

**LEADING EDGE CONSTRUCTION MATERIALS TESTING COMPANY LIMITED**

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<b>Test Report No.:</b>	<b>Q19A195</b>
<b>Date of Issue :</b>	<b>November 18, 2019</b>
<b>Revision :</b>	<b>00</b>

## Fire Resistance Test Report for Jumbo Gypsum Block Wall

Sponsor:	Mercurio Servicos De Engenharia Companhia Limitada.
Address:	Patio Da Concordia No 5-43, Fabrica Wang Kai 9 Andar A, Macau.
<b>Information provided by Sponsor</b>	
Product Name:	Jumbo Gypsum Block Wall (Non-Loadbearing)
Nominal dimension:	600(L)*500(H) *100mmT(Sample), 3.00m×3.00m(Wall)
Test Specimen Layout:	See <b>Appendix 1</b>
<b>Details of Test and Results</b>	
Test Method:	ASTM E119-18a: Standard Test Methods for Fire Tests of Building Construction and Materials
Date of Test:	Oct 31th, 2019
Test Results:	The test specimen has withstood the fire-resistance test without passage of flame or gases hot enough to ignite cotton waste, transmission of heat through the wall during the test was not raise the temperature on its unexposed surface more than 250°F (139°C) above its initial temperature for a period of 240 minutes, and there was no failure in the hose stream test. (Test was terminated upon sponsor request)
Conclusion:	The specimen meet the condition of acceptance of ASTM E119 when exposed to a fire-resistance rating of 4 hours fire-resistance test and hose stream test.



Authorized Signatory  
Mr. Zeng Xiang Jian

Date Nov 18th, 2019

The test results are valid only the condition under which the test was conducted. This Laboratory is accredited by the International Accreditation Service for specific test and/or measurements in accordance with ISO 17025. The results shown in this test report have been determined in accordance with the laboratory's terms of accreditation. It may not be reproduced except with prior written approval from the issuing laboratory.



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### 1. Introduction

The fire resistance property of the panel wall on insulation & integrity elements was tested in Leading Edge Construction Materials Testing Company Limited Zhaoqing Laboratory (the Laboratory) in accordance with the requirements of **ASTM E119-18a**. The construction layout and the materials specification of the specimen are shown in the **Appendix 1**, which were provided by the Sponsor and the dimensions were verified by the Laboratory.

### 2. Location of Testing Facilities

Asia Aluminum Industrial City, The New & High-Tech Industrial Development Zone, Dawang, Zhaoqing, Guang Dong Province, China.

### 3. Installation of Test Specimen and Test Conditions

The test specimen shall be representative of the construction that the test is intended to assess, as to materials, workmanship, and details such as dimensions of parts, and shall be built under conditions representative of those applied in building construction and operation. The physical properties of the materials and ingredients used in the test specimen shall be determined and recorded.

The size and dimensions of the test specimen specified herein shall apply for classifying constructions of dimensions within the range employed in buildings. When the conditions of use limit the construction to smaller dimensions, the dimensions of the test specimen shall be reduced proportionately for a test qualifying them for such restricted use.

### 4. Equipment

- (a) Vertical furnace with natural gas burners;
- (b) 9 nos. K-type furnace control thermocouples with hot junction at the specimen at the start of the heating period;
- (c) National instruments (NI) data logger system which is capable for logging one temperature reading per min.;
- (d) 9 thermocouples installed at the unexposed face of the test specimen to evaluate the insulation properties of the panel system;
- (e) Cotton pads, gap gauges when necessary;



## 5. Test Procedures

The test was conducted according to ASTM E119-18a. The standard measures the fire-resistance performance by quantifying the temperature rise on the unexposed face of the building element when the exposed side is subjected to the standardized ASTM E119 Time versus Temperature curve.

The fire resistance test was carried out on 31st Oct 2019 under non loadbearing condition for 4 hours and was then submitted to the ASTM E2226 hose stream test. After the 240 minute fire exposure test, a hose stream was applied to the exposed surface in accordance with the requirements of ASTM E2226.

The unexposed surface of Jumbo Gypsum Block Wall was instrumented with a total of nine (9) Type thermocouples to measure the transmission of heat from exposed surface. The vertical furnace was equipped with nine (9) furnace probes as per ASTM E119-18a. The temperature of the thermocouples and furnace were recorded at one minute interval during the test.

When

When the indicated resistance period is  $\frac{1}{2}$  h or over, determined by the average or maximum temperature rise on the unexposed or maximum temperature rise on the unexposed surface or within the test specimen, or by failure under load, a correction shall be applied for variation of the furnace exposure from that prescribed, where it will affect the classification, by multiplying the indicated period by two thirds of the difference in area between the curve of average furnace temperature and the standard curve for the first three fourths of the period and dividing the product by the area between the standard curve and a base line of 68°F for the same part of the indicated period, the latter area increased by 54°F\*h (3240°F\*min) to compensate for the thermal lag of the furnace thermocouples during the first part of the test. For fire exposure in the test higher than the standard, the indicated resistance period shall be increased by the amount of the correction and be similarly decreased for fire exposure below standard.

The correction can be expressed by the following equation:

$$C = \frac{2I(A - A_S)}{3(A_S + L)}$$



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Variable	Description	Value	Units
C	Correction Factor	54	Seconds
I	Indicated FR Period	242	Minutes
A	Area under indicated FR Period for first $\frac{3}{4}$ of the test period	162757	$^{\circ}\text{C} * \text{min}$
A <sub>s</sub>	Area under standard E119 Time vs. Temp. curve for first $\frac{3}{4}$ of test period	163685	$^{\circ}\text{C} * \text{min}$
L	Lag Correction	1800	$^{\circ}\text{C} * \text{min}$
FR Period	Fire-Resistance Period	241	Minutes

### 6. Conditions of Acceptance

6.1 The test specimen has withstood the fire-resistance test without passage of flame or gases hot enough to ignite cotton waste, for a period equal to that for which classification is desired.

6.2 The test specimen has withstood the fire and hose stream test as specified in 7.6, without passage of flame, of gases hot enough to ignite cotton waste, or of passage of water from the hose stream. The test specimen shall be considered to have failed the hose stream test if an opening develops that permits a projection of water from the stream beyond the unexposed surface during the time of the hose stream test.

6.3 Transmission of heat through the wall or partition during the fire-resistance test shall not raise the temperature on its unexposed surface more than 250°F (139°C) above its initial temperature.

### 7. Data and Test Information

The mean measured temperature-time curve of the furnace and the ASTM E119-18a standard fire curve are shown in the **Appendix 3**.

The mean and maximum measured temperature-time curves at the unexposed face of the test specimen are shown in the **Appendix 4**.

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**8. Summary of Test Results**

The test was terminated at 240 minutes upon the request of the Sponsor. Photo records of the test before, during and after testing are shown in **Appendix 5**, the test results were shown below:

The test specimen has withstood the fire-resistance test without passage of flame or gases hot enough to ignite cotton waste, transmission of heat through the wall during the test was not raise the temperature on its unexposed surface more than 250°F (139°C) above its initial temperature for a period of 240 minutes, and there was no failure in the hose stream test.

<b>Time (Minute : Second)</b>	<b>Observations</b>
00:00	Start of test
00:30	No visible change
60:11	No crack or collapse was observed. The temperature rise of the unexposed surface was within the allowable range.
90:00	No visible change
120:09	No crack or collapse was observed. The temperature rise of the unexposed surface was within the allowable range.
150:00	No change
180:12	No crack or collapse was observed. The temperature rise of the unexposed surface was within the allowable range.
240:07	Test ended. No crack or collapse was observed. The temperature rise of the unexposed surface was within the allowable range. Burn mark was observed on exposed face of the specimen.



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### 9. Limitations of Test Results:

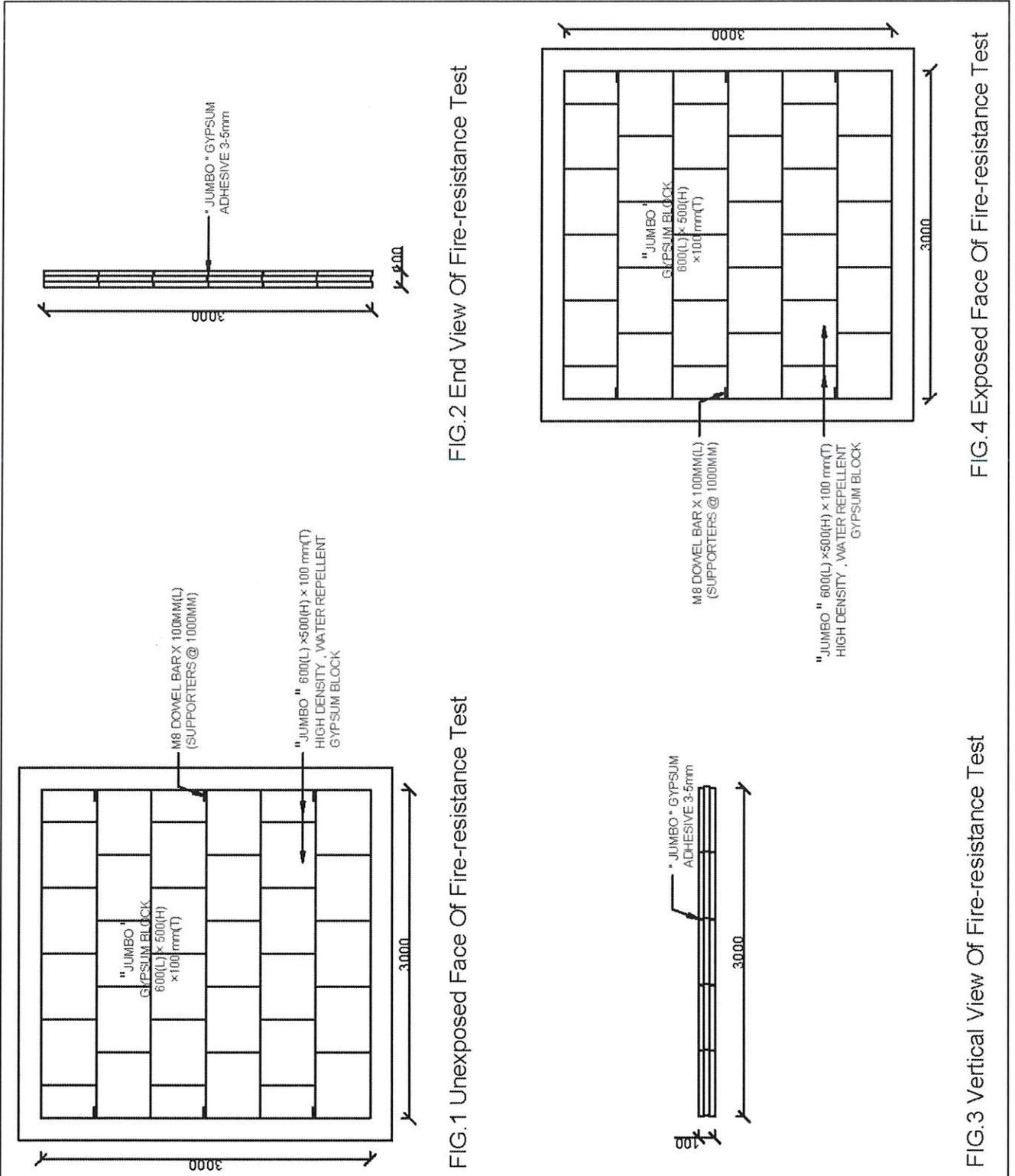
This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in ASTM E119-18a standards. Any significant deviation with respect to size, construction details, loads, stresses, and edge or end conditions other than those allowed under field of direct application in the relevant test method is not covered by this report.

Application of the test results to the same product to other dimensions or different fixing methods or different fire scenario under different heating regime is subjected to be assessed and justified by professional engineer.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.



## Appendix 1: Test Specimen Layout



**Figure 1: Installation platform & samples layout of the specimen**



## Appendix 2: Time-Temperature Curve of the Furnace

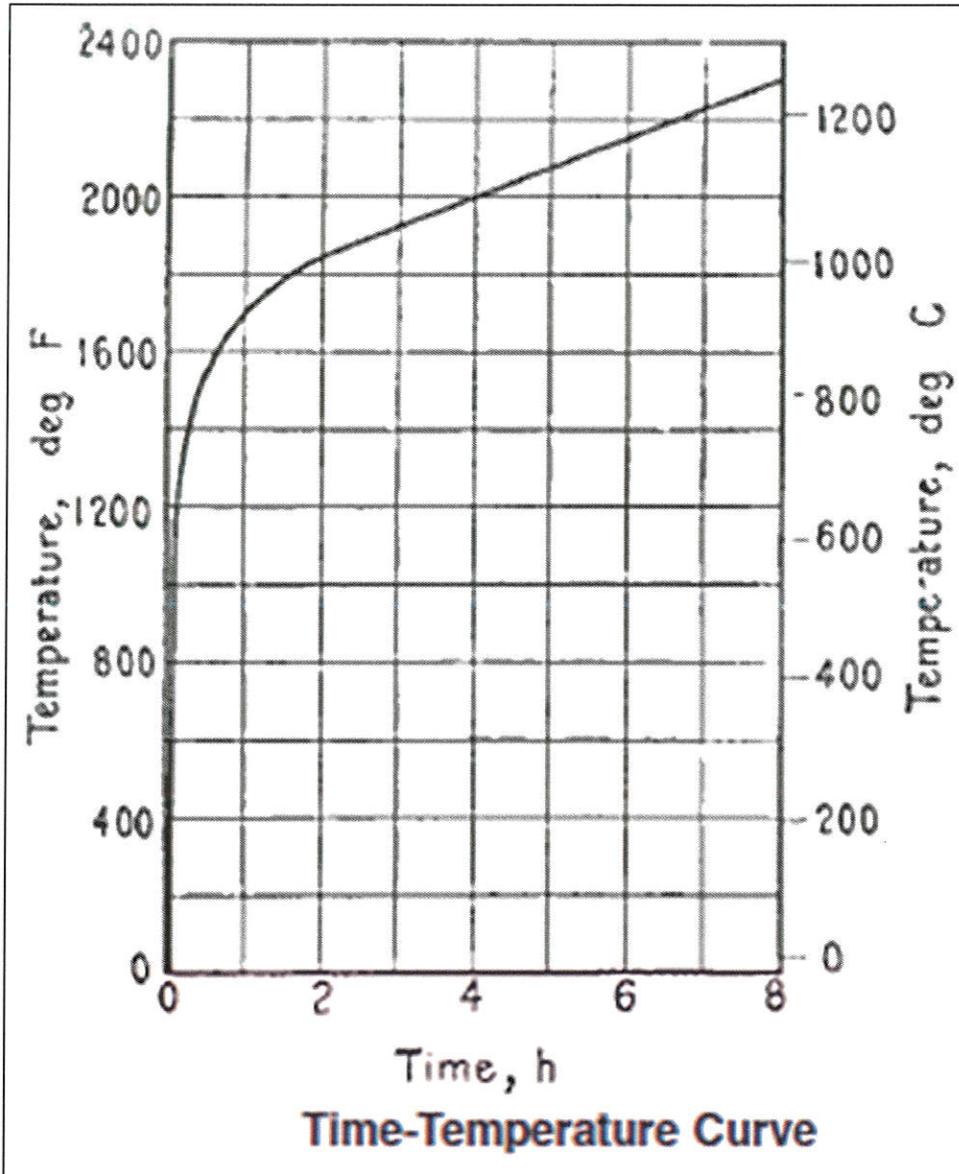
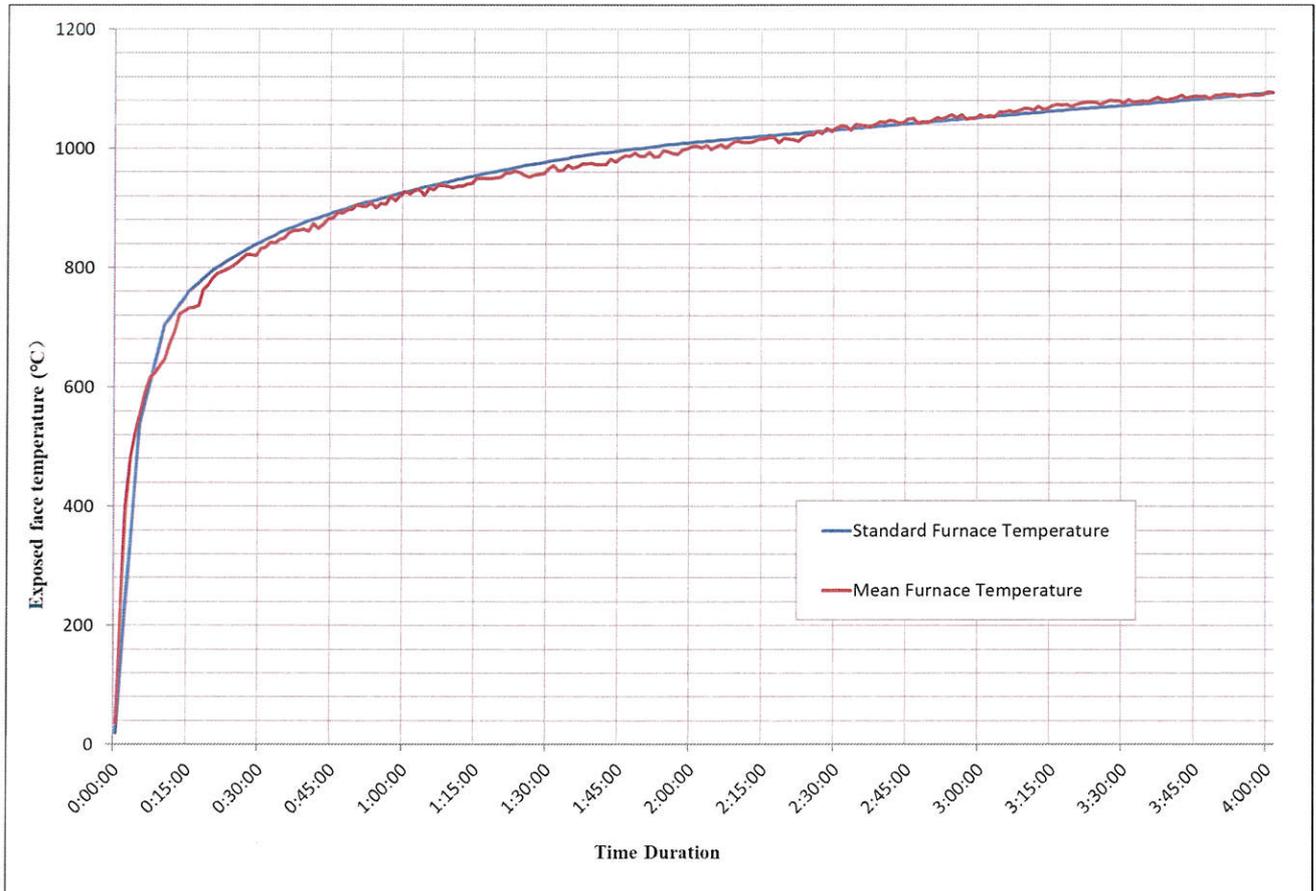


Figure 2: Standardized ASTM E119 Time vs. Temperature Curve



### Appendix 3: Furnace Temperature Records



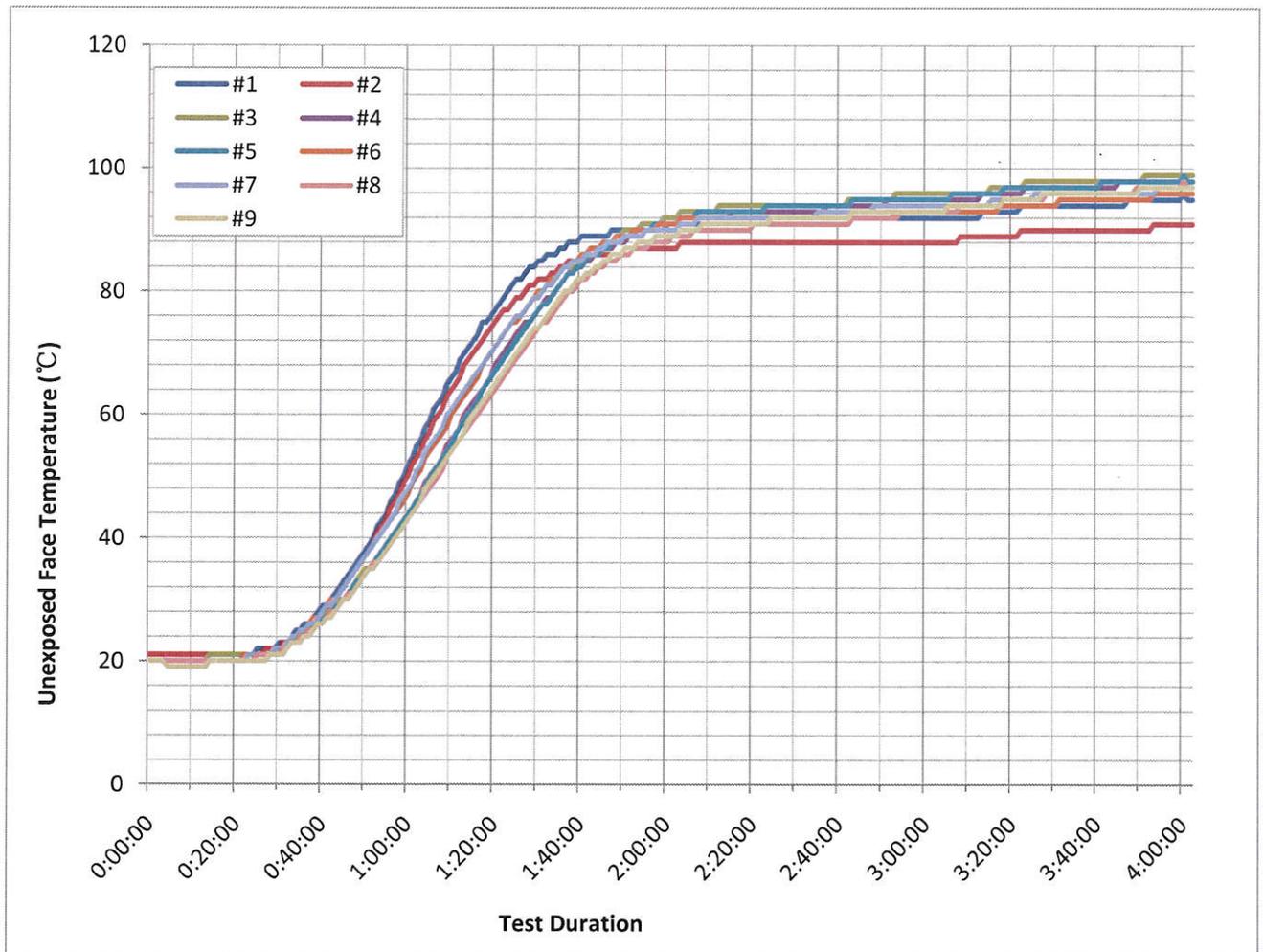
**Figure 3: Measured Furnace Temperature**



## Appendix 4: Unexposed Face Temperature Records



***Figure 4: Locations of Thermocouples on Unexposed Face of Test Specimen***



***Figure 5: The measured unexposed surface temperature-time curves***



## Appendix 5: Photo Record



***Figure 6: Photo of Exposed Face before Testing***



***Figure 7: Photo of Unexposed Face before Testing***

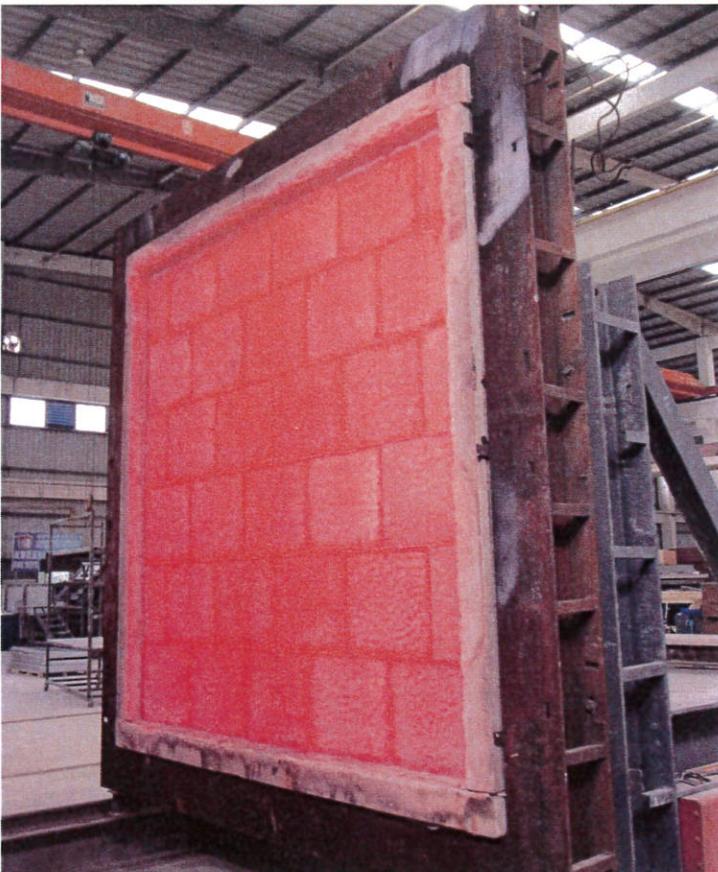


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***Figure 8: Photo of Unexposed Face of Specimens after 240 Minutes Testing***



***Figure 9: Photo of exposed face after 240 Minutes Testing***



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***Figure 10: Hose Stream Test***

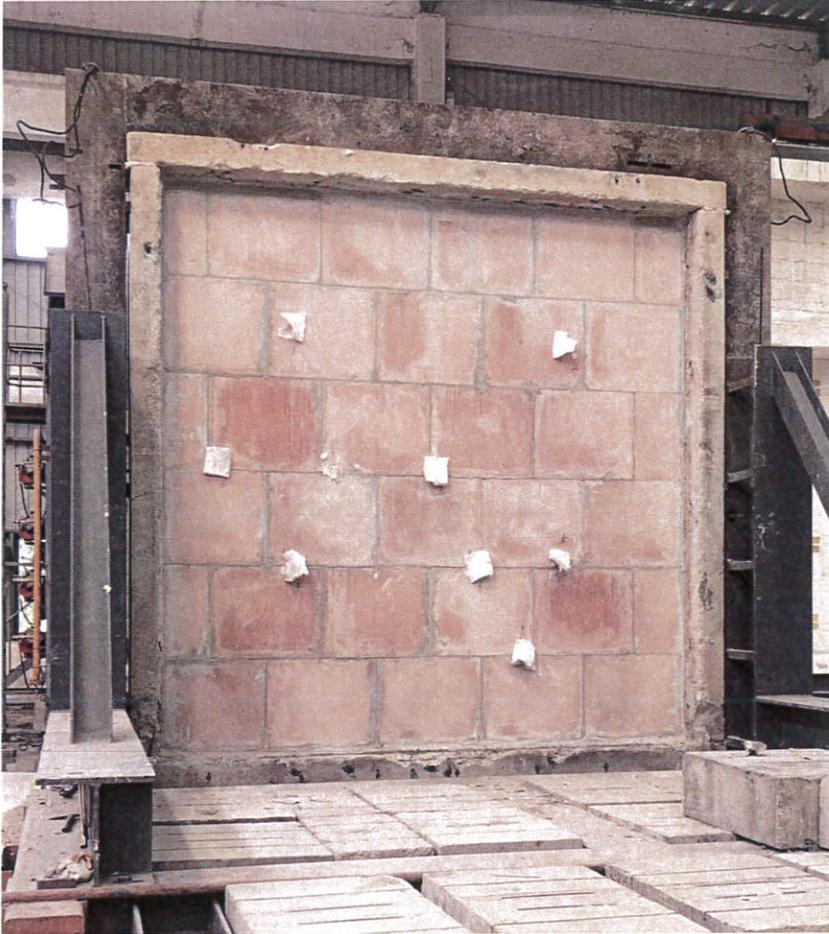


***Figure 11: Photo of exposed face after Hose Stream Test***



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***Figure 12: Photo of unexposed face after Hose Stream Test***