Small-Scale Horizontal 1-Hour Fire Endurance Test 1

Conducted For:

International Fire Resistant Systems, Inc.
580 Irwin Street No.1
San Rafael, California 94901
Phone: 415-459-6488

Conducted On:
May 17, 2000

WFCi Report #00050H.T1
(Wood and Embossed Tin Ceiling-Floor Assembly)

Report Issued on May 24, 2000

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INTRODUCTION

This report documents the fire testing performed by Western Fire Center, Inc. (WFCi, *the laboratory*) for International Fire Resistant Systems, Inc., 580 Irwin Street, No. 1, San Rafael California, 94901 (the *customer*) on May 17, 2000. One small-scale horizontal fire endurance test was conducted on ceiling-floor assembly, which was constructed with embossed tin, ceiling joists and T & G pine flooring. The apparatus used in this test is described in detail within the Uniform Building Code (UBC) Standard 26-2, Small-scale Horizontal Exposure Furnace (Figure 1).

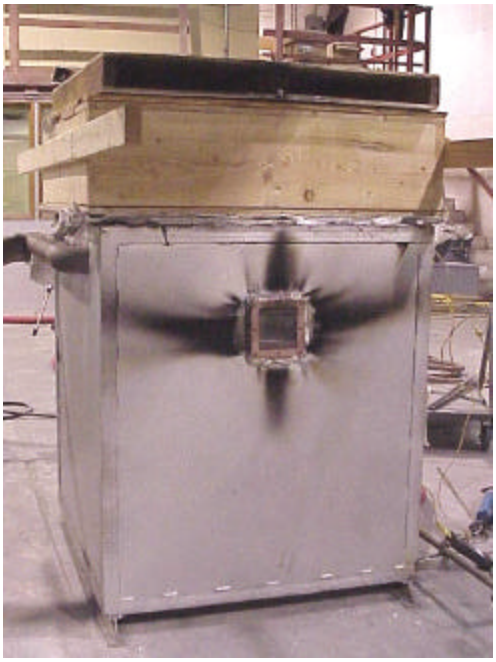

Figure 1. Small-scale Horizontal Exposure Furnace

The purpose of this test is to evaluate the temperature use or heat transmission performance of a ceiling-floor structure when the assemblies are subjected to a standard fire exposure condition.

This test method does not evaluate the performance of the product with respect to its ability to remain in place under all actual fire exposure conditions.

SUMMARY OF THE TEST METHOD

This is a modified small-scale test of Uniform Building Code (UBC) Standard 7-1, Fire Tests of Building Construction and Materials, used for evaluating the fire performance of building assemblies. This small-scale test, described in UBC Standard 26-2, Test Method for the Evaluation of Thermal Barriers, uses a horizontal exposure furnace to subject specimens to a standard time-temperature curve as specified in UBC Standard 7-1.

In this test, the specimen is placed on top of the furnace. The exposed surface is subjected to the time-temperature curve while temperature measurements are taken on the unexposed surface. Nine thermocouples are placed on the unexposed surface and then covered with a piece of calcium silicate board.

The transmission of heat through the assembly during the fire endurance test should not raise the temperature on its unexposed surface more than 250°F (121°C) above its initial temperature.

For the 1-hour fire endurance test, the test will be continued for one hour or until the interface temperature between the unexposed surface and calcium silicate board exceeds the temperature criteria limit.

SAMPLE DESCRIPTION

One specimen was constructed on May 16, 2000 with following materials:

- 4" x 12" ceiling joists (12" O.C.)
- 2" X 12" wood stud (Figure 2)
- Oak sheathing (1" x 6", diagonal, Figure 3)
- T & G pine floor finishing (Figure 4)
- 1" x 2" Douglas fir framing (Figure 5)
- Embossed tin ceiling (Figure 6)
- Firefree 88 intumescent paint (Ff_{88}, Figure 7)
- Envirotrol Primer (Figure 8)

The tin ceiling was sprayed coated with 40 dry mils of Ff_{88} on May 3, 2000 after 10 dry mils of Envirotrol primer was air-dried. The test was conducted on May 17, 2000.

Figure 2. Construction of Test Assembly

Figure 3. Oak Sheathing on One Side of the Wood Frame

Figure 4. T & G Flooring as Assembly Unexposed Face

Figure 5. Tin Ceiling and Douglas Fir Frame

Figure 6. Ff_{88} Coated Embossed Tin Ceiling as Assembly Exposed Face

Figure 7. Firefree 88 Coating Used

Figure 8. Envirotrol Primer Used

TEST NOTE

Horizontal Test 1 --
10 Mils of Envirotrol Primer & 40 Mils of Ff88 over Embossed Tin Ceiling

Sample Assembled: 5/16/00

Test Date: 5/17/00

Sample Tested: An embossed tin ceiling-floor section, 46.5" x 42" in dimension. The total thickness was 14" to 14.5".

Furnace: UBC 26 - 2 Small-scale Horizontal Exposure Furnace.

Fuel: Natural gas.

Cameras: One video camera and a 35mm camera were used for documentation.

Observations:

Test Time (min:sec)	Event
-1:00	Video camera rolling.
0:00	Activated the furnace.
0:46	Exposed face darkening, bubbling.
1:12	Intumescense occurred.
2:07	Visible smoke outside the furnace.
2:30	Entire exposed face is dark in color.
5:18	Exposed face coating getting lighter in color.
10:04	Top layer of coating is light gray in color.
12:36	A small flame appears on coating.
18:04	Coating is white in color.
19:47	Another flame appears at another spot.
22:15	Flame at another spot.
23:51	Light smoke escaping from assembly cavity.
34:14	Not flaming on exposed face at this moment. Coating is white in color.
38:00	The 1" x 2" Douglas fir frame next to tin ceiling is darkening.
41:41	Coating foaming up evenly on exposed face.
51:13	More smoke leaking out from cavity.
60:00	Turn off gas, test terminated.
Post Comment	• Exposed face -- Coating stayed in position throughout the entire test. Coating foamed up approximately 1" (Figure 9). • Unexposed face -- A few discoloring spots on floor finishing (Figure 10). • Wood studs & oak sheathing -- Partially charred (Figure 11).

Figure 9. Post Test -- Exposed Face, Cracked Gypsum Board

Figure 10. Post Test -- Unexposed Face Floor Finishing

Figure 11. Post Test -- View of Cavity

TEST RESULTS AND CONCLUSION

The temperature data was collected during the test with a computer and the results are summarized in Table 1. The charts from collected data are shown in Appendix A. The photographs from the test are also included in this report in Appendix B (Photos 1-30).

Table 1. Horizontal Fire Endurance Test Results

ISSUE	TEST 1 Specimen #1
Test Date	5/17/00
Exposed-face Coating Information	10 mils Envirotrol Primer, 40 dry mils Ff88
Test Duration (minutes)[1]	60
Max. Temp Rise of Unexposed Face TC 1 (°C)	36
Max. Temp Rise of Unexposed Face TC 2 (°C)	31
Max. Temp Rise of Unexposed Face TC 3 (°C)	67
Max. Temp Rise of Unexposed Face TC 4 (°C)	74
Max. Temp Rise of Unexposed Face TC 5 (°C)	27
Max. Temp Rise of Unexposed Face TC 6 (°C)	78
Max. Temp Rise of Unexposed Face TC 7 (°C)	34
Max. Temp Rise of Unexposed Face TC 8 (°C)	45
Max. Temp Rise of Unexposed Face TC 9 (°C)	48
Average of Max. Temp Rise of Unexposed Face TC (°C)	49
Exposed Face Deterioration	Coating stayed in position through 1-hour test.

This test was terminated after 60 minutes. None of the temperature rises of the unexposed face exceeded the 121°C criteria limit. This test assembly passed the small-scale 1-hour ceiling/floor (horizontal) fire endurance test.

[1] Time to test terminated.

SIGNATURE PAGE

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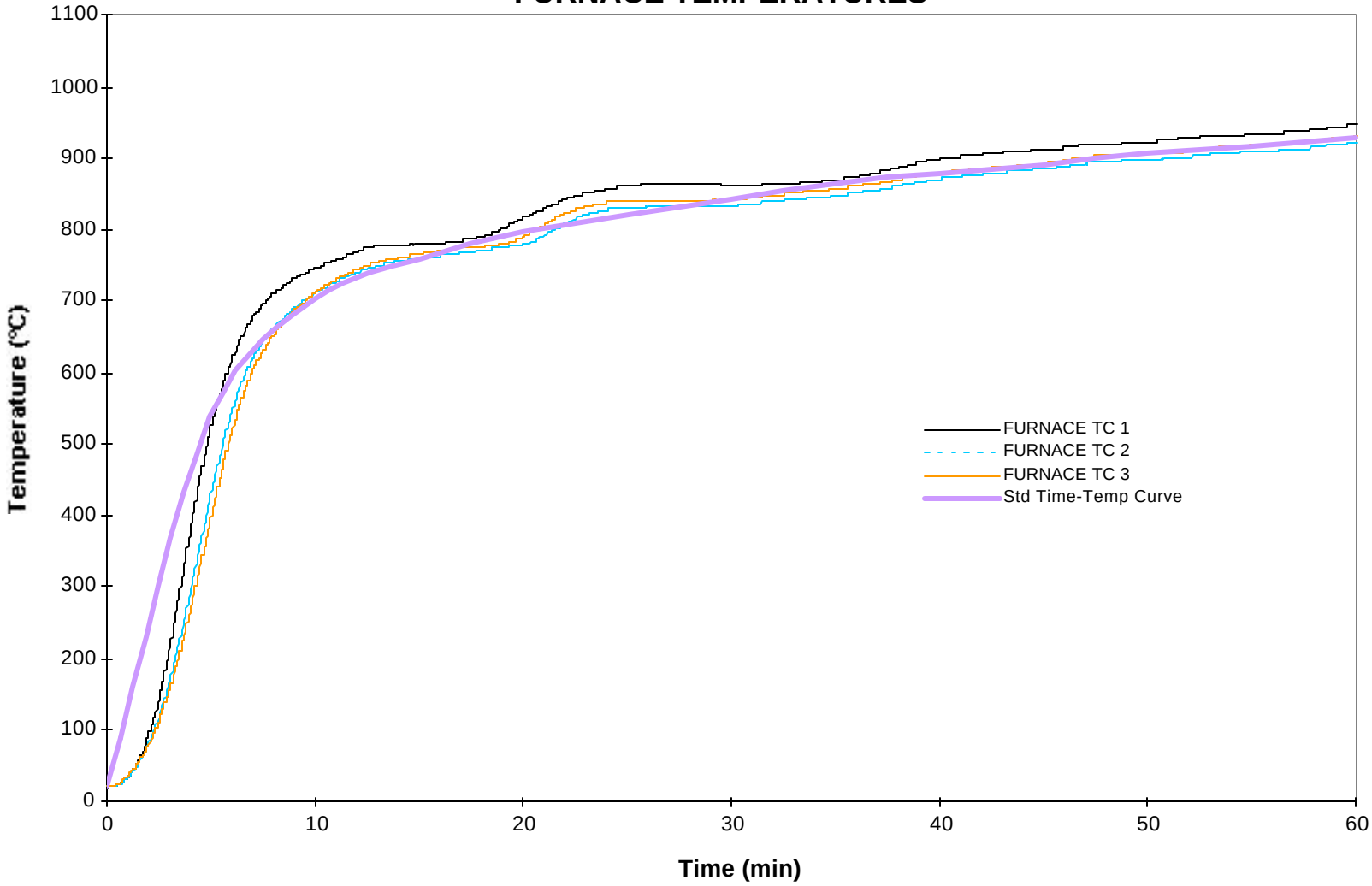
Appendix A
CHARTS

SMALL-SCALE HORIZONTAL FIRE ENDURANCE TEST 1

(10 MILS OF ENVIROTROL PRIMER, 40 DRY MILS OF FIREFREE 88 OVER EMBOSSED TIN CEILING)

FURNACE TEMPERATURES



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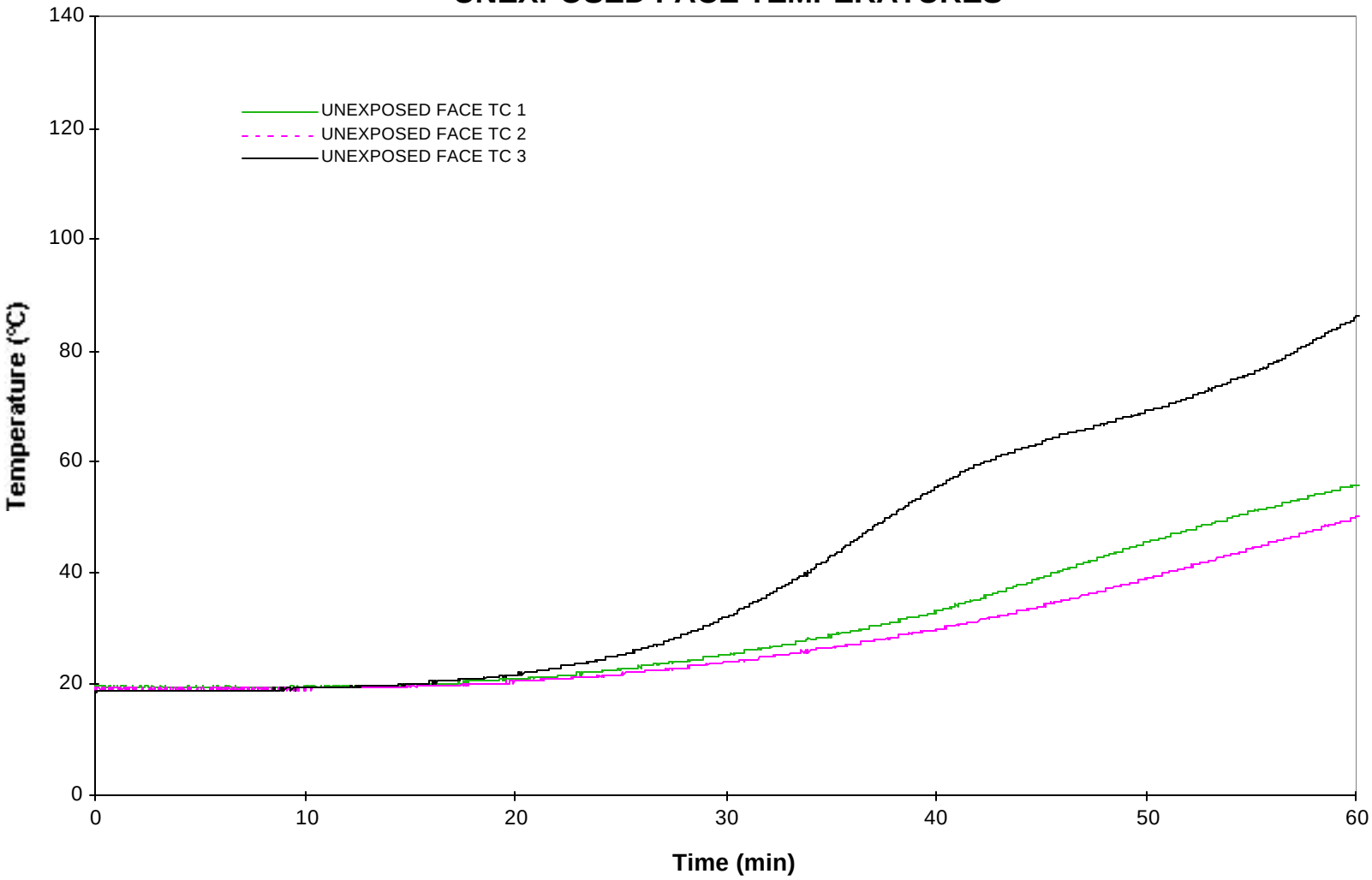
UNEXPOSED FACE TEMPERATURES



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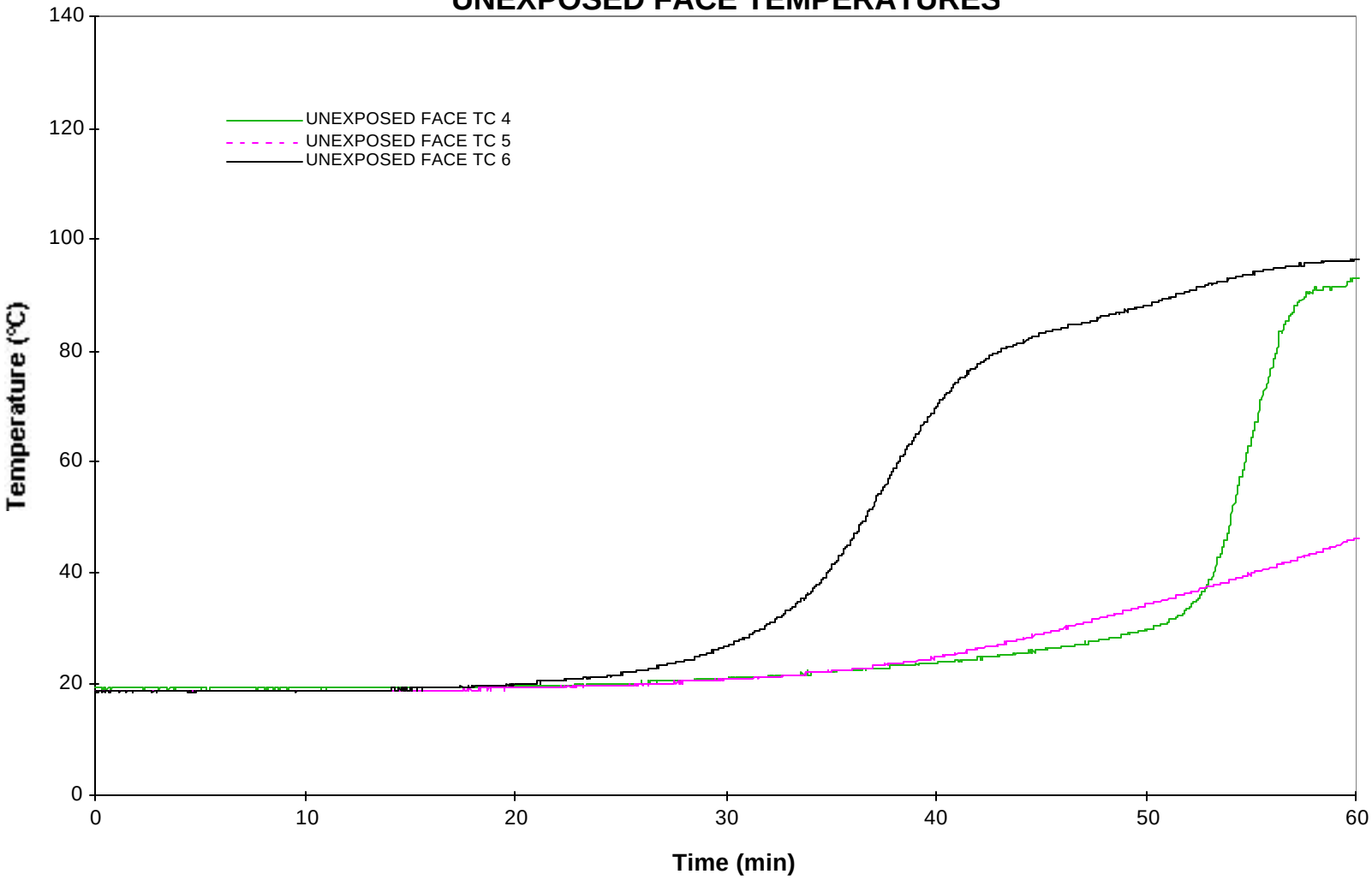

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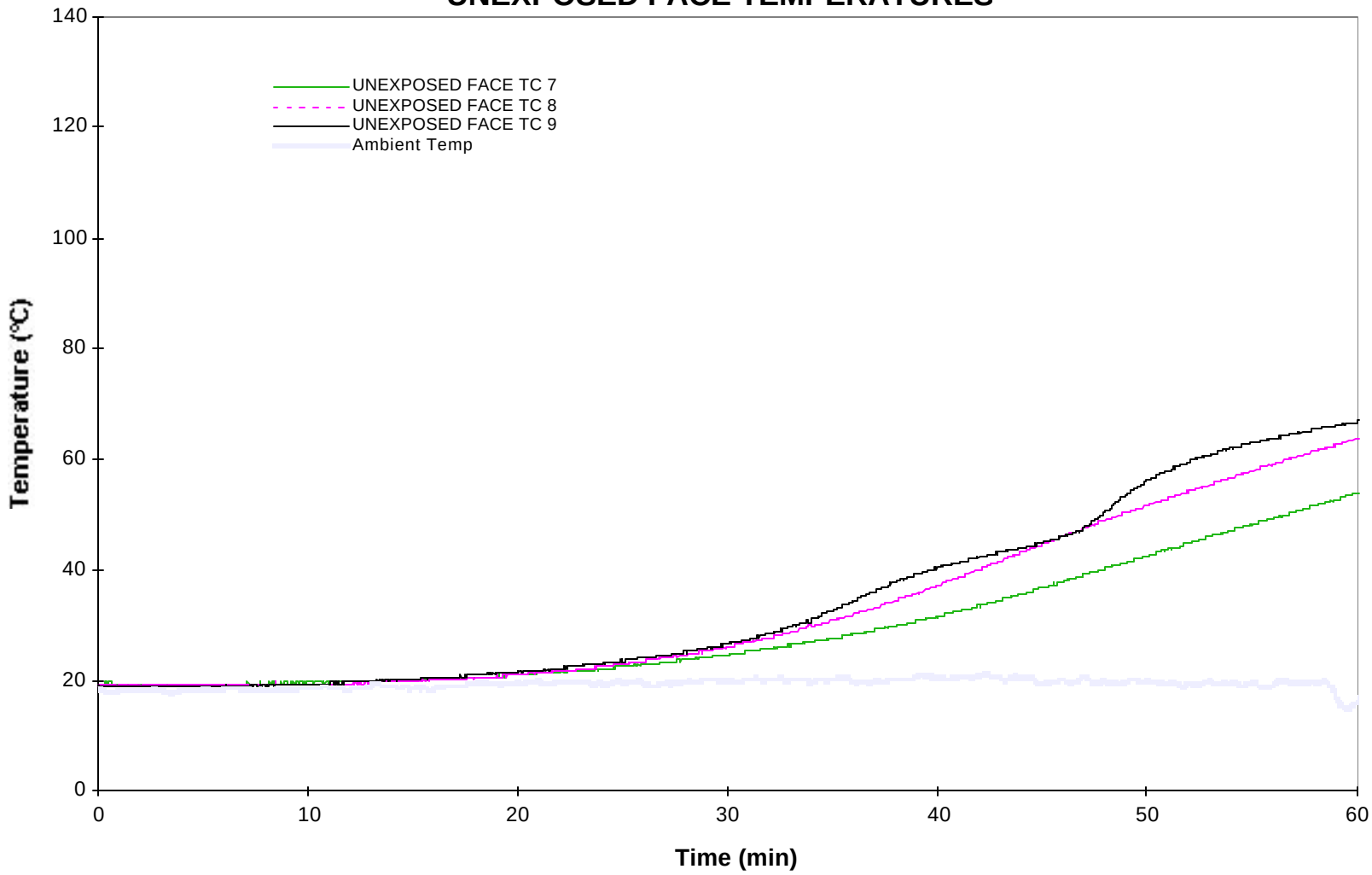

Appendix B
PHOTOGRAPHS