the specimen was detached from the furnace and moved to the hose stream bay area within 2 minutes.

The optional program as per ASTM E119-12a Section 7.6.3 was carried out and the initial test specimen was subjected the hose stream test procedure for a duration of 72 seconds at 30 psi.

## 5.2. EXAMINATION OF RESULTS (Test 1 with Optional Program)

The initial test sample has undergone fire endurance and hose stream test procedures as required by ASTM E119-12a.

The initial test sample has met the requirements of the fire endurance test procedure but has failed the hose stream test.

As per the requirements of the ASTM E119-12a, a duplicate test specimen is to be constructed and the fire test repeated to one-half the fire endurance test duration of the initial test specimen (not exceeding 1 hour) and subjected to the full duration of the hose stream test as calculated on the initial test specimen (72 seconds).

### 5.2.1. Correction Factor for the Fire Endurance Test

In accordance with the ASTM E119-12a test standard, a calculation for any correction to the indicated fire resistance period was done. The correction factor was then mathematically added to the indicated fire resistance period, yielding the fire resistance period achieved by this specimen:

**Correction Factor for the Fire Endurance Test**

ITEM	DESCRIPTION	TEST VALUE
C	correction factor	37 seconds
I	indicated fire-resistance period	60 minutes
A	area under the curve of indicated average furnace temperature for the first three fourths of the indicated period	85072 (°F•min)
As	area under the standard furnace curve for the same part of the indicated period	87306 (°F•min)
ITEM	DESCRIPTION	TEST VALUE
L	lag correction	1800
	FIRE RESISTANCE PERIOD ACHIEVED BY THIS SPECIMEN ==>	61 minutes

Note: The standard specifies that the fire resistance be determined to the nearest integral minute. Consequently, if the correction factor is less than 30 seconds, and the test specimen met the criteria for the full indicated fire resistance period, no correction is deemed necessary.

### 5.3. RESULTS AND OBSERVATIONS (Test 2 – ½ duration fire test & hose stream test )

The test was initiated on March 10<sup>th</sup> 2015. The client was not present to witness the test. The ambient laboratory temperature at the time of the test was 54.7°F and the relative humidity was between 46% - 50%. Unexposed face temperatures were not recorded.

Observations made during Test 2:

Time (min:sec)	Observation(s)	
	Exposed Face	Unexposed Face
0:00	Start of test.	
1:47	Paper facing starting to burn off.	
10:00	Specimen stable	Deflection observed. No other change.
15:00	Specimen stable	Specimen deflecting towards the furnace.
<b>30:00</b>	<b>End of ½ duration fire endurance test.</b>	

Immediately after the repeat fire endurance test, the specimen was detached from the furnace and moved to the hose stream bay area within 2 minutes.

The test specimen was subjected to the impact, erosion and cooling effects of hose stream for a duration of 72 seconds at 30 psi.

### 5.4. EXAMINATION OF RESULTS (Test 2 – ½ duration fire test & hose stream test)

The duplicate test sample has undergone one half the fire endurance test exposure period as determined by the initial fire test and the hose stream test procedures as required by ASTM E119-12a.

The duplicate test sample has met the requirements of the ½ duration fire endurance test as well as endured the impact, erosion and cooling effects of the hose stream for a duration of 72 seconds at 30 psi without developing any openings anywhere on the assembly.

## 6 Conclusion

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Intertek Testing Services NA, Inc. (Intertek) has conducted testing for Sage Manufacturing LLC using their 3-5/8 inch "R-Stud" product as part of a drywall partition and evaluate fire resistance. Testing was conducted in accordance with ASTM E119-12a Standard Test Methods for Fire Tests of Building Construction and Materials July 15 2012 Edition.

The initial Fire test and Hose Stream test (as per ASTM E110-12a Section 7.6.3 Optional Program) was conducted on March 4<sup>th</sup>, 2015 and was completed the same day. The fire test was repeated on March 10<sup>th</sup> 2015 on a duplicate test specimen (in accordance with ASTM E119-12a Section 7.6.2.1) to qualify the specimen to the hose stream requirements of the standard.

The drywall partition has met the conditions of acceptance of AETM E119-12a as indicated below:

<b>FIRE RESISTANCE RATING</b>
<b>60 MINUTES</b>

The conclusions of this test report may be used as part of the requirements for Intertek product certification. Authority to Mark must be issued for a product to become certified.

### INTERTEK TESTING SERVICES NA, INC.

Tested &  
Reported by:

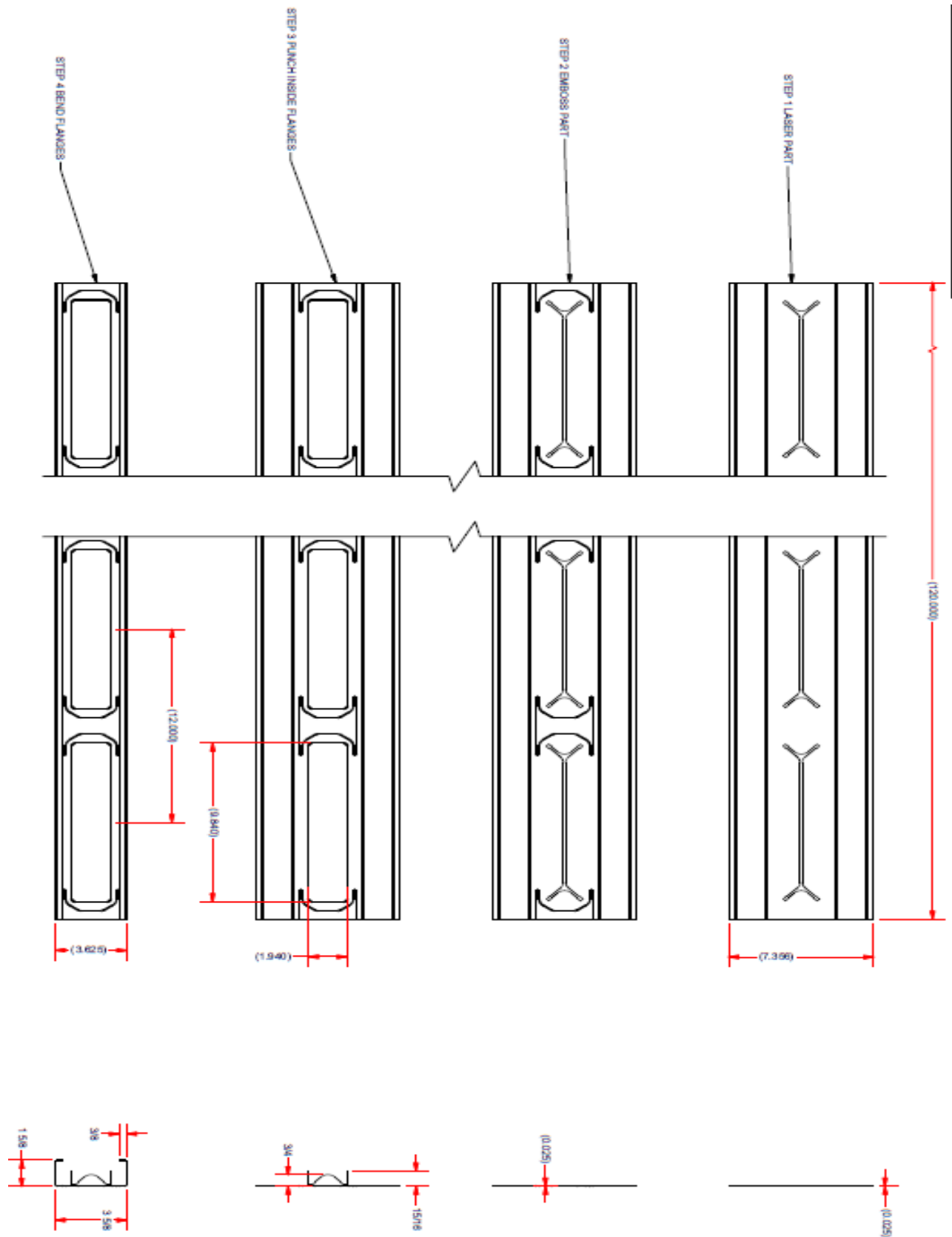
  
Vijay Lucas  
Technical Analyst – Fire

Reviewed by:

  
Greg Philp  
Reviewer - Fire

## APPENDIX A

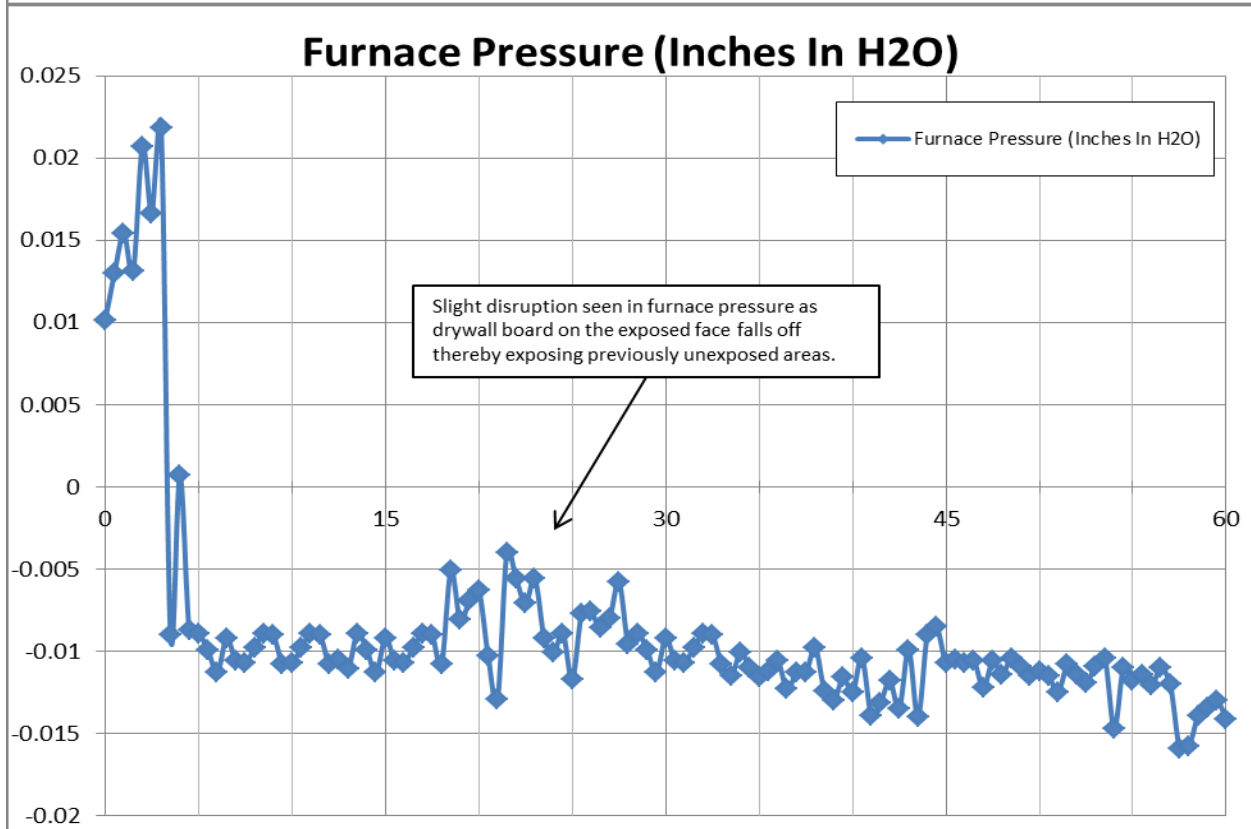
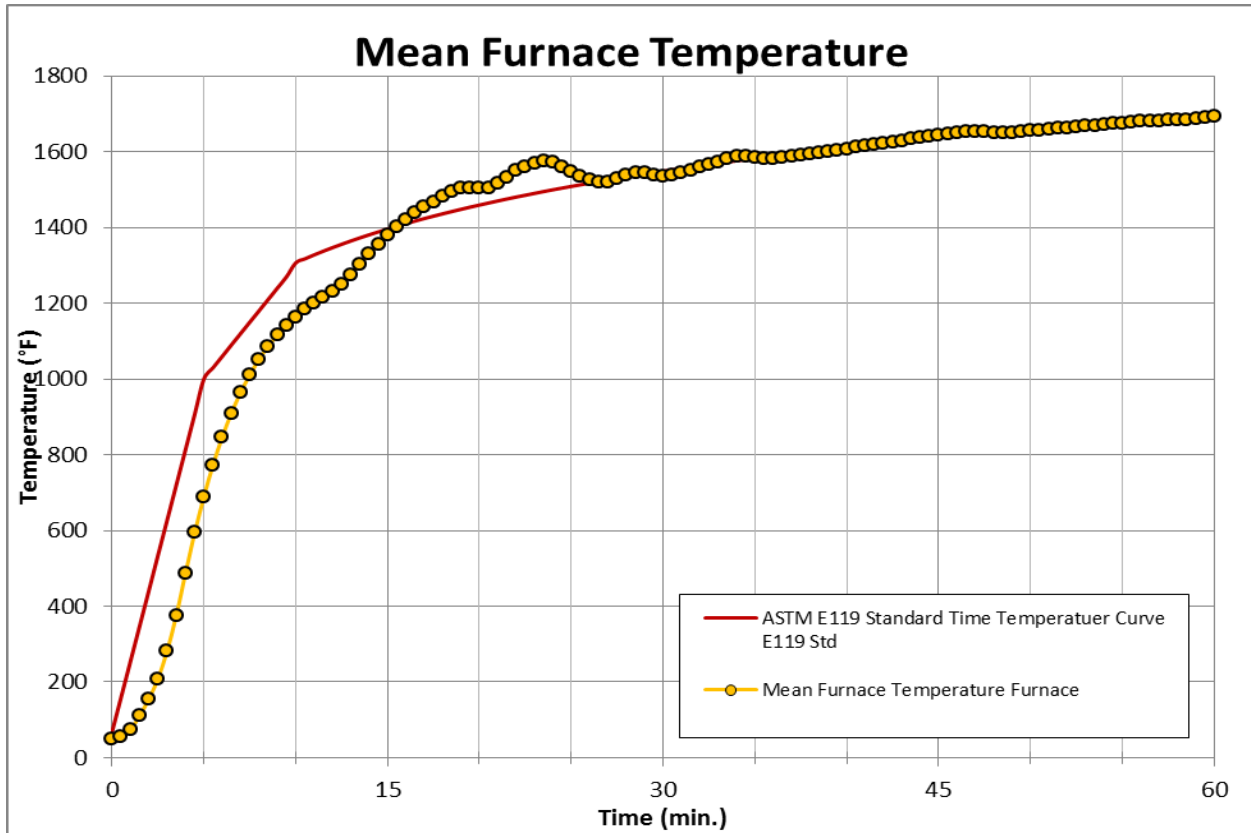
### Drawings

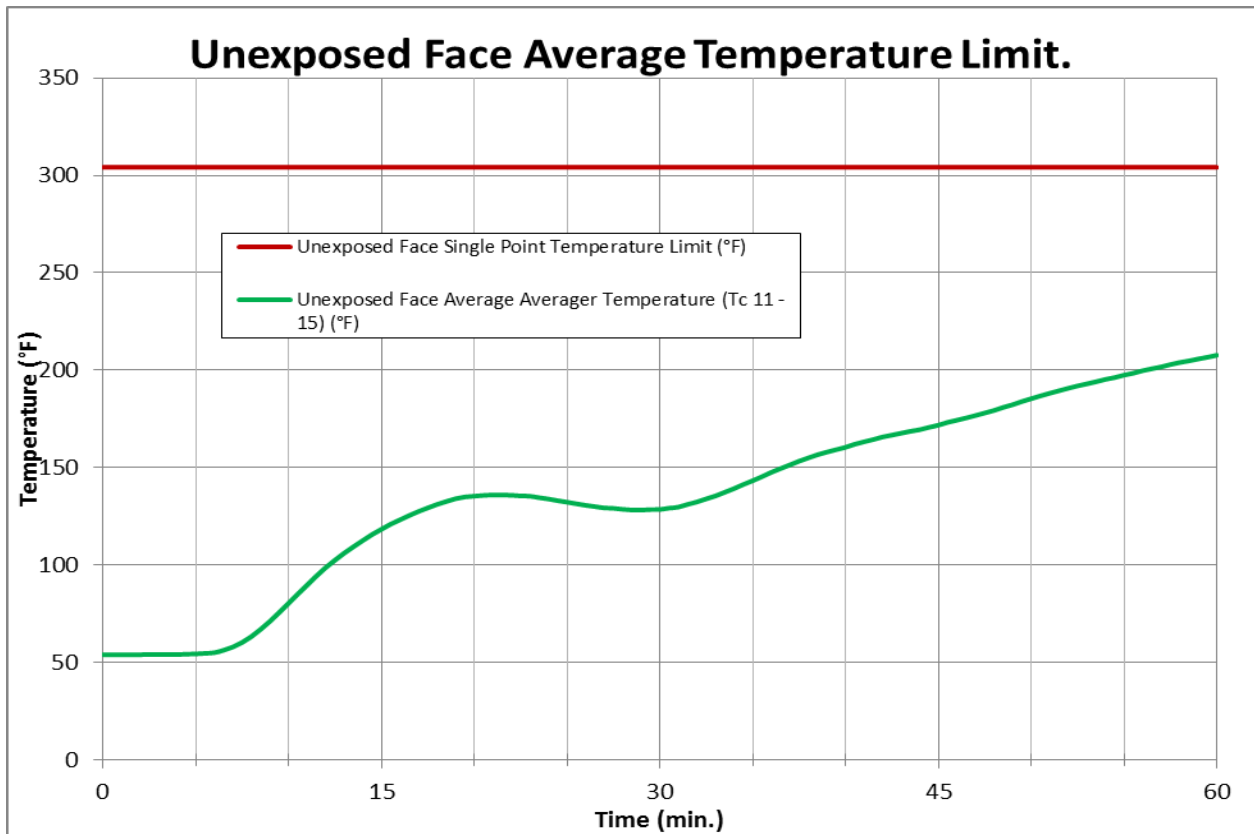
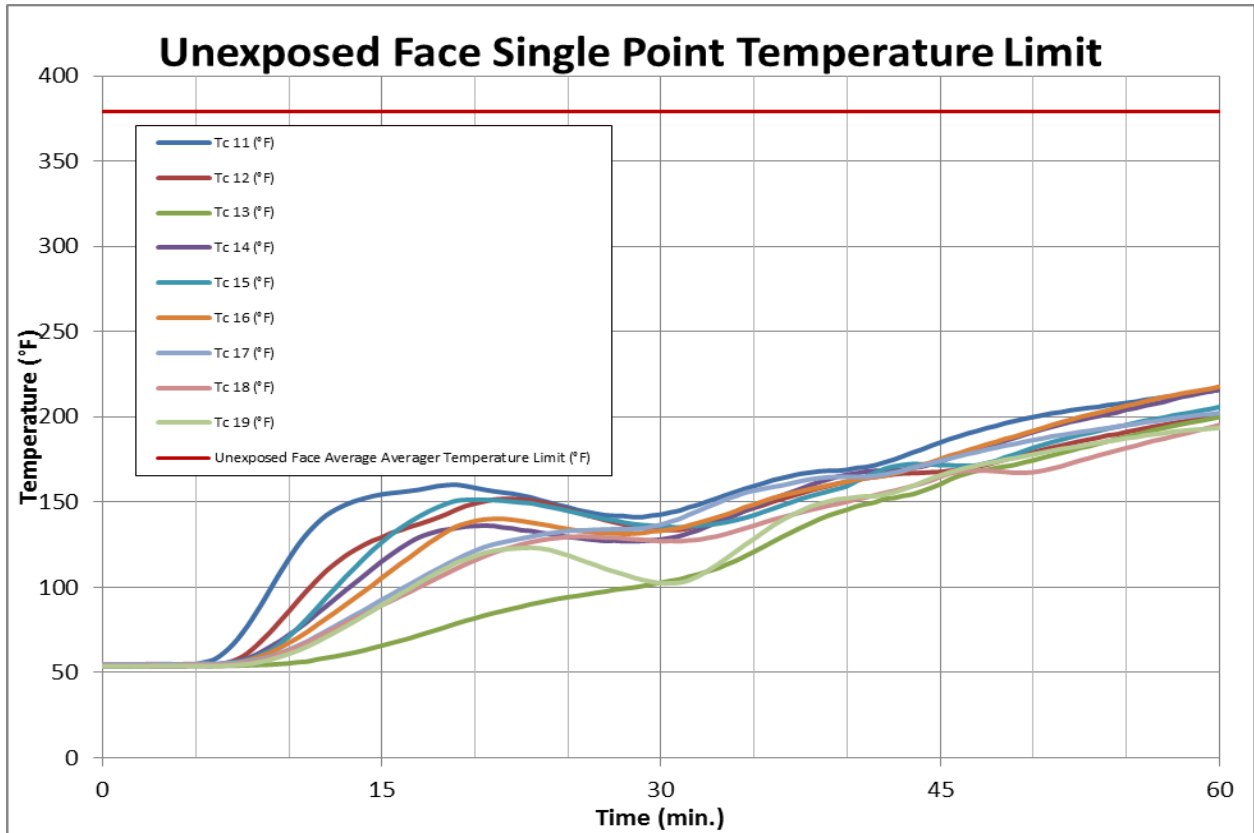


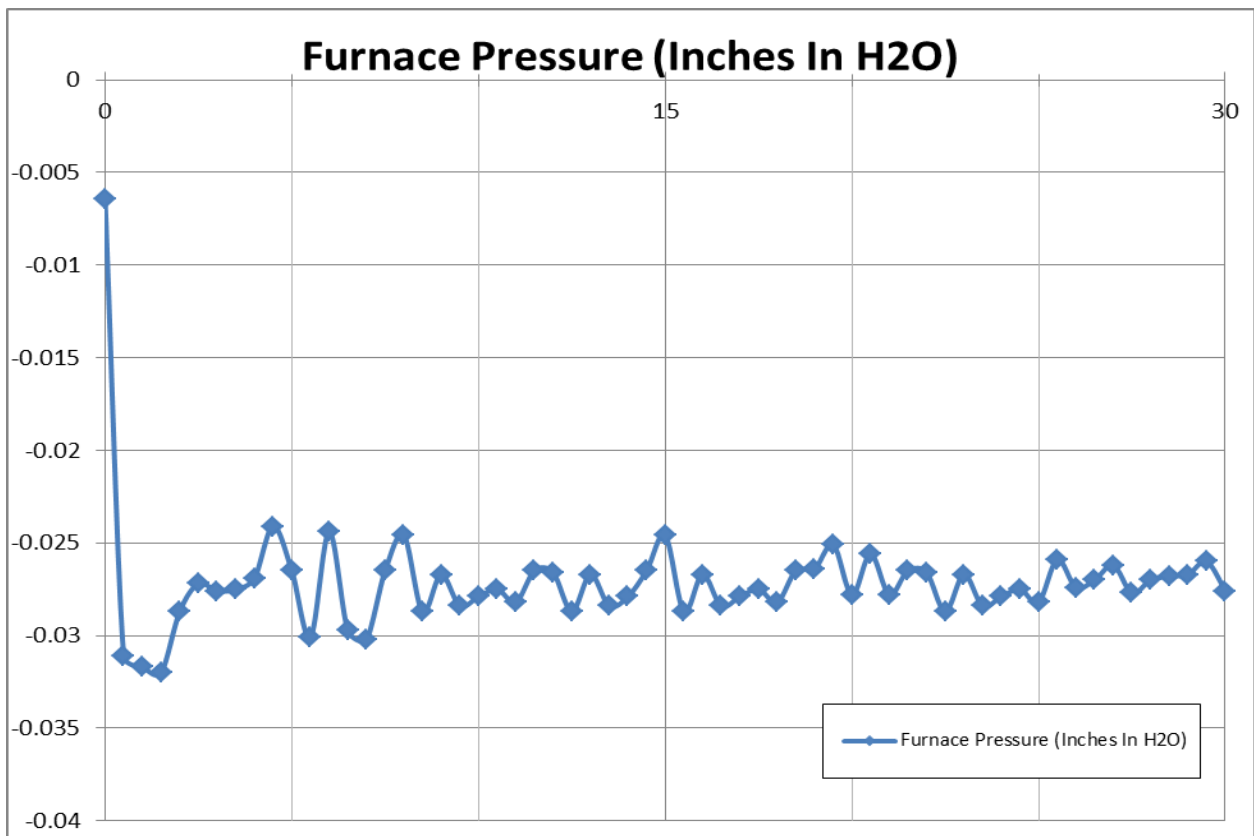
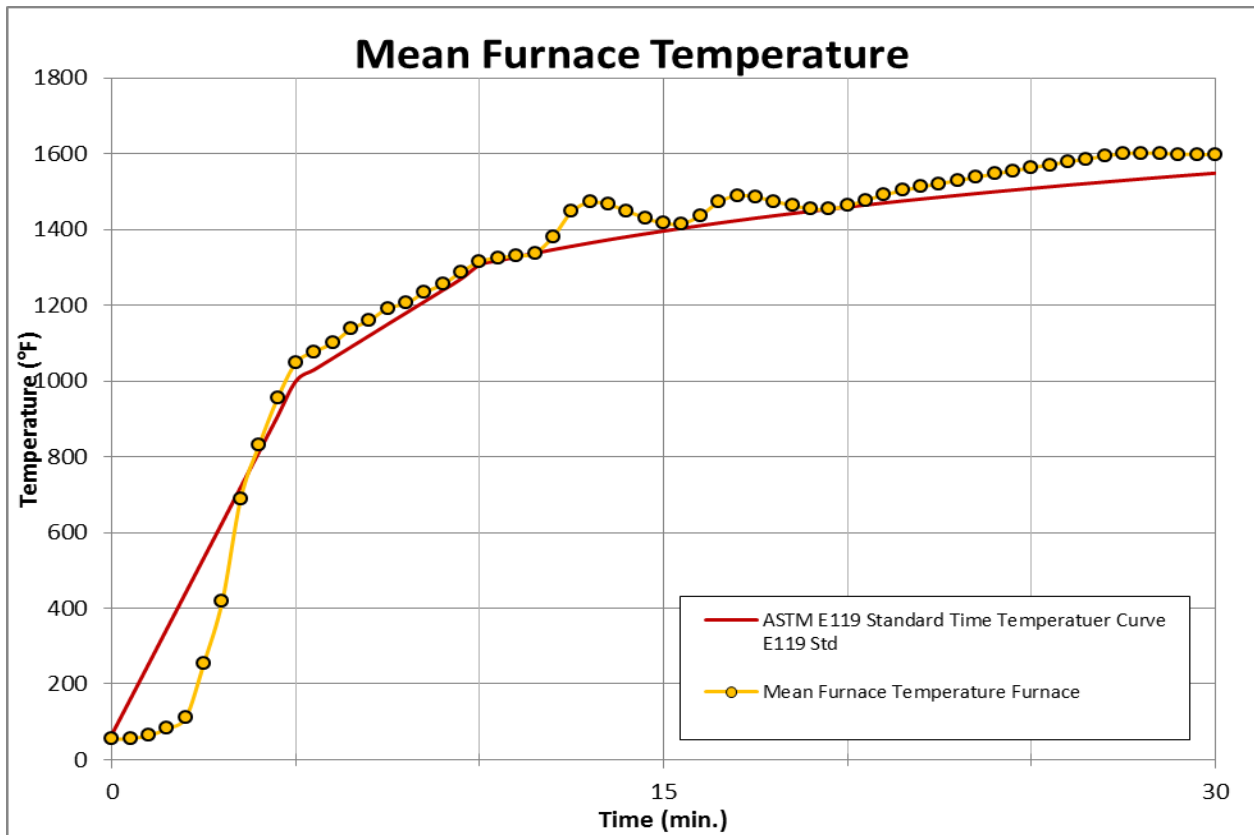


## APPENDIX B

### Test Data







**Deflection Measurements (Initial Test Sample)**

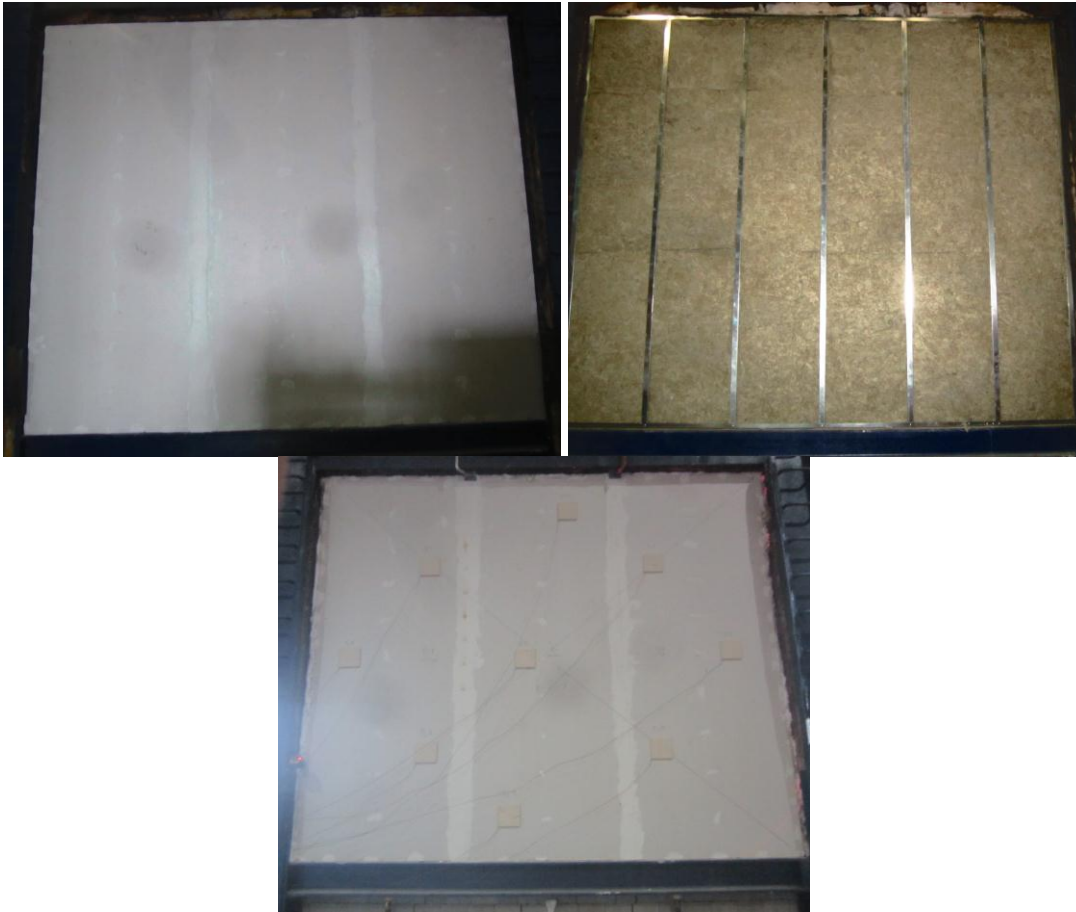
<b>Time (min.)</b>	<b>D1</b>	<b>D2</b>	<b>D3</b>
00:00	0	0	0
05:00	-4	-5	-5
10:00	-8	1	0
15:00	-10	0	10
25:00	-63	-49	-33
30:00	-65	-60	-54
45:00	-77	-66	-63
55:00	-79	-76	-72

Note: Negative values indicate movement towards the furnace.

## APPENDIX C

### Photographs

**TEST SAMPLE 1**



1. The exposed face, cavity and unexposed face of the sample prior to the test.

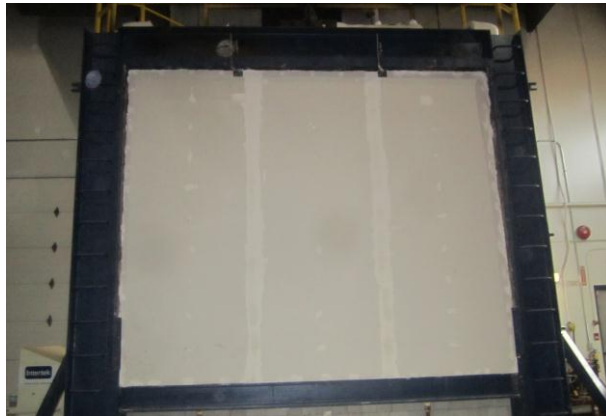


2. Cracks visible on the exposed face of the sample during the test.



3. The exposed face after the fire test and immediately after the hose stream test.

**TEST SAMPLE 2**



1. The duplicate test sample during the fire test



2. The duplicate test sample after the fire and hose stream test.

### REVISION SUMMARY

<b>DATE</b>	<b>SUMMARY</b>
March 25, 2015	Original Issue Date