TEST REPORT

REPORT NUMBER: G102596804SAT-001
ORIGINAL ISSUE DATE: June 13, 2016
REVISED DATE: N/A

EVALUATION CENTER
16015 Shady Falls Road
Elmendorf, TX 78112
Phone: (210) 635-8100
Fax: (210) 635-8101
www.intertek.com

RENDERED TO

Acroplast, Inc.
1873 Williamstown Drive
St. Peters, MO 6376

PRODUCT EVALUATED: Arcoplast Engineered Polymer Panels
EVALUATION PROPERTY: Heat Release, Flame Spread

Report of testing Arcoplast Engineered Polymer Panel System for compliance with the applicable requirements of the following criteria: ISO 9705:1993(E), Full-scale room test for surface products, First Edition, Corrected and reprinted 1996-03-01

1 Table of Contents

2 Introduction

Intertek Testing Services NA (Intertek) has conducted testing for Arcoplast Inc. on Arcoplast Engineered Polymer Panels to evaluate heat release and flame spread properties when subjected to specific ignition conditions. Testing was conducted in accordance with ISO 9705 Full-scale room test for surface products. Annex B, Alternative ignition source. . This evaluation was performed on June 13, 2016.

3 Test Samples

3.1. SAMPLE SELECTION

Samples were submitted to Intertek directly from the client. Samples were not independently selected for testing. Samples arrived at the Evaluation Center on June 9, 2016. The samples were delivered by Arcoplast representative Grant Gilbane.

3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The substrate consisted of 3-5/8", 20 gauge, studs and track. 5/8" thick gypsum wall board was applied to the exterior of the studs and joist.

The test specimen consisted of 1/2" Acroplast Engineered polymer panels, 3M VHB adhesive tape, Aluminum spline, 3m Primer 94 and LORD 410/19 GB Grey Acrylic adhesive.

Final interior dimensions were 8 feet high, 8 feet wide and 12 feet deep.

See drawings and photos in Appendix A and B for a visual depiction of the description.

4 Testing and Evaluation Methods

This fire test measures certain fire performance characteristics of materials in an enclosure under specified fire exposure conditions. It determines the extent to which the finish covering materials may contribute to fire growth in a room and the potential for fire spread beyond the room under the particular conditions simulated. The test indicates the maximum extent of fire growth in a room, the rate of heat release, and if they occur, the time to flashover and the time to flame extension beyond the doorway following flashover. It does not measure the fire growth in, or the contribution of, the room contents. The test ends if flashover occurs or after 15 min, whichever occurs first. Continue observation for 2 hrs. r until signs of visual combustion have ceased, whichever occurs first.

The potential for spread of fire to other objects in the room, remote from the ignition source, is evaluated by measurements of:

1. The total heat flux incident on the center of the floor.
2. A characteristic upper-level gas temperature in the room.
3. Instantaneous net peak rate of heat release.

TEST EQUIPMENT AND INSTRUMENTATION

IGNITION SOURCE

The ignition source for the test is a gas burner with a nominal 12”X12” top surface. The burner is filled with sand. The upper level of sand is to be level with the upper edge of the burner.

The top surface of the burner through which the gas is applied is positioned 12 inches above the floor, and the burner enclosure is located such that the edge of the diffusion surface is positioned directly against both walls in the left or right corner of the room opposite from the door.

The gas supply to the burner is C.P. grade propane. The burner is capable of producing a gross heat output of 40±1 kW for five minutes followed by a 160±5 kW for ten minutes. The test ends when 15 minutes or flash over occurs. Continue observation for 2 hrs. Or until signs of visual combustion have ceased, whichever occurs first.

COMPARTMENT GEOMETRY AND CONSTRUCTION

The interior dimensions of the floor of the fire room, when the specimens are in place, measures 3.6 m ± 0.05 m X 2.4 m ± 0.05 m. The finished ceiling is 2.4 m ± 0.05 m above the floor. The three walls are at right angles defining the compartment. The compartment contains a 0.8 m ± 0.01 m X 2.0 m ± 0.01 m doorway in the center of one of the 2.4 m by 2.4 m walls, which is provided by Intertek. No other openings are present to allow ventilation. The test room is lined with 5/8” type X gypsum wallboard.

TOTAL HEAT FLUX GAUGE

A gauge shall be mounted a maximum of 2 inches above the floor surface, facing upward in the geometric center of the test room. The gauge shall be of the Gardon type, with a flat black surface, and a 180-degree view angle. In operation, it shall be maintained at a constant temperature (within ± 5% °F) above the dew point by water supplied at a temperature from 120° to 150°F.

THERMOCOUPLES

Bare chromel-alumel thermocouples 20 mil in diameter (24 GA. Type K, Chromel-Alumel, Special Limits of Error: ±1.1°C, purchased with Lot Traceability and with 5-point calibrations at each end of the Lot Purchase), with electrically welded thermo-junctions shall be used at each required location. The thermocouple wires, within 0.5 inches of the thermo-junction, shall be run along expected isotherms to minimize conduction errors. The insulation between the wires shall be stable to at least 2000°F or the wires shall be separated.

THERMOCOUPLE LOCATIONS

LOCATION	DESCRIPTION OF PLACEMENT
DOORWAY	A thermocouple is located in the interior plane of the door opening on the door centerline, 4 inches down from the top.
ROOM	Thermocouples are located 4 inches below the ceiling at the center of the ceiling, the center of each of the four ceiling quadrants and directly over the center of the ignition burner. To map the gas flow pattern in the room door opening there are seven probes. These probes are positioned at different heights and locations on a thermocouple tree.
HOOD EXHAUST DUCT	One pair of thermocouples is placed in the duct 9 duct diameters downstream of the entrance to the horizontal duct.

DUCT GAS VELOCITY

A bi-directional probe is used to measure gas velocity in the duct. The probe consists of a short stainless steel cylinder 1.75 inches long and 0.875 inches inside diameter, with a solid diaphragm in the center. The pressure taps on either side of the diaphragm support the probe. The axis of the probe is along the center line of the duct, 9 duct diameters downstream from the entrance. The pressure taps are connected to a pressure transducer capable of resolving pressure differences of 0.001 inches W.C.

CO and CO2 MEASUREMENTS

The exhaust duct measurement of CO and CO2 mole fractions is used principally as a measurement of the heat release rate as noted in Appendix F. Intertek has elected to utilize the oxygen depletion calculations for calorimetry described in ASTM and other methods. This method of calculation uses only oxygen depletion levels and has accuracy similar to the more complex ones. Using this method also has the advantage of eliminating potential sources of error which are not only mathematical, but can also show up in the additional complexities of hardware, potential for leaks, and time synchronization of instruments and gas flows.

OXYGEN MEASUREMENTS

A stainless steel gas sampling tube is located 10 duct diameters downstream from the entrance to the duct at the geometric center of the duct ±1/2 inch to obtain a continuously flowing sample for determining the oxygen concentration of the exhaust gas as a function of time. The oxygen content of the duct exhaust gas is determined by an oxygen analyzer with a relative accuracy of ±0.001% in the concentration range from 0 to 21% oxygen. The signal from the oxygen analyzer is within 5% of its final value within 30 seconds following a step change in the composition of the gas stream flowing past the sampling tube inlet.

PHOTOGRAPHIC RECORDS

Digital color photographs and DV videotaping are both used to record and document the test. Care is taken to position the photographic equipment so as to not interfere with the smooth flow of air into the test room.

PROCEDURE

SUMMARY OF METHOD

A calibration test is run within 30 days of testing any material as specified in the standard. All instrumentation is zeroed, spanned and calibrated prior to testing. The specimen is installed and the diffusion burner is placed. The collection hood exhaust duct blower is turned on and an initial flow is established. The gas sampling pump is turned on and the flow rate is adjusted. When all instruments are reading steady state conditions, the computer data acquisition system and video equipment is started. Ambient data is taken then the burner is ignited at a fuel flow rate that is known to produce 40 kW of heat output. This level is maintained for 5 minutes at which time the fuel flow is increased to the 160 kW level for a 10-minute period. During the burn period, all temperature, heat release and heat flux data is being recorded every 6 seconds. At the end of the 15 minute burn period, the burner is shut off and all instrument readings are stopped. Post test observations are made and this concludes the test.

All damage is documented after the test is over, using descriptions, photographs and drawings, as is appropriate.

4.1. TEST STANDARD

5 ISO 9705:1993(E), Full-scale room test for surface products, First Edition, Corrected and reprinted 1996-03-01 ANNEX B- Alternative ignition source

6 Testing and Evaluation Results

6.1. RESULTS AND OBSERVATIONS

FIRE TESTS
The test was started at 9:35 a.m. on June 13, 2016. The ambient temperature was 70°F with a relative humidity of 72%. The data acquisition system was started and the burner was ignited. Events during the test are described below:

TIME (hour:min:sec)	OBSERVATION
0:00	Ignition of burner. Heat output set to 40 kW.
0:10	Discoloration 1 to 3ft vertically above burner
0:55	Crackling sound
2:00	No change
3:00	Flame tips 5ft vertically
3:35	Flaking on corner boards 1 to 2ft
4:30	No change

5:00	Increase gas flow 160kW
5:10	Horizontal flame tips 4ft
6:00	Discoloration of on panels in corner above burner 1 to 8ft vertically
6:30	Charring and flaking 1 to 4ft vertically in corner above burner
8:00	Charring, discoloration, flaking 2ft horizontally at ceiling along back and side wall
8:30	Flame tips 7ft horizontally on ceiling and walls
10:00	Charring 4ft on ceiling
10:43	Intermittent flame tips 8ft back and sidewall
12:00	Increase in smoke
12:31	No change
13:32	Horizontal Flaming 4ft 4ft back wall, side wall and ceiling
14:00	Back ceiling panels falls
14:28	Flaming drops
15:13	Gas off
0:00	Start observation
0:49	Middle ceiling panel falls
3:12	Flaming top of back wall
17:57	All flaming ceased
23:00	Observation complete - all combustion ceased

Post Test Observations:

7 The sample had visible discoloration 5ft on back and side walls burner side at the top 2ft of room, with a very light char layer.

8 Conclusion

The sample submitted, installed, and described in this report did not Flashover during the 15 minute exposure described in A.2 of ISO 9705 using the alternative ignition source (ANNEX B-Alternative ignition source).

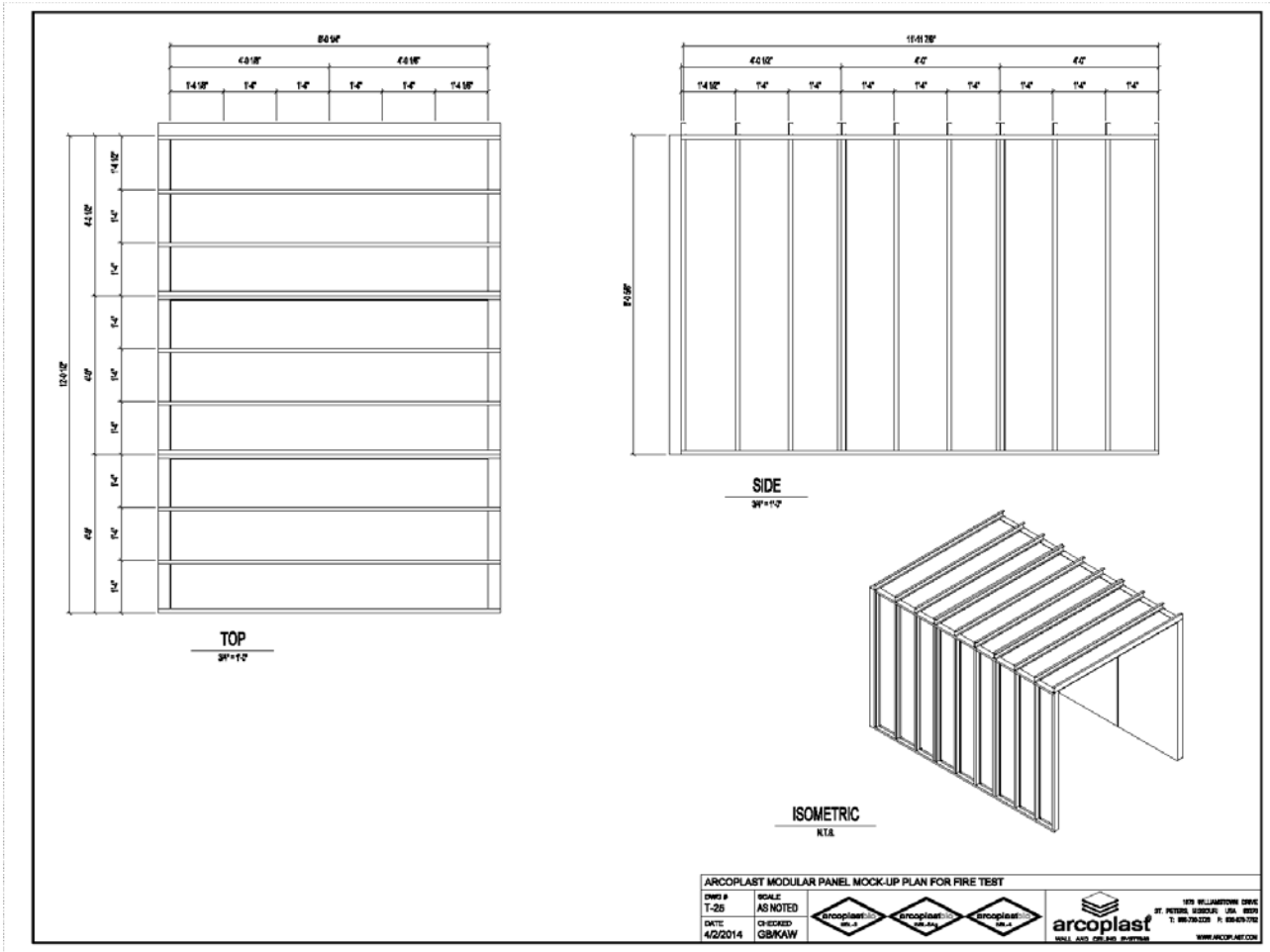
INTERTEK TESTING SERVICES NA

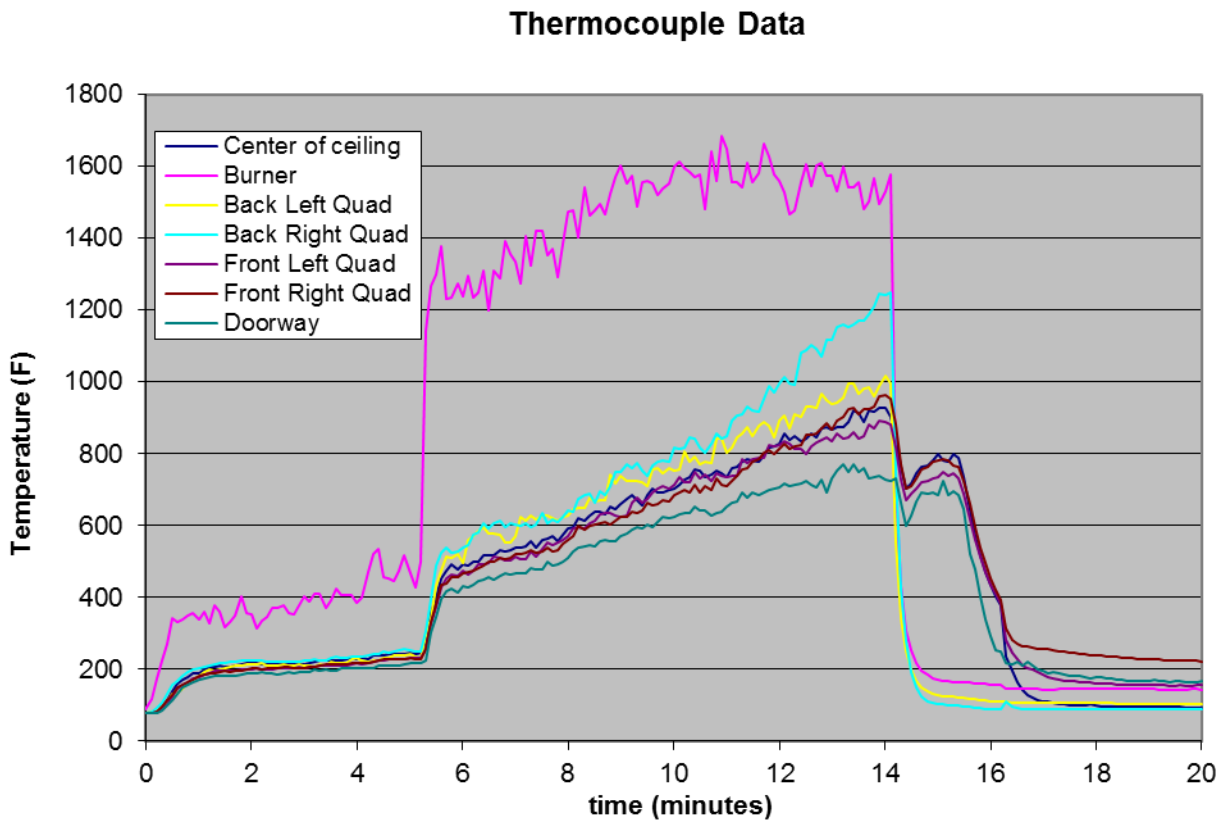
Reported by: _____
Troy G. Bronstad
Senior Associate Engineer

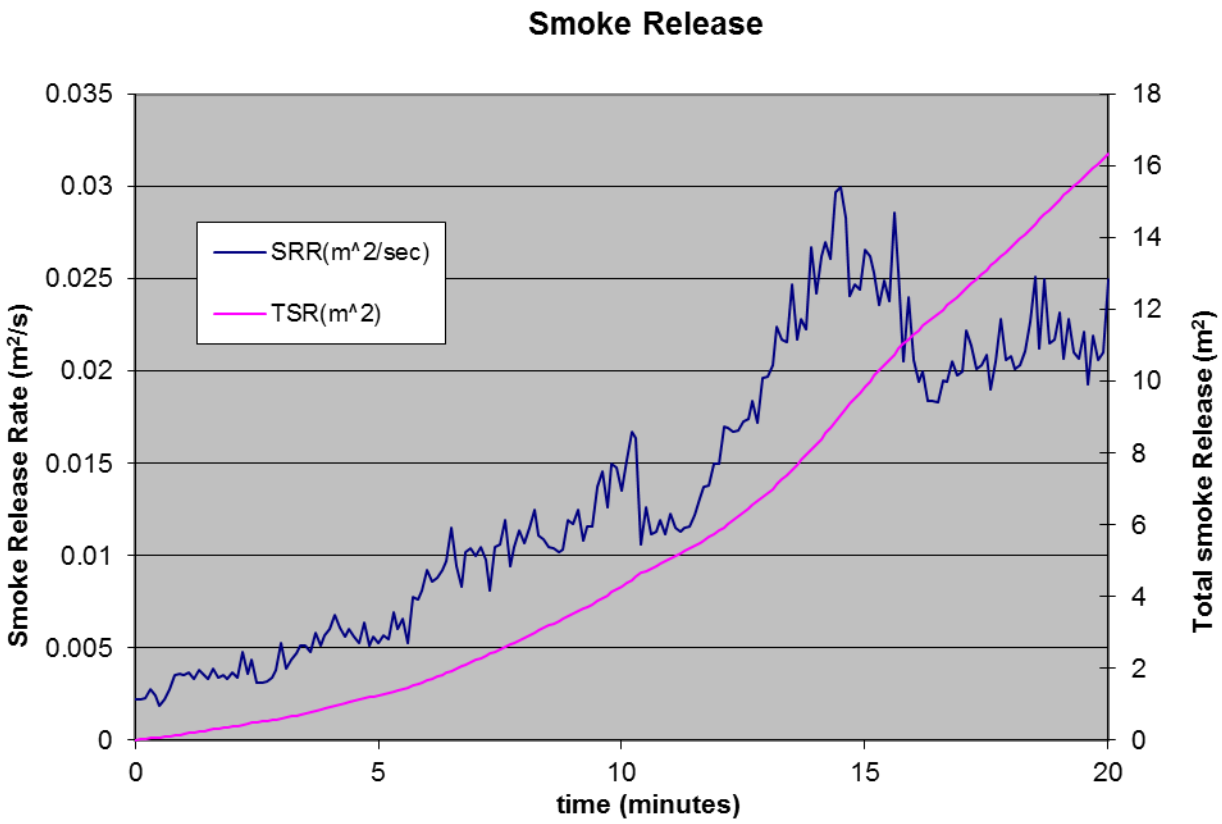
Reviewed by: _____
Herbert W. Stansberry II
Engineering Supervisor

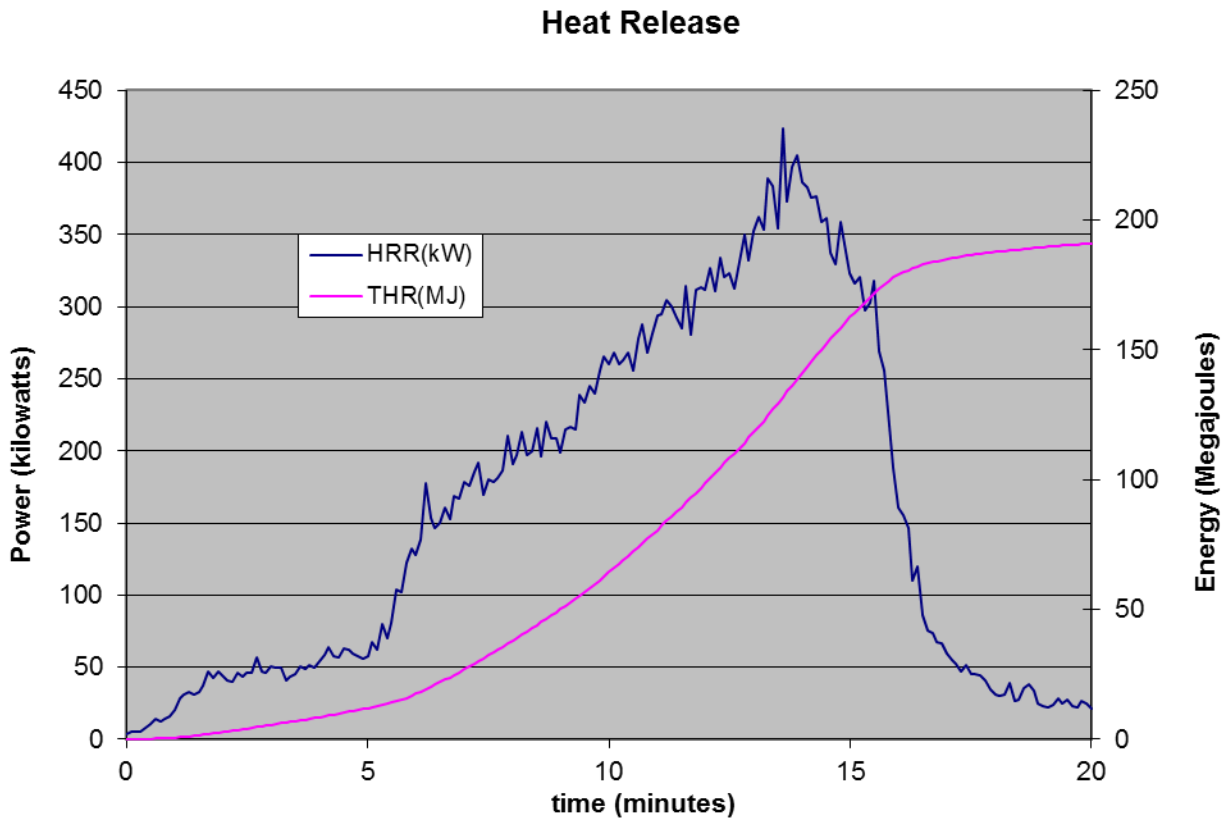
APPENDIX A

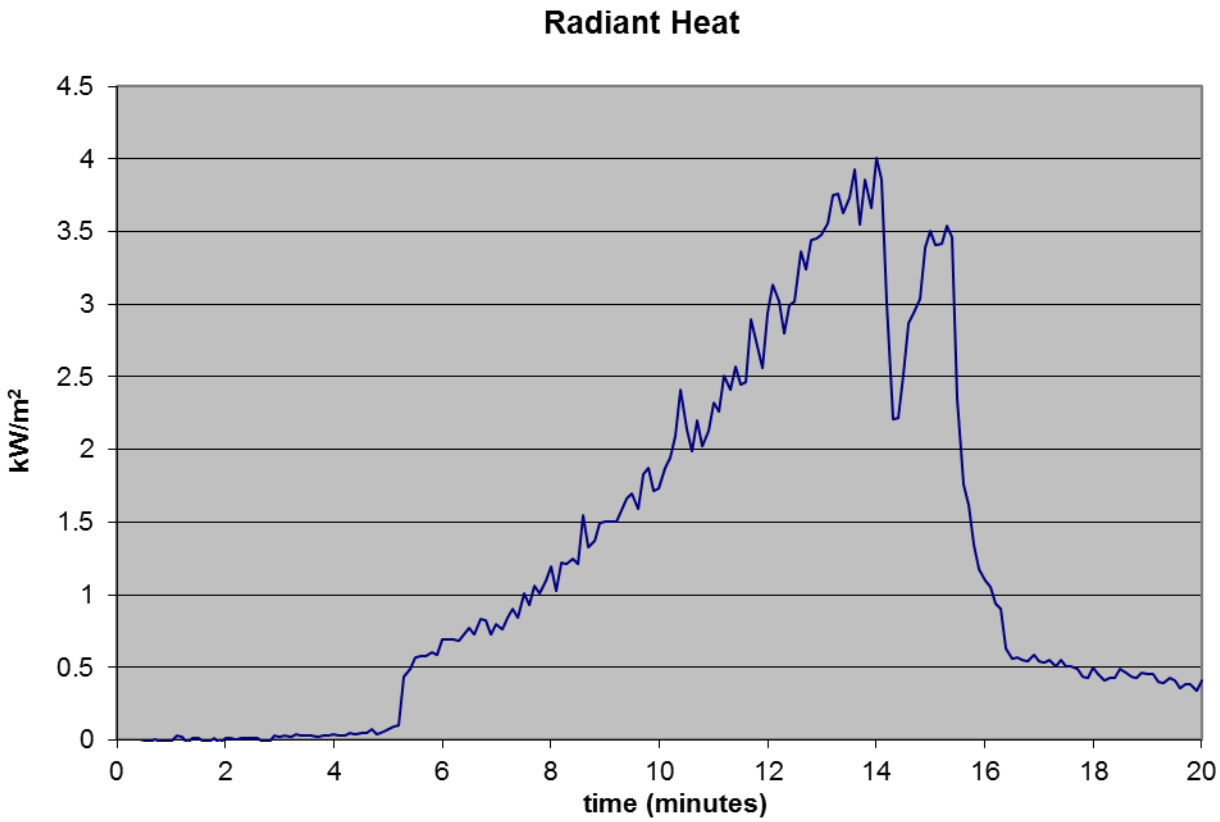
Test Drawings and Data

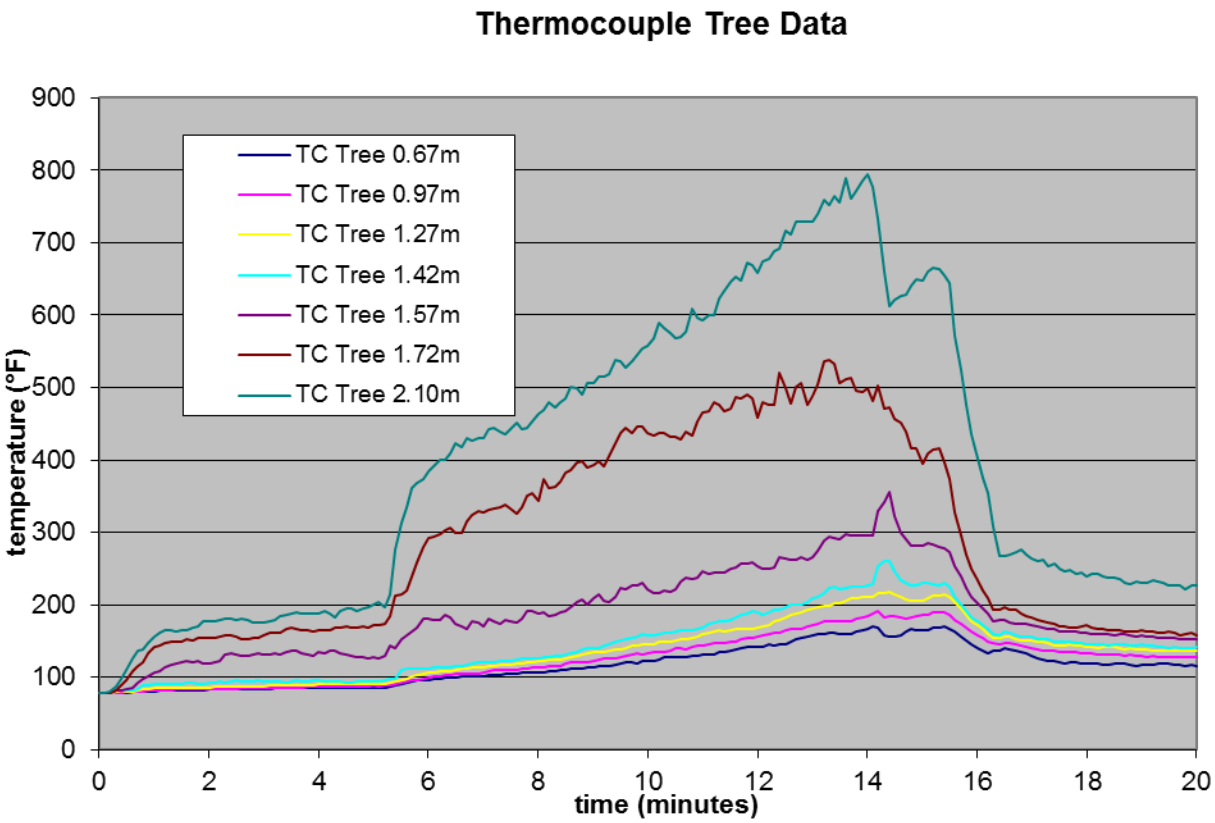

TOP
SIDE
ISOMETRIC
ARCOPLAST MODULAR PANEL MOCK-UP PLAN FOR FIRE TEST
T-25
AS NOTED
4/2/2014
GB/KAW
arcoplast


Thermocouple Data
Temperature (F)
time (minutes)
Center of ceiling
Burner
Back Left Quad
Back Right Quad
Front Left Quad
Front Right Quad
Doorway
0
200
400
600
800
1000
1200
1400
1600
1800
0
2
4
6
8
10
12
14
16
18
20


Smoke Release
Smoke Release Rate (m²/s)
Total smoke Release (m²)
time (minutes)
SRR(m^2/sec)
TSR(m^2)
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
18
16
14
12
10
8
6
4
2
0
0
5
10
15
20


Heat Release
HRR(kW)
THR(MJ)
Power (kilowatts)
Energy (Megajoules)
time (minutes)
0
50
100
150
200
250
300
350
400
450
0
5
10
15
20


Radiant Heat
kW/m²
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
2
4
6
8
10
12
14
16
18
20
time (minutes)


Thermocouple Tree Data
TC Tree 0.67m
TC Tree 0.97m
TC Tree 1.27m
TC Tree 1.42m
TC Tree 1.57m
TC Tree 1.72m
TC Tree 2.10m
temperature (°F)
time (minutes)
0
100
200
300
400
500
600
700
800
900
0
2
4
6
8
10
12
14
16
18
20

APPENDIX B
Photographs

Pre-test photo

Test photo

Test photo

Test photo

Test photo

Test photo

Test photo

Test photo

Start of observation

Middle ceiling panel falls

Post test observation

Small flame post test observation

All flaming ceased

Observation complete - Post test photo

CALIBRATED EQUIPMENT USED FOR TESTING

Description	Serial No.	Calibration Due Date
DAQ	046E016	10-6-16
Transducer	2322926	8-18-16
Radiometer	154471	9-23-16
Stop Watch	140426219	6-26-16
Thermo Hygrometer	140560381	8-19-16

LAST PAGE OF TEST REPORT

REVISION SUMMARY

DATE	SUMMARY
June 13, 2016	First issue. No revision