



Project Record

ANAB ISO/IEC 17025:2017
Accredited Forensic Testing Laboratory

Title	Smoke/CO Alarm Activation on Lower Floor with Smoldering/Flaming Combustion Occurring on Upper Floor		
Test Type	Custom		
Lab Number	22FR0016-1	Author	David R. Tucholski
Test dates	3/6/23, 3/7/23, 3/8/23, 3/9/23	No. Tests	4

Introduction

Four experiments were conducted to evaluate the performance of smoke alarms and carbon monoxide (CO) alarms located on the bottom floor of a two-story structure with respect to combustion on the upper floor. Two types of combustion were considered: smoldering and flaming. In addition to the smoke alarms and CO alarms, instrumentation for the experiments included heat flux transducers, thermocouples, optical density meters, gas analyzers, and a weather station. The experiments were also documented using digital video cameras and a digital still camera. The experiments were conducted in the Large Burn Room (LBR) of the Bureau of Alcohol, Tobacco, Firearms and Explosive Fire Research Laboratory (ATF FRL) located in Beltsville, MD.

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NOTE: All dimensional measurements were taken in English units and were later converted to metric units. Any inconsistencies between the two units are due to rounding errors when the English units were converted to metric.

Experiment Setup

Figure 1 shows a plan view of the two-story structure. The overall interior dimension of each floor was approximately 4.88 m long by 3.66 m wide (16 feet long by 12 feet wide). Each floor had a room that measured approximately 4.88 m long by 2.62 m wide by 2.44 m high (16 feet long by 8 feet 7 inch wide by 8 ft high). A stairwell was located on the west side of the structure that connected the two floors. The structure was built on top of a wood platform. An exterior door was located on each floor of the structure, although the door on the bottom floor was sealed with tape during each test. The door on the upper floor was either open or closed, depending on the test being conducted. Figure 2 shows an exterior view of the east side of the structure.

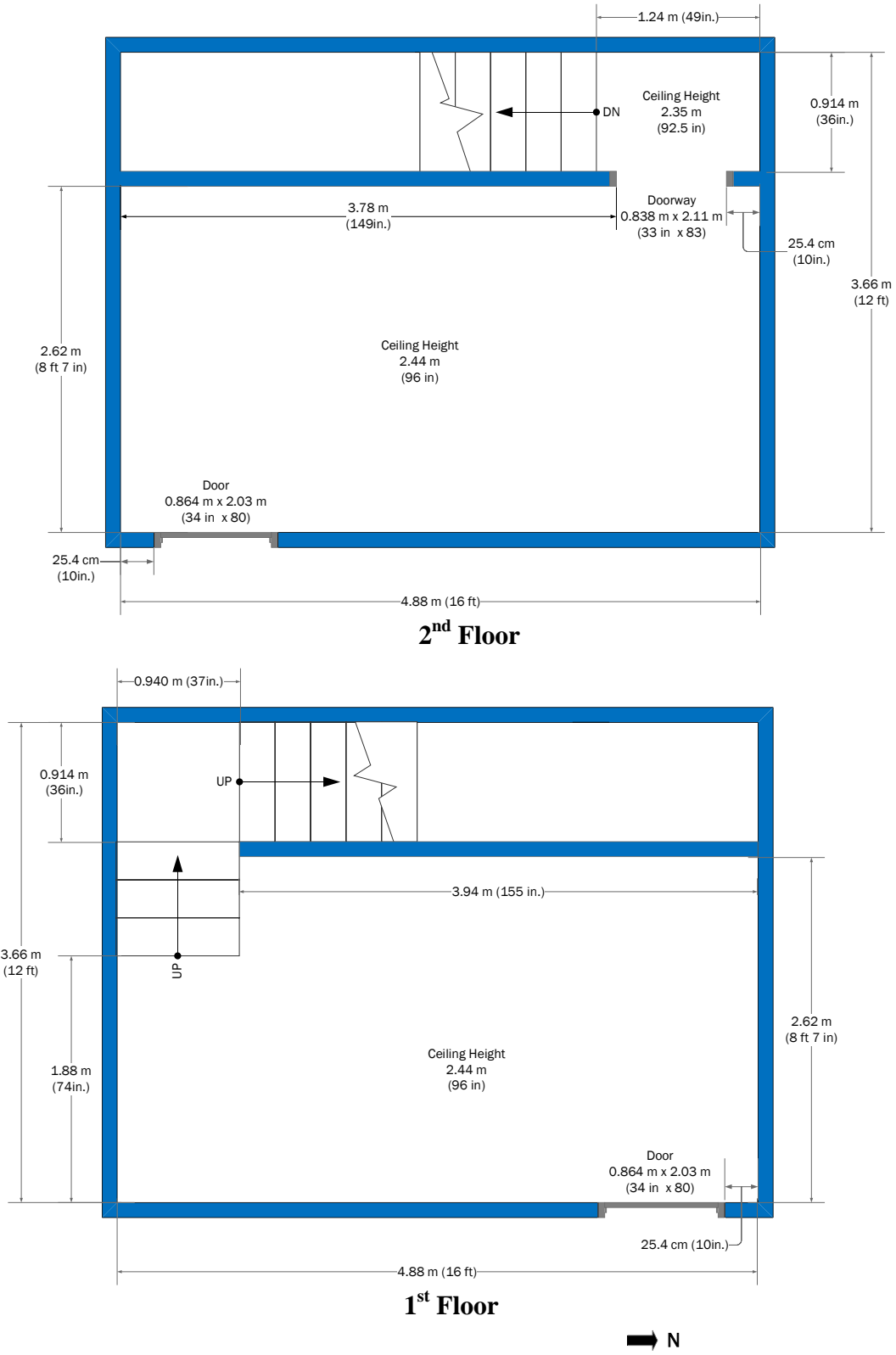


Figure 1. Plane view of test structure



Figure 2. Exterior view of the east side of the structure (360079_1304634.jpg)

Construction Details

Platform

The structure was built on top of a wood platform that was framed using 2 x 6 dimensional lumber¹. The floor joists were spaced 40.6 cm (16 inch) on center. A single layer of 1.59 cm (5/8 inch) thick plywood was attached to the top of the platform.

Walls

The walls were framed using 2 x 4 dimensional lumber and the studs were spaced 40.6 cm (16 inch) on center. The interior surfaces were sheathed with a single layer of 1.27 cm (1/2 inch) thick gypsum wallboard and the seams were sealed with tape and joint compound. The interior walls were painted with builder's grade interior flat white paint. The exterior surfaces were not finished. However, plywood sheathing that was 1.59 cm (5/8 inch) thick was added at various locations on the exterior walls to help prevent the walls from racking.

Ceiling

The ceiling in each room was framed using 2 x 10 engineered wood I-joist. The I-joists were 24.1 cm (9.5 inch) deep and spaced 40.6 cm (16 inch) on center. The sloped ceiling

¹ Lumber sizes listed in this report (e.g., 2 x 4) are given in terms of their nominal dimensions in inches, which is greater than the dressed size or actual size of the wood.

in the stairwell was framed using 2 x 4 lumber. Each ceiling was sheathed with a single layer of 1.27 cm (1/2 inch) thick gypsum wallboard and the seams were sealed with gypsum wallboard tape and joint compound. The ceilings were then painted with builder's grade interior flat white paint.

For the flaming fire tests, a section of gypsum wall board was attached to the ceiling above the sofa to limit the damage to the ceiling. Figure 3 shows the extra piece of gypsum wall board attached to the ceiling.



Figure 3. Extra section of gypsum wall board attached to ceiling above the sofa for the flaming fire tests (360086_1305181.jpg)

Floor

The floor in the lower level room consisted of a single layer of 1.27 cm (1/2 inch) thick gypsum wallboard that was placed on top of the plywood attached to the platform. The floor in the upper level room consisted of a single layer of 1.27 cm (1/2 inch) thick gypsum wallboard placed on top of 1.59 cm (5/8 inch) thick plywood that was attached to the I-joist.

Stairs

An L-shaped set of stairs was located on the west side of the structure. There were three steps between the first floor and a landing. The stairs turned 90 degrees and an additional 10 steps went from the landing to the second floor. The wood steps were covered with 1.27 cm (1/2 inch) thick gypsum wallboard and had a nominal rise of 17.8 cm (7 inch)

and tread depth of 27.9 cm (11 inch). The width of the stairs was approximately 0.91 m (36 inch). A drawing of the stairs is shown in Figure 4. The ceiling above the stairs was sloped at an angle of approximately 35 degrees, similar to the slope of the stairs. The ceiling started to slope above the landing and then stopped at the second floor landing.

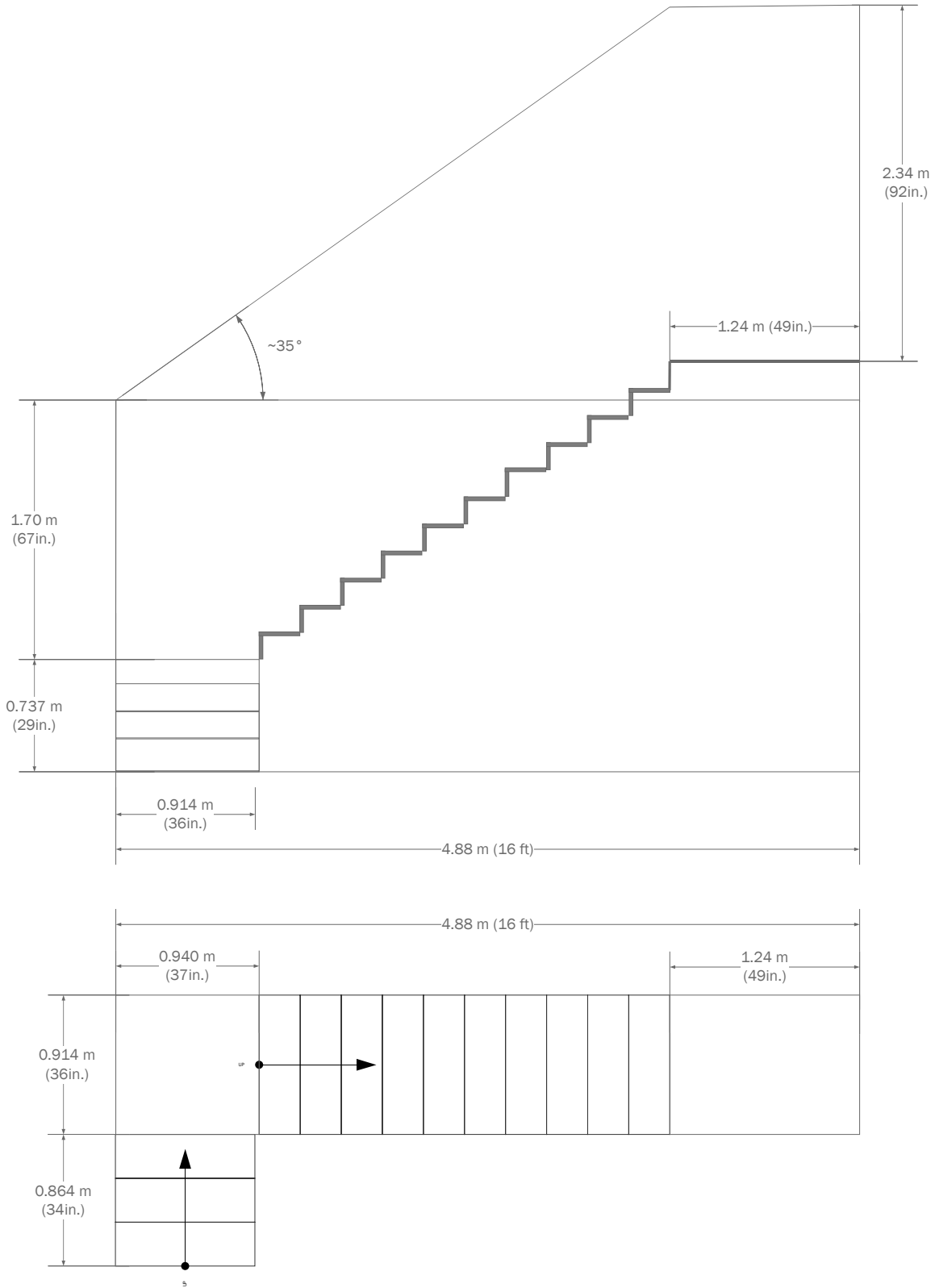


Figure 4. Stairs - elevation and plan view

Doors

The structure had two exterior doors, one on each level. Each door was a standard hollow core door that measured 86.4 cm (34 inch) wide by 2.03 m (80 inch) high. For each test, the door on the first floor was sealed with aluminum tape before the start of the test, as shown in Figure 5. The door on the upper level was either open or closed, depending on the test being conducted. For the flaming fire test, the door on the upper floor was removed from the structure.



Figure 5. First floor door sealed with aluminum tape (360079_1304764.jpg)

Items for Smoldering Tests

Cotton Batting

Cotton batting from the Warm Company (Warm and Natural, Item 2105A) was used for the smoldering tests. The batting was made of 87.5% cotton and 12.5% polypropylene. The batting measured 1.14 m (45 inch) wide by 36.6 m (40 yards) long and weighed approximately 8.2 kg (18 lbs). The batting arrived in a roll that was approximately 30.5 cm (12 inch) in diameter by 1.14 m (45 inch) long. For each smoldering test, the cotton batting was unrolled and then folded into an approximate rectangular shape, as shown in Figure 6 and Figure 7. For Test 1, the folded shape of the cotton batting measured roughly 0.610 m wide by 0.813 m long by 0.406 m high (24 inch wide by 32 inch long by 16 inch high). For Test 2, the folded shape of the cotton batting measured roughly 1.17 m wide by 0.610 m long by 0.178 m high (46 inch wide by 24 inch long by 7 inch high).



Figure 6. Cotton batting for Test 1 (360079_1304756.jpg)



Figure 7. Cotton batting for Test 2 (360082_1304921.jpg)

After folding the cotton batting, it was placed on a section of gypsum wallboard, which was located in the north-east corner of the room on the 2nd floor.

Cartridge Heater

A cartridge heater from Vulcan (Model TB507A) was placed within the cotton batting to initiate a smoldering combustion reaction. The cartridge heater was 12.7 cm (5 inch) long and had a diameter of 1.27 cm (½ inch). The heater had an output power rating of 500 Watt at a 120 VAC input. The heater was powered using a variable transformer (Staco Energy, model 2510CT). The cartridge heater is shown in Figure 8 and the transformer is shown in Figure 9.

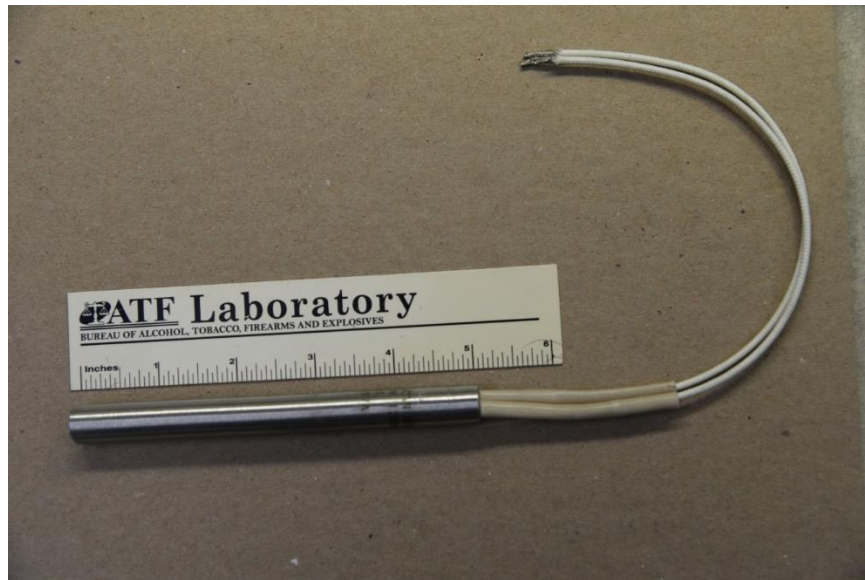


Figure 8. Cartridge heater (360079_1313695.jpg)



Figure 9. Variable transformer (360079_1304639.jpg)

The cartridge heater was placed between the layers of the cotton batting as shown in Figure 10 and Figure 11.



Figure 10. Cartridge heater location for Test 1 (360079_1304744.jpg)



Figure 11. Cartridge heater location for Test 1 (360082_1304928.jpg)

Items for Flaming Fire Tests

Furniture

The upper room was furnished with an upholstered chair and sofa, a coffee table, a TV stand, and a bookcase. Table 1 contains a summary of the items. The items are shown in Figure 12 and Figure 13. The approximate location of each item is shown in Figure 14.

Table 1. Furnishing items in the Living Room

Item	Brand	Retailer	Part Number
Upholstered Chair	Lifestyle Solutions	Walmart	CC-WEN-KS1-M26-DG-RA
Upholstered Sofa	Lifestyle Solutions	Walmart	CC-WEN-KS3-M26-DG-RA
TV Stand	Brimnes	Ikea	403.376.94
Coffee Table	Lack	Ikea	401.042.94
Bookcase	Billy	Ikea	302.638.44



Figure 12. Upholstered sofa, coffee table, TV stand and bookcase for the flaming fire (360086_1305161.jpg)

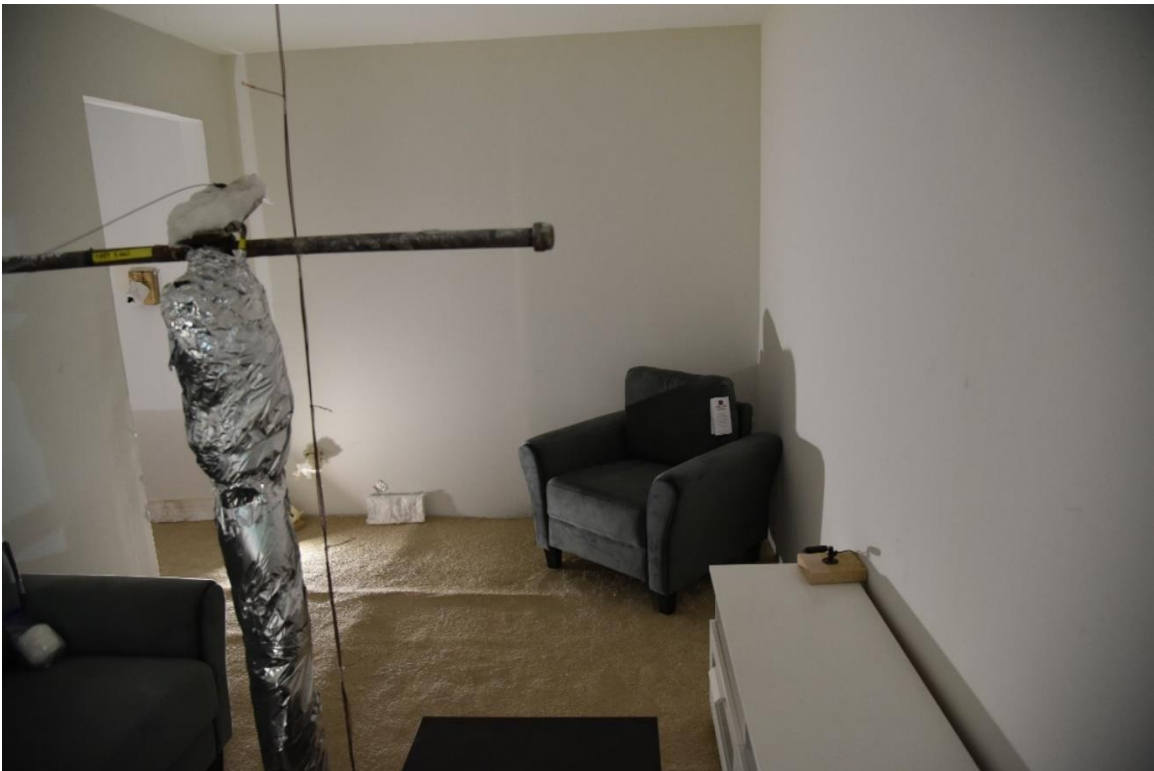


Figure 13. Upholstered chair for flaming fire tests (360086_1305151.jpg)

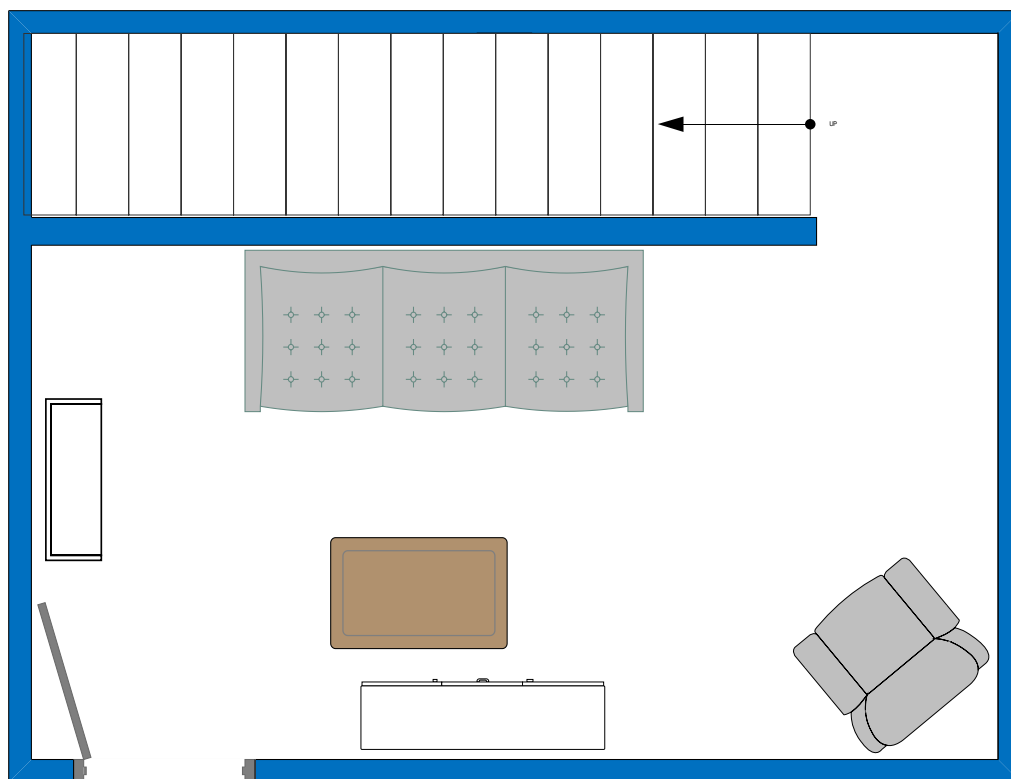


Figure 14. Approximate location of the furniture in the upper room (360086_1305151.jpg)

Carpet

The floor on the upper level was covered with a carpet pad and builder's grade carpet. The stairs and landing were also covered with carpet and carpet pad.

Ignition Package

The fires were initiated on the sofa using an open flame from a butane torch to ignite an ignition package prepared by the FRL staff. The ignition package is shown in Figure 15. The ignition package consisted of a quart-size plastic bag that contained paper towels and medical gauze rolled together and soaked in gasoline. The medical gauze used was a CVS/pharmacy Sterile Premium Rolled Gauze, constructed of a Rayon-polyester blend. The gauze had a listed un-stretched length of 7.62 cm x 1.92 m (3 inches x 2.1 yard). Ten sheets from a paper towel roll were used and each sheet of paper towel measured 22.5 cm x 27.9 cm (8.875 inch x 11 inch).

Each ignition package was assembled by first unrolling the medical gauze and laying it out flat in the un-stretched position. A continuous section of ten (10) paper towel sheets

was then removed from the paper towel roll and folded width wise in a tri-fold manner such that the folded width of the continuous section of paper towels measured approximately 7.3 cm (2.875 inches). The folded continuous section of paper towels was placed on top of the un-stretched medical gauze. They were then rolled together such that the paper towels were on the inside and the medical gauze was on the outside of the roll. The roll was then placed inside the quart-sized plastic bag and approximately 250 ml (8.5 fluid ounces) of gasoline was poured into the bag.



Figure 15. Ignition package (358561_1238921.jpg)

Smoke/CO Alarms

Both AC powered and battery powered smoke alarms and CO alarms were used in the experiments. A summary of each alarm is provided in Table 2. Photographs of the alarms are shown in Figure 16 and Figure 17.

Table 2. Summary of Smoke Alarms and CO Alarms

Alarm ID	Alarm Type	Sensor Type	Manufacturer	Model	Power Source
1	Smoke	Ionization	Kidde	21007581	120 VAC
2	Smoke	Photoelectric	Kidde	P4010ACS	120 VAC
3	CarbonMonoxide	Electrochemical	Kidde	900-0121	120 VAC
4	Smoke	Ionization	First Alert	SA303CN3	9 VDC
5	Smoke	Photoelectric	LS Home	GS528A	9 VDC
6	CarbonMonoxide	Electrochemical	First Alert	CO400	9 VDC



Figure 16. AC powered alarms – image annotated (360079_1304666.jpg)

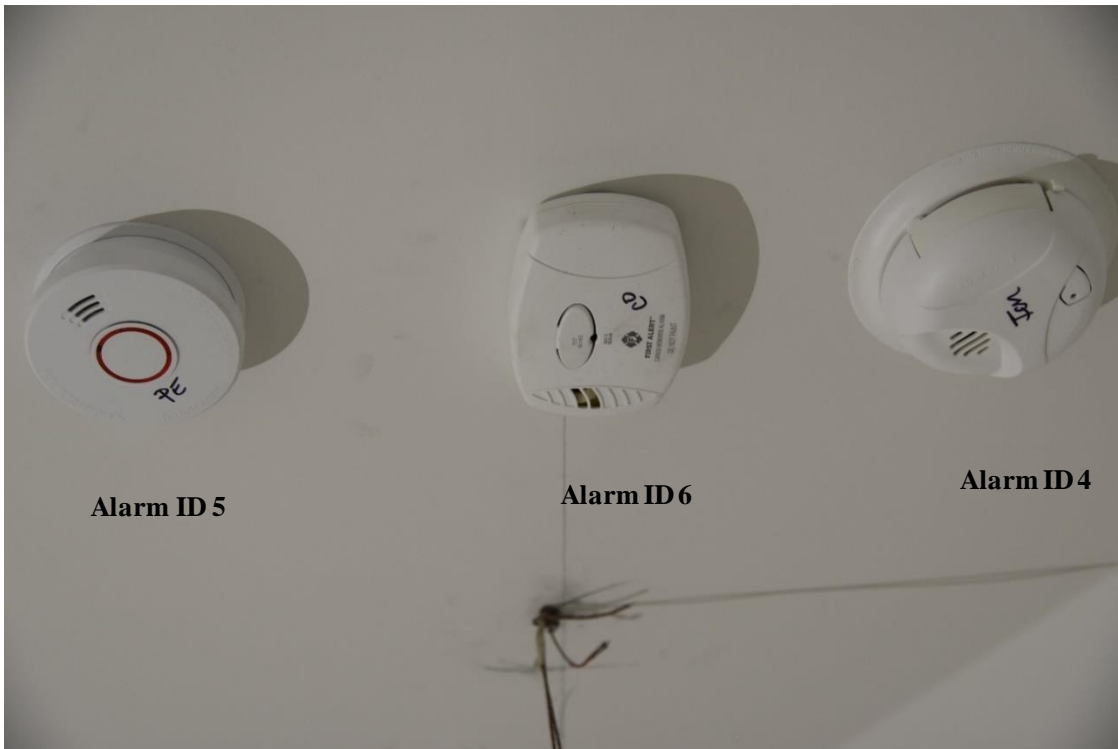


Figure 17. Battery powered alarms - image annotated (360079_1304668.jpg)

Table 3 summarizes which alarms were used during each test and where these devices were located.

Table 3. Summary of Smoke/CO Alarms During Each Test

Test	Type of Combustion	Alarm IDs 1 st Floor	Alarm IDs 2 nd Floor
1	Smoldering	1-6	1-6
2	Smoldering	1-6	1-6
3	Flaming	1-6	1-3
4	Flaming	1-6	1-3

Experiment Details

Table 4 provides a summary of the four experiments conducted. Two variables were considered: the type of combustion (smoldering/flaming) and the door position on the 2nd floor (open/closed).

Table 4. Summary of Experiments

Test Number	Experiment ID	Type of Combustion	Door Position on 2 nd Floor
1	360079	Smoldering	Closed
2	360082	Smoldering	Open
3	360086	Flaming	Closed
4	360089	Flaming	Open*

* Door was removed from structure

Experimental Procedures

Test 1 - Smoldering

The cotton batting was placed in the structure along with the cartridge heater. The door on the 1st floor was sealed shut with tape and the door on the 2nd floor was closed (but not sealed with tape). With the power turned off to the variable transformer, the dial on the variable transformer was set to approximately 50%. The experiment was then started and the power to the variable transformer was turned on. Over approximately the next hour, the transformer was turned off and on and set to other settings in an attempt to generate visible smoke without causing the cotton batting to ignite and transition to a flaming fire. The smoke was being monitored via video cameras located in the test structure on each floor. After approximately 70 minutes, the smoke was not visible. Therefore, the door on the 2nd floor was opened and the cotton batting was unfolded in half, causing more smoke to be generated immediately. The door was then closed, and the experiment continued. After a total test time of approximately 3 hours and 15 minutes, the door on the 2nd floor was opened again and water from a fire extinguisher was applied to the cotton batting.

The experiment continued with the door open on the 2nd floor for an additional 20 minutes, after which the experiment was stopped.

Test 2 - Smoldering

The cotton batting was placed in the structure along with the cartridge heater. The cartridge heat was reused from the first test. The cotton batting was not folded as tightly as it was for Test 1, in an attempt to generate more smoke quicker. The door on the 1st floor was sealed shut with tape and the door on the 2nd floor was kept open. With the power turned off to the variable transformer, the dial on the variable transformer was set to approximately 50%. The experiment was then started and the power to the variable transformer was turned on. Over approximately the next 20 minutes, the transformer was turned off and on to generate visible smoke without causing the cotton batting to ignite and transition to a flaming fire. The variable transformer was then turned off and the test continued. After a total test time of 3 hours, the test was stopped.

Test 3 – Flaming Fire

The door on the 1st floor was sealed shut with tape. The ignition package was placed on the right side of the sofa. The test was then started when the ignition package was ignited with a butane torch, as shown in Figure 18. Test personnel then exited the structure through the door on the 2nd floor and closed the door behind them. The test proceeded for approximately 45 minutes, at which point the door on the 2nd floor was opened and the fire, which had been limited to the sofa, was suppressed. The door on the 1st floor was then opened and the test was stopped.



Figure 18. Ignition package ignited using open flame from butane torch (360086_1305186.jpg)

Test 4 – Flaming Fire

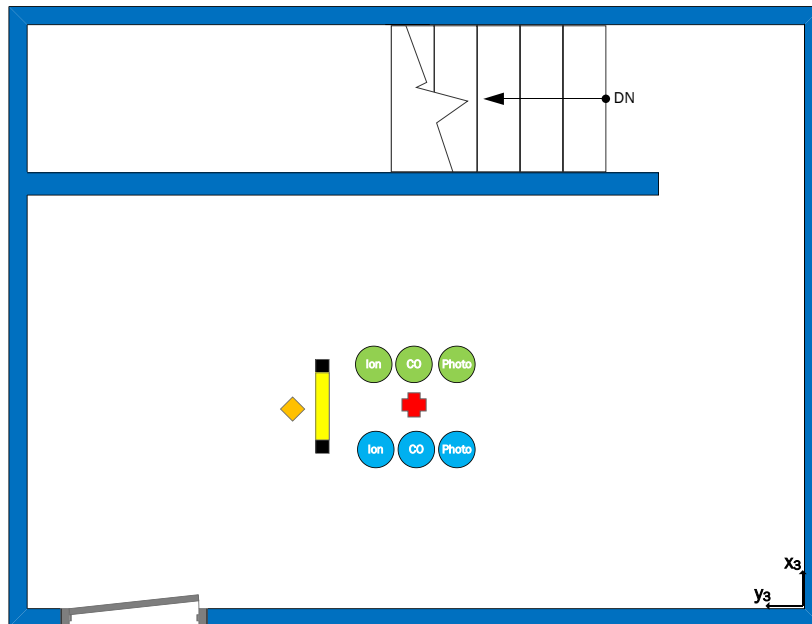
Following Test 3, the damaged sofa was removed from the structure along with the section of carpet that had been damaged. These items were replaced, while the other items remained from Test 3. The door on the 2nd floor was removed from the structure and the door on the 1st floor was sealed shut with tape. The ignition package was placed on the right side of the sofa. The test was started when the ignition package was ignited using a butane torch. Test personnel then exited the structure through the doorway on the 2nd floor. The test proceeded for approximately 14 minutes, and then the fire was suppressed using a deluge water suppression system. The test continued for an additional 8 minutes and then the test was stopped.

Instrumentation

A variety of instrumentation was used during the experiments and included thermocouples (TC) for temperature measurement, heat flux transducers for heat flux measurement, gas analyzers to measure the concentrations of oxygen, carbon monoxide, and carbon dioxide within the structure, optical density meters (ODM) to measure the optical density of the smoke, and a weather station to measure the atmospheric conditions in the laboratory (pressure, temperature, and relative humidity). Figure 19 provides the general location of the instrumentation, which is based on a Cartesian coordinate system (x , y , z). Location x and location y are both located in the horizontal plane. Location z is the vertical distance from the floor to the centerline of the instrument. The specific location of each instrument is provided in the following sections for the individual instrumentation.

For the smoldering tests (Tests 1 and Test 2), two additional thermocouples (TCs) were used during the tests. The thermocouples were placed within the cotton batting: one TC was placed near the cartridge heater to verify the heater was working properly, and the second TC was placed in a location remote from the cartridge heater. For the flaming fire tests (Test 3 and Test 4), the battery powered smoke/CO alarms were not used on the upper floor, nor was the ODM.

2nd Floor



1st Floor

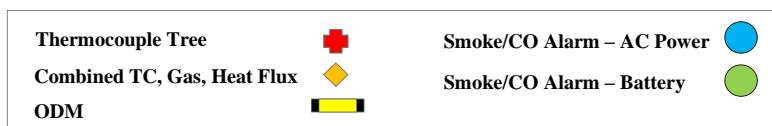
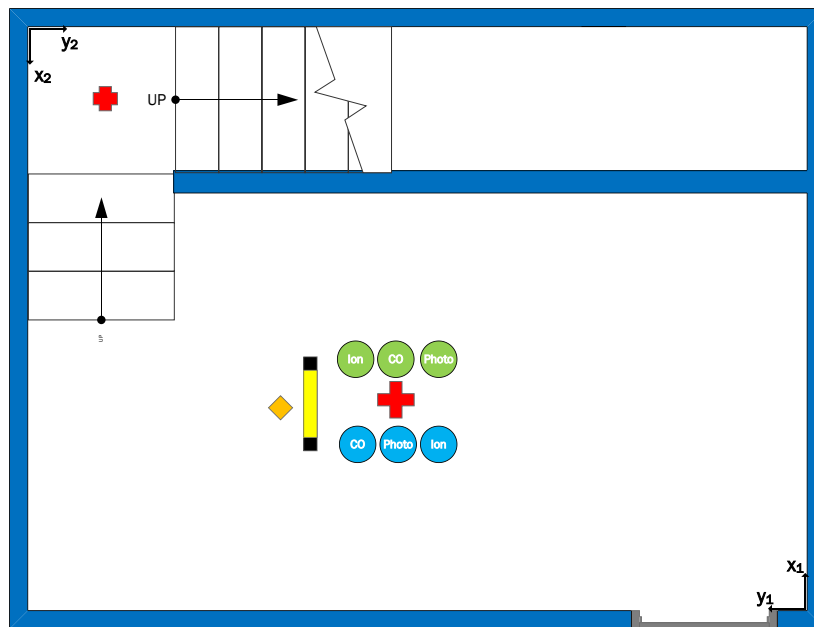


Figure 19. General Instrumentation Layout

The smoke alarms and CO alarms were mounted directly to the ceiling. The exception to this were the 120 VAC powered alarms on the first floor. These alarms were mounted slightly off of the ceiling so that wires for power and data could be run along the ceiling, instead of through the ceiling joist, as shown in Figure 20. These alarms were offset from the ceiling by approximately 2.54 cm (1 inch). The general location of each type of alarm is shown in Figure 19. Note that for Test 3 & 4, the AC powered ion smoke alarm and CO alarm were switched in positions.

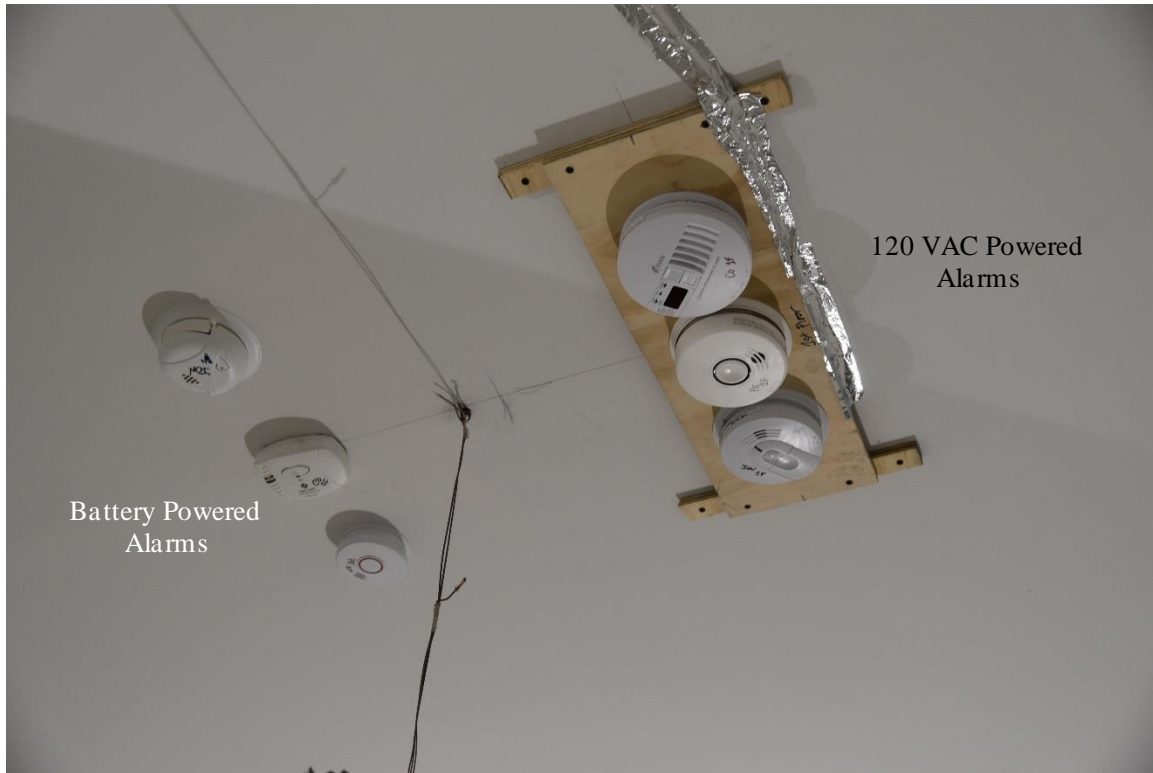


Figure 20. Alarms mounted on first floor ceiling – image annotated (360082_1304945.jpg)

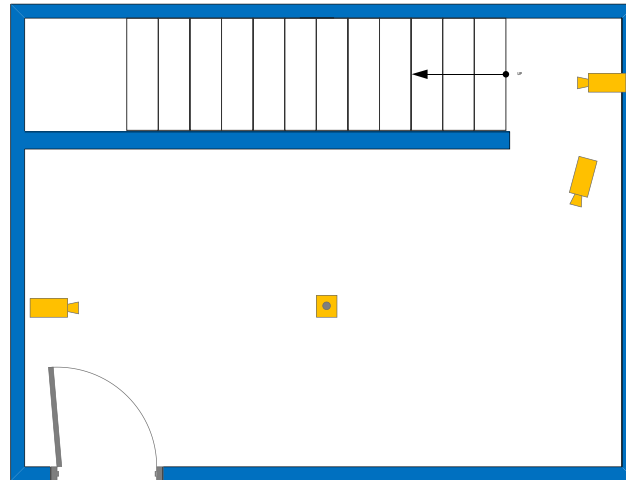
Two methods were used to determine when the smoke/CO alarms activated. For the 120 VAC powered alarms, a voltage signal was obtained using the interconnect wire from these alarms and the voltage was recorded using the data acquisition. For the battery powered alarms, an interconnect wire was not available. Therefore, alarm activation was determined manually by using a video camera pointed at the alarms to detect when the alarm's indicator light started to flash.

The tenability conditions in each room were determined by measuring the smoke density, the ambient temperature, the radiant heat flux, and the gas concentrations of carbon monoxide (CO), carbon dioxide (CO₂), and oxygen (O₂). Measurements were obtained approximately 1.52 m (5 ft) above the floor and the equipment was mounted to an instrumentation stand, as shown in Figure 21. The smoke density was measured using a white light source, which can be seen in Figure 21.

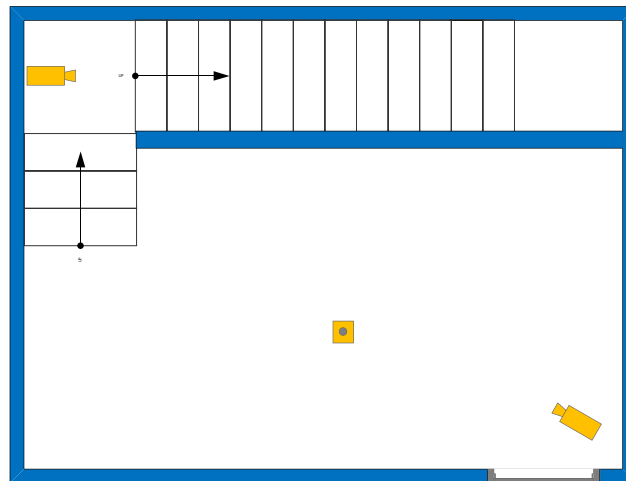


Figure 21. Instrumentation stand for tenability measurements (360086_1305132.jpg)

The experiments were also documented using a still camera and video cameras. A high definition (HD) video camera was located outside of the structure and multiple standard definition (SD) video cameras were used inside the structure. Figure 22 shows the general layout of the cameras. For the flaming combustion tests (Test 3 and Test 4), the video camera that had been pointed up at the alarms on the 2nd story ceiling for Test 1 and 2 was instead focused on the origin of the fire, which was on the sofa.



2nd Floor



1st Floor

Figure 22. General layout of video cameras

Laboratory Conditions

The ambient laboratory temperature, barometric pressure, and relative humidity were measured during the experiment(s). Barometric pressure measurement is accomplished using a silicon capacitive absolute sensor. The micromechanical sensor uses dimensional changes in its silicon membrane to measure pressure. Humidity measurement is achieved using a capacitive humidity sensor. The capacitance of the thin-film polymer sensor changes as the relative humidity changes. Temperature measurement is attained using a platinum Resistance Temperature Detector (RTD) sensor. The RTD contains a resistor that changes resistance as the temperature changes. The Laboratory Conditions were

measured in accordance with the method defined in FRL Laboratory Instruction “LI017 Laboratory Conditions” [1].

The following table provides a description of the instrumentation used to collect the ambient laboratory conditions measurements during the experiments.

Table 5. Lab Conditions Description

Description	Manufacturer	Model	Bar Code
Vaisala LBR	Vaisala	PTU301	99001066

The following table provides a summary of the initial conditions at the start of the experiment(s). The ‘Description’ column shows the location of the measurements.

Table 6. Ambient Laboratory Initial Condition Summary

Test Number	Exp ID	Description	Temperature (C)	Pressure (kPa)	Relative Humidity (%)
1	360079	Vaisala LBR	11	102	36
2	360082	Vaisala LBR	9	101	49
3	360086	Vaisala LBR	8	102	33
4	360089	Vaisala LBR	9	102	39

Thermocouples

Thermocouples are temperature measurement sensors that consist of two dissimilar metals joined at one end (a junction) that produces a small thermo-electrical voltage when the wire is heated. The change in voltage is interpreted as a change in temperature [2]. There are many configurations of thermocouples which affect the temperature range, ruggedness, and response time. The information required to identify these factors for the thermocouples that were used during the experiment(s) conducted for this test series is provided in the “Thermocouple Measurement Description” table. Thermocouples used during this test series were used in accordance with the method defined in FRL laboratory instruction “LI001 Thermocouple” [3].

The following table provides a description of the instrumentation used to collect the temperature measurements during the experiments. The "Description" column describes the location of the temperature measurement. The "Z" location is the height of the thermocouple above the floor. The "Thermocouple Type" describes the characteristics of the thermocouple used.

Table 7. Thermocouple Measurement Description

Description	X (m)	Y (m)	Z (m)	Thermocouple type
Landing 0'	1.320	2.570	0.000	Type K, Glass Ins., 24 AWG wire
Landing 1'	1.320	2.570	0.305	Type K, Glass Ins., 24 AWG wire
Landing 2'	1.320	2.740	0.610	Type K, Glass Ins., 24 AWG wire
Landing 3'	1.320	2.740	0.914	Type K, Glass Ins., 24 AWG wire
Landing 4'	0.457	0.457	1.219	Type K, Glass Ins., 24 AWG wire
Landing 5'	0.457	0.457	1.524	Type K, Glass Ins., 24 AWG wire
Landing 6'	0.457	0.457	1.829	Type K, Glass Ins., 24 AWG wire
Landing 7'	0.457	0.457	2.134	Type K, Glass Ins., 24 AWG wire
1st Floor 0'	1.321	2.438	0.000	Type K, Glass Ins., 24 AWG wire
1st Floor 1'	1.321	2.438	0.305	Type K, Glass Ins., 24 AWG wire
1st Floor 2'	1.321	2.438	0.610	Type K, Glass Ins., 24 AWG wire
1st Floor 3'	1.321	2.438	0.914	Type K, Glass Ins., 24 AWG wire
1st Floor 4'	1.321	2.438	1.219	Type K, Glass Ins., 24 AWG wire
1st Floor 5'	1.321	2.438	1.524	Type K, Glass Ins., 24 AWG wire
1st Floor 6'	1.321	2.438	1.829	Type K, Glass Ins., 24 AWG wire
1st Floor 7'	1.321	2.438	2.134	Type K, Glass Ins., 24 AWG wire
1st Floor 8'	1.321	2.438	2.438	Type K, Glass Ins., 24 AWG wire
2nd Floor 0'	1.321	2.438	0.000	Type K, Glass Ins., 24 AWG wire
2nd Floor 1'	1.321	2.438	0.305	Type K, Glass Ins., 24 AWG wire
2nd Floor 2'	1.321	2.438	0.610	Type K, Glass Ins., 24 AWG wire
2nd Floor 3'	1.321	2.438	0.914	Type K, Glass Ins., 24 AWG wire
2nd Floor 4'	1.321	2.438	1.219	Type K, Glass Ins., 24 AWG wire
2nd Floor 5'	1.321	2.438	1.524	Type K, Glass Ins., 24 AWG wire
2nd Floor 6'	1.321	2.438	1.829	Type K, Glass Ins., 24 AWG wire
2nd Floor 7'	1.321	2.438	2.134	Type K, Glass Ins., 24 AWG wire
2nd Floor 8'	1.321	2.438	2.438	Type K, Glass Ins., 24 AWG wire
Tenability 1st Floor 5'	1.372	2.565	1.524	Type K, Glass Ins., 24 AWG wire
Tenability 2nd Floor 5'	1.321	2.743	1.524	Type K, Glass Ins., 24 AWG wire
*Smolder TC 1	No Data	No Data	No Data	Type K, Glass Ins., 24 AWG wire
*Smolder TC 2	No Data	No Data	No Data	Type K, Glass Ins., 24 AWG wire

**Only used during Test 1 and Test 2*

Heat Flux Transducers

A heat flux transducer is a device that measures the rate of absorbed incident energy, and expresses it on a per unit area basis. The operating principle of the Schmidt-Boelter heat flux transducer(s) used during this test series is based on one-dimensional heat conduction through a solid. Temperature sensors are placed on a thin, thermally conductive sensor element, and applying heat establishes a temperature gradient across the element. The heat flux is proportional to the temperature difference across the element according to Fourier's Law [4]. Heat flux transducers were used in accordance with the method defined in FRL laboratory instruction "LI002 Heat Flux Transducer" [5].

The following table provides a description of the transducer used to collect heat flux measurements during the experiment(s). The "Description" column typically describes the location of the heat flux transducer. Heat flux mode indicates whether the total heat flux was measured or just the radiation fraction. Heat flux over range is the maximum measured value reported for this transducer. Location X and Location Y are Cartesian

coordinates generally located in a horizontal plane. Location Z is the distance from the floor to the centerline of the transducer.

Table 8. Heat Flux Measurement Description

Description	Heat Flux Mode	Heat Flux Over Range (kW/m ²)	Bar Code	X (m)	Y (m)	Z (m)
1st Floor Total	Total - Dual	37.50	99000074	1.32	2.57	1.52
1st Floor Rad	Radiometer - Dual	37.50	99000661	1.32	2.57	1.52
2nd Floor Total	Total - Dual	37.50	99000059	1.32	2.74	1.52
2nd Floor Rad	Radiometer - Dual	37.50	99000662	1.32	2.74	1.52

Optical Density Meter

Optical density meter(s) were used to measure the smoke obscuration during the experiment(s). Optical density meters consist of two parts: a light source and a photo transducer which responds to the intensity of light from the light source. The photo transducer produces an output voltage that is linear with the amount of light received from the light source. An increase in intensity of light results in an increase in output voltage and a decrease in intensity of light results in a decrease in output voltage. Prior to the start of each test series each optical density meter is functionally verified using neutral density filters.

The following table provides a description of the optical density meter(s) used in the experiment. The extinction beam path length is the distance measured from the light source to the lens of the photo transducer. The Minimum Allowable Measurement is the minimum light transmission (%) measured by the ODM, which is based on the neutral density filter used during calibration.

Table 9. Optical Density Meter Description

Description	Light Source Type	Beam Path Length (m)	Minimum Allowable Measurement (%)	X (m)	Y (m)	Z (m)
1st Floor ODM	White light	0.889	10	1.321	2.565	1.524
2nd Floor ODM	White light	0.889	10	1.321	2.743	1.524

Smoke and Carbon Monoxide Detectors

Smoke and carbon monoxide (CO) detectors are devices used to activate an alarm in the presence of smoke or carbon monoxide. These detectors send notifications in the form of audible, visible, and/or electrical responses. A functionally verified clock is used to record the time of alarm activation during the test.

The following table provides a description of the detectors used in the experiment. The location column describes the mounting position of the detector. For wall-mounted detectors, the distance from ceiling column indicates the vertical distance from the ceiling

to the centerline of the detector. The next few columns provide information about the specifications of the detector.

Table 10. Detectors Summary

Description	Location	Manufacturer	Model	Detector Type	Sensor Type
1F Ion	Ceiling	Kidde	21007581	smoke	ionization
1F Photo	Ceiling	Kidde	P4010ACS	smoke	photoelectric
1F CO	Ceiling	Kidde	900-0121	carbon monoxide	electrochemical
2F Ion	Ceiling	Kidde	21007581	smoke	ionization
2F Photo	Ceiling	Kidde	P4010ACS	smoke	photoelectric
2F CO	Ceiling	Kidde	900-0121	carbon monoxide	electrochemical
1F Photo -Battey	Ceiling	LSHome	GS528A	smoke	photoelectric
1F CO - Battery	Ceiling	First Alert	CO400	carbon monoxide	electrochemical
1F Ion - Battery	Ceiling	First Alert	SA303	smoke	ionization
2F Photo -Battey	Ceiling	LSHome	GS528A	smoke	photoelectric
2F CO - Battery	Ceiling	First Alert	CO400	carbon monoxide	electrochemical
2F Ion - Battery	Ceiling	First Alert	SA303	smoke	ionization

Gas Analyzer-Paramagnetic-O₂

A gas analyzer was used to measure the oxygen (O₂) concentration at one or more point measurement location(s). The oxygen analyzer operates according to the paramagnetic alternating pressure principal. The resolution of the oxygen transducer’s output signal is less than 0.1% of the respective output signal span value. The analyzer was zeroed and calibrated prior to each test. Nitrogen was used as the zero gas, and dried ambient air, which is assumed to have an oxygen concentration of 20.95 %, was used as the span gas. The gas concentration point measurements were conducted in accordance with the method defined in FRL laboratory instruction “LI016 - Point Source Gas Analysis” [6].

The following table provides a description of the instrumentation used to collect the O₂ gas concentrations during the experiments.

Table 11. O₂ Analyzer Description

Description	O2 Analyzer Full Scale Range (%)	O2 Span Gas Value (%)	Bar Code
1st Floor	25	20.95	99000557
2nd Floor	25	20.95	99000555

The following table provides information about the oxygen sampling location(s) and the operating parameters of the analyzer(s). The “Oxygen Delay Time” is the time required for the gas analyzer output to adjust when subjected to a known gas concentration change at the measurement location. The "Exhaust Return" states where the gas sample bypass and analyzer exhaust lines are returned to during the experiment.

Table 12. O₂ Measurement Description

Description	Location X (m)	Location Y (m)	Location Z (m)	Oxygen Delay Time (s)	Exhaust Return Line
1st Floor	1.32	2.57	1.52	12	To Test Chamber
2nd Floor	1.32	2.74	1.52	13	To Test Chamber

Gas Analyzer-NDIR-CO/CO₂

A gas analyzer was used to measure both the carbon monoxide (CO) and carbon dioxide (CO₂) concentrations at one or more point measurement location(s). The CO/CO₂ gas analyzer utilizes two separate Nondispersive Infrared (NDIR) type transducers to measure the concentration of each gas. The resolution of each transducer's output signal is less than 0.1% of the respective output signal span value. The span value is defined as the input value used to test the upper range of the analyzer. The analyzer was zeroed and spanned prior to each test. Nitrogen was used as the zero gas and a pre-mixed calibration gas with known concentrations of CO and CO₂ were used as the span gas. The gas concentration point measurements were conducted in accordance with the method defined in FRL laboratory instruction "LI016 - Point Source Gas Analysis" [6].

The following table provides a description of the instrumentation used to collect the CO and CO₂ gas concentrations during the experiments.

Table 13. CO and CO₂ Analyzer Description

Description	CO Analyzer Full Scale Range (mol/mol)	CO Span Gas Value (mol/mol)	CO2 Analyzer Full Scale Range (mol/mol)	CO2 Span Gas Value (mol/mol)	Bar Code
1st Floor	0.05	0.0452	0.25	0.2229	99000557
2nd Floor	0.05	0.0452	0.25	0.2229	99000555

The following table provides information about the carbon monoxide and carbon dioxide sampling location(s) and the operating parameters of the analyzer(s). The "CO/CO₂ delay time" is the time required for the gas analyzer output to adjust when subjected to a known gas concentration change at the measurement location. The "Exhaust Return" states where the gas sample by-pass and analyzer exhaust lines are returned to during the experiment.

Table 14. CO and CO₂ Measurement Descriptions

Description	Location X (m)	Location Y (m)	Location Z (m)	CO/CO2 Delay Time (s)	Exhaust Return
1st Floor	1.32	2.57	1.52	13	To Test Chamber
2nd Floor	1.32	2.74	1.52	13	To Test Chamber

Experiment Photographs

Digital Cameras are used within the FRL to record digital still photographs during experiments. Digital Cameras used during this test series were used in accordance with the method defined in FRL Laboratory Instruction "LI003 Digital Cameras" [7].

Results for Test 1 (ID 360079)

The following table lists selected events that occurred during the experiment.

Table 15. Experiment Events

Description	Time (s)
Variable Transformer Setting 50%	0
Variable Transformer Setting 30%	1690
Variable Transformer Off	2011
Variable Transformer Setting 50%	4030
Variable Transformer Off	4390
2nd Story Door Opened/Batting Opened	4470
2nd Story Door Closed	4500
2nd Story Door Opened/Batting Partially Suppressed	11714

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures over pre-determined time spans.

Table 16. Temperature Value Result Summary

Description	Initial (C)	Max (C)	30 second max average (C)	1 minute max average (C)	5 minute max average (C)	10 minute max average (C)
Landing 0'	11.6	13.1	13.1	13.1	13.1	13.1
Landing 1'	11.8	13.2	13.2	13.2	13.2	13.2
Landing 2'	11.7	13.2	13.2	13.2	13.2	13.2
Landing 3'	11.7	13.3	13.2	13.2	13.2	13.2
Landing 4'	11.6	13.4	13.4	13.4	13.4	13.4
Landing 5'	11.6	13.9	13.9	13.9	13.8	13.8
Landing 6'	11.7	16.1	15.5	15.4	15.3	15.3
Landing 7'	11.9	21.5	21.4	21.3	21.2	21.2
1st Floor 0'	11.4	12.6	12.5	12.5	12.5	12.5
1st Floor 1'	11.3	12.6	12.5	12.5	12.5	12.4
1st Floor 2'	11.5	12.8	12.7	12.7	12.7	12.6
1st Floor 3'	11.4	12.7	12.7	12.7	12.6	12.6
1st Floor 4'	11.4	12.8	12.7	12.7	12.7	12.7
1st Floor 5'	11.4	12.9	12.8	12.8	12.8	12.8
1st Floor 6'	11.4	12.9	12.9	12.9	12.9	12.9
1st Floor 7'	11.4	13.0	13.0	13.0	13.0	13.0
1st Floor 8'	11.5	13.2	13.2	13.2	13.2	13.1
2nd Floor 0'	12.4	24.8	24.6	24.5	24.4	24.3
2nd Floor 1'	12.4	28.8	28.7	28.6	28.6	28.5
2nd Floor 2'	12.4	29.5	29.4	29.4	29.4	29.3
2nd Floor 3'	12.4	30.1	30.0	30.0	29.9	29.8
2nd Floor 4'	12.5	30.6	30.6	30.5	30.5	30.4
2nd Floor 5'	12.5	30.9	30.9	30.9	30.9	30.8
2nd Floor 6'	12.6	31.4	31.3	31.2	31.1	31.1
2nd Floor 7'	12.7	32.6	32.5	32.4	32.3	32.2
2nd Floor 8'	12.8	32.6	32.3	32.3	32.2	32.1
Tenability 1st Floor 5'	11.7	13.1	13.0	13.0	13.0	12.9

Description	Initial (C)	Max (C)	30 second max average (C)	1 minute max average (C)	5 minute max average (C)	10 minute max average (C)
Tenability 2nd Floor 5'	12.7	30.6	30.5	30.5	30.4	30.4
Smolder TC 1	12.4	870.1	869.7	869.4	866.2	860.3
Smolder TC 2	12.6	491.3	490.6	490.2	488.0	485.1

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

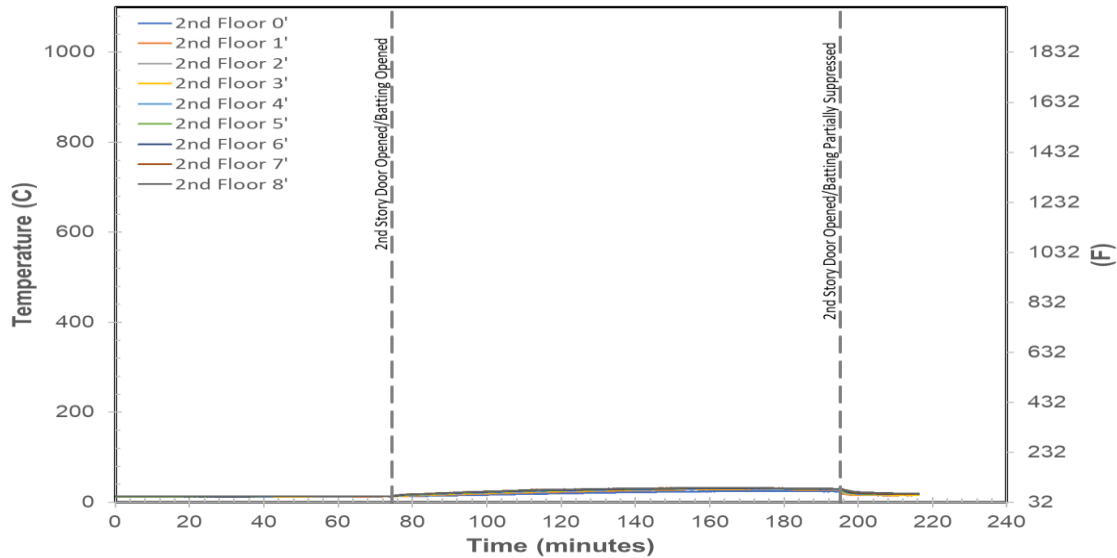


Figure 23. Temperature – 2nd Floor

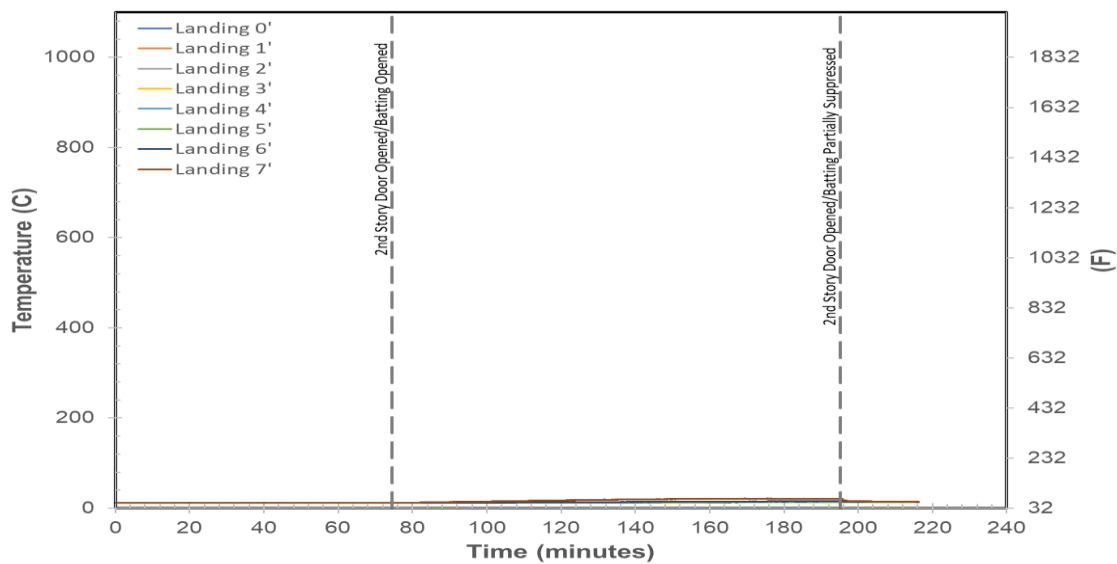


Figure 24. Temperature – Landing

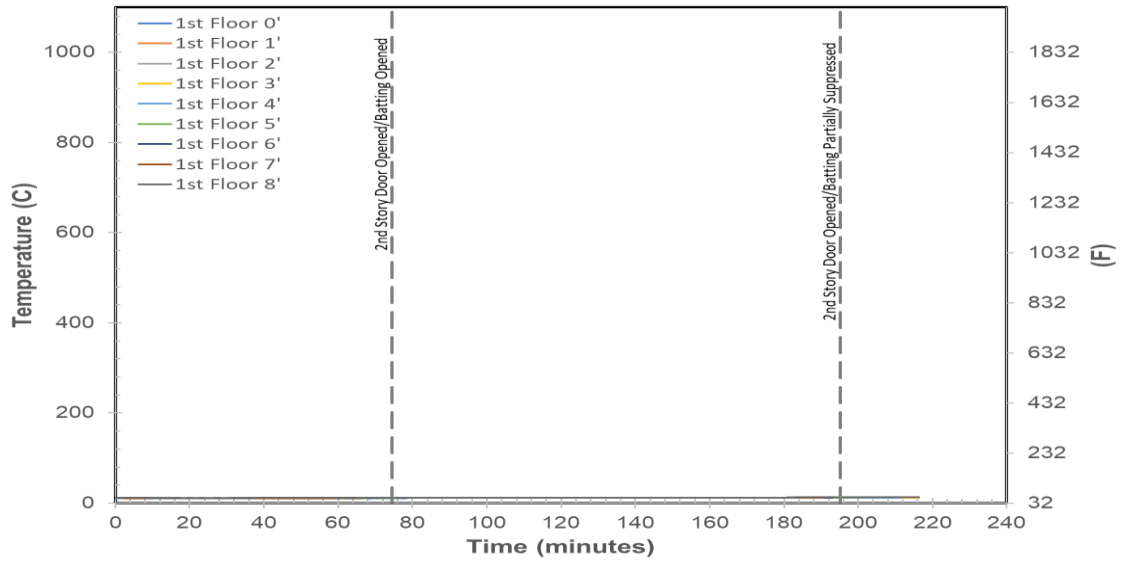


Figure 25. Temperature – 1st Floor

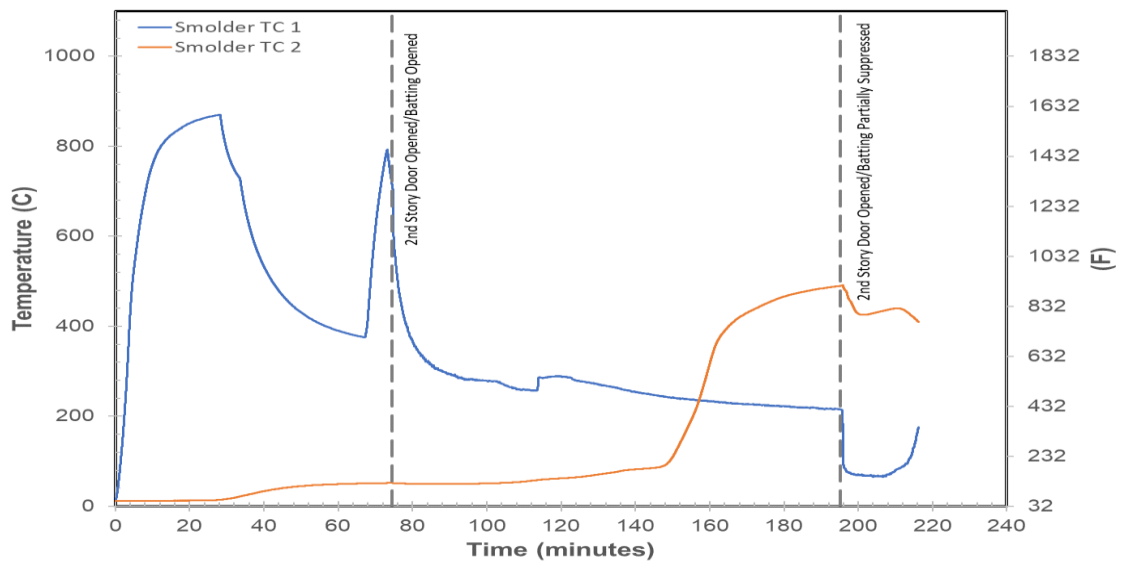


Figure 26. Temperature – Cotton Batting

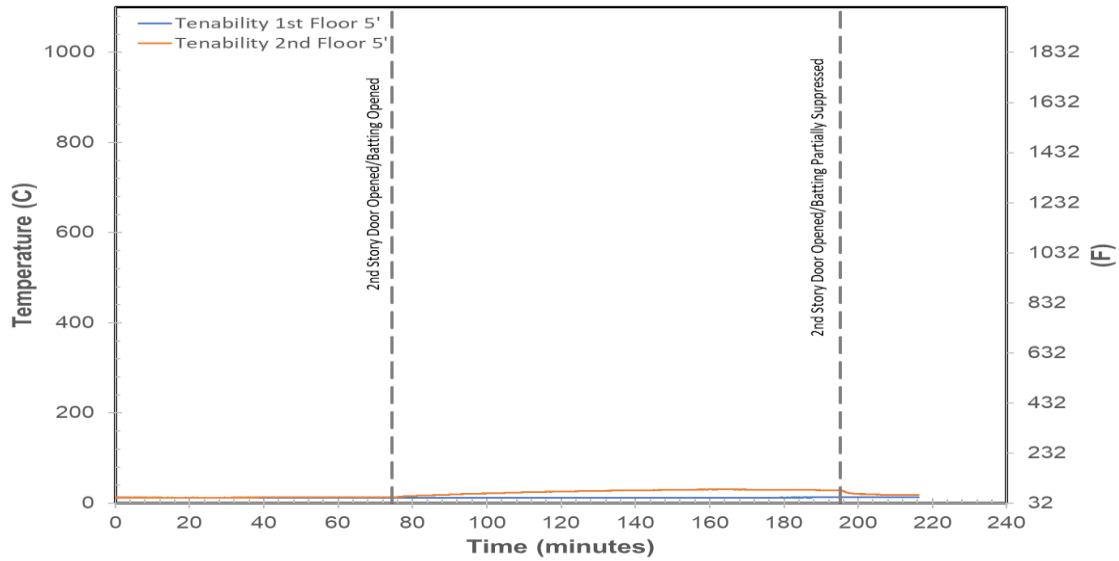


Figure 27. Temperature – Tenability

The following table provides a summary of the heat flux results. The “Description” column typically describes the location of the heat flux transducer. The time at which the heat flux first changes by a pre-determined amount is provided in the “Time of Initial Change” column. The pre-determined amount of change in heat flux is provided in the “Initial Change Amount” column. The maximum heat flux recorded during the test is provided in the “Maximum” column. The “Maximum Average” columns are calculated over pre-determined time spans. A “SC” indicates that the values did not change sufficiently for this value to be calculated.

Table 17. Heat Flux Result Summary

Description	Time of Initial Change (s)	Initial Change Value (kW/m ²)	Maximum (kW/m ²)	10 Second Maximum Average (kW/m ²)	30 Second Maximum Average (kW/m ²)	1 Minute Maximum Average (kW/m ²)	5 Minute Maximum Average (kW/m ²)	10 Minute Maximum Average (kW/m ²)
1st Floor Total	SC	1	0.0	0.0	0.0	0.0	0.0	0.0
1st Floor Rad	SC	1	0.0	0.0	0.0	0.0	0.0	0.0
2nd Floor Total	SC	1	0.2	0.1	0.1	0.1	0.1	0.1
2nd Floor Rad	SC	1	0.0	0.0	0.0	0.0	0.0	0.0

The following chart(s) shows a time dependent representation of the baseline corrected instantaneous heat flux measured during the experiment.

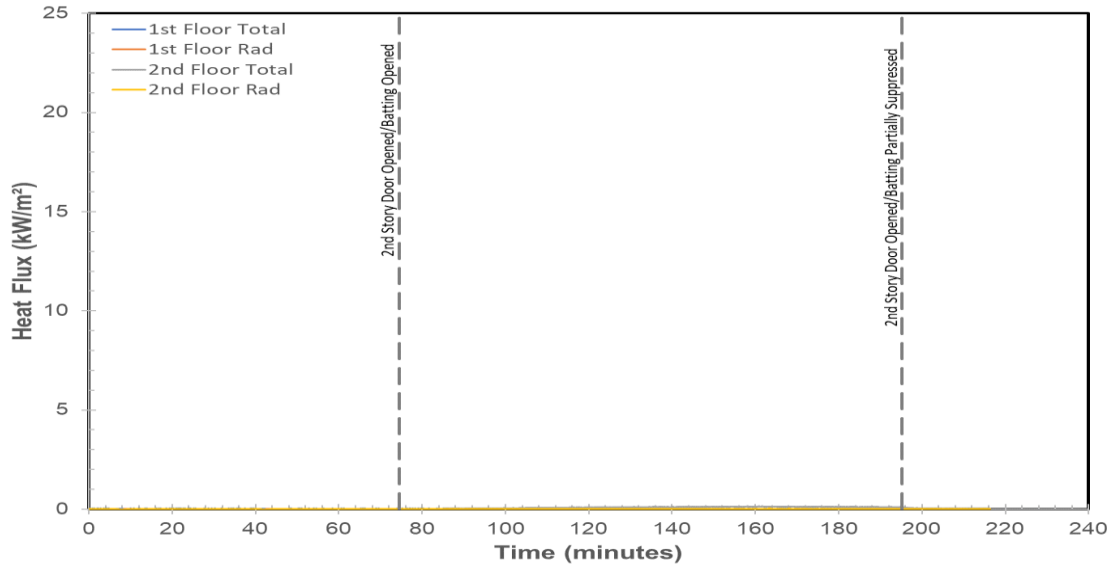


Figure 28. Heat Flux

The following table provides a summary of the optical density.

Table 18. Optical Density Results Summary

Description	Average Optical Density (1/m)	Maximum Optical Density (1/m)
1st Floor ODM	0.09	0.28
2nd Floor ODM	0.60	1.12

The following chart provides a time dependent representation of the optical density measured during the experiment.

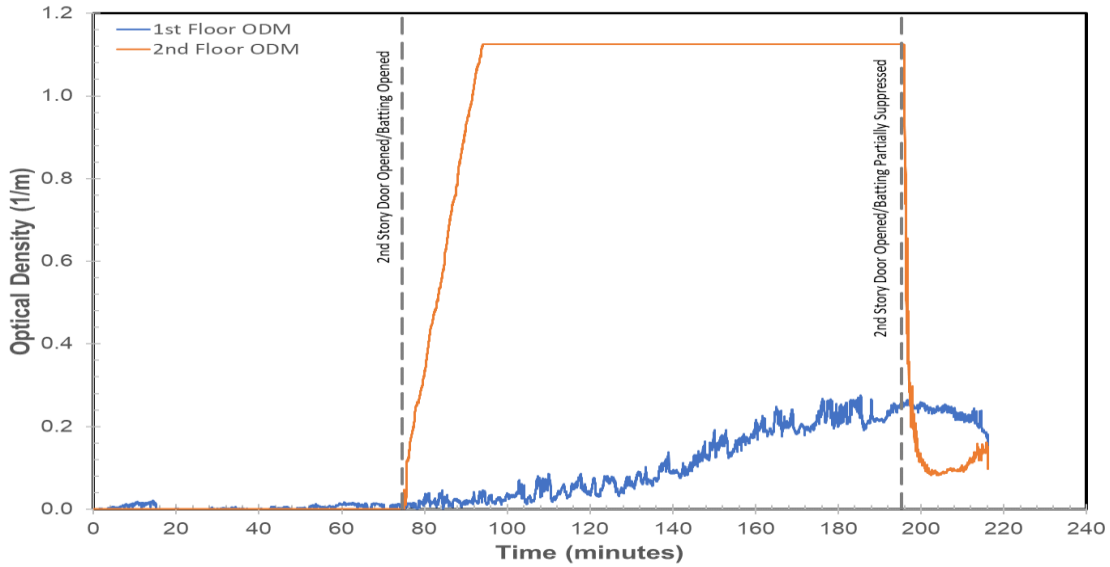


Figure 29. Optical Density

The following chart shows the obscuration during the experiment.

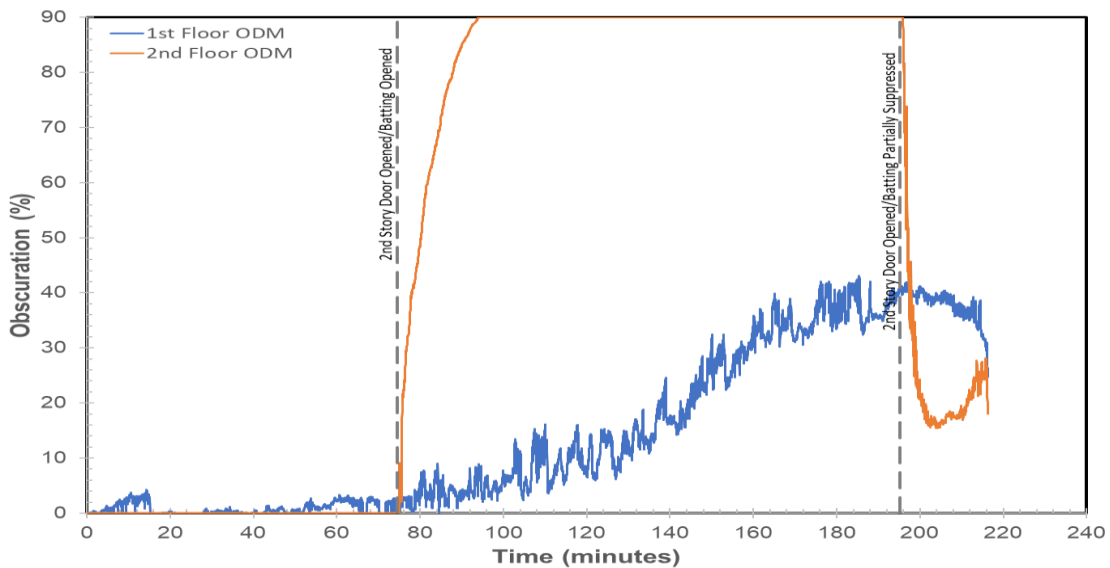


Figure 30. Obscuration

The following table shows which oxygen analyzer(s) were taken out of service during the experiment.

Table 19. Out of Service

Description	Time out of service time (s)	Out of service reason
2nd Floor	0	Air Leak

The following table provides a summary of the oxygen measurement results.

Test 1 (ID 360079)

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Table 20. Oxygen Measurement Results

Description	Full Scale Range (%)	Minimum Value (%)	Average (%)
1st Floor	25	20.34375	20.70521

The following chart presents the oxygen concentration(s) measured during the test.

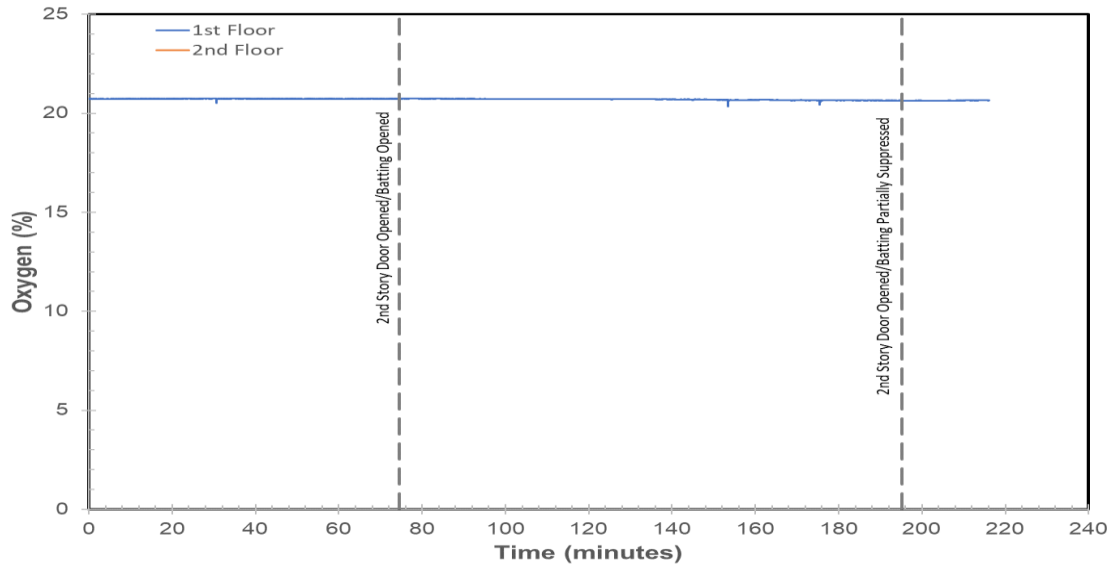


Figure 31. Oxygen Concentration

The following table shows which CO/CO2 gas analyzer(s) were taken out of service (OOS) during the experiment.

Table 21. Out of Service

Description	CO- Time OOS (s)	CO- Reason OOS	CO2- Time OOS (s)	CO2- Reason OOS
2nd Floor	0	Air Leak	0	Air Leak

The following table provides a summary of the carbon monoxide gas measurement results.

Table 22. CO Measurement Results

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
1st Floor	0.05	0.0002	-0.0001

The following table provides a summary of the carbon dioxide gas measurement results.

Table 23. CO2 Measurement Results

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
1st Floor	0.25	0.0014	0.0002

The following chart shows the carbon monoxide concentration(s) measured during the experiment.

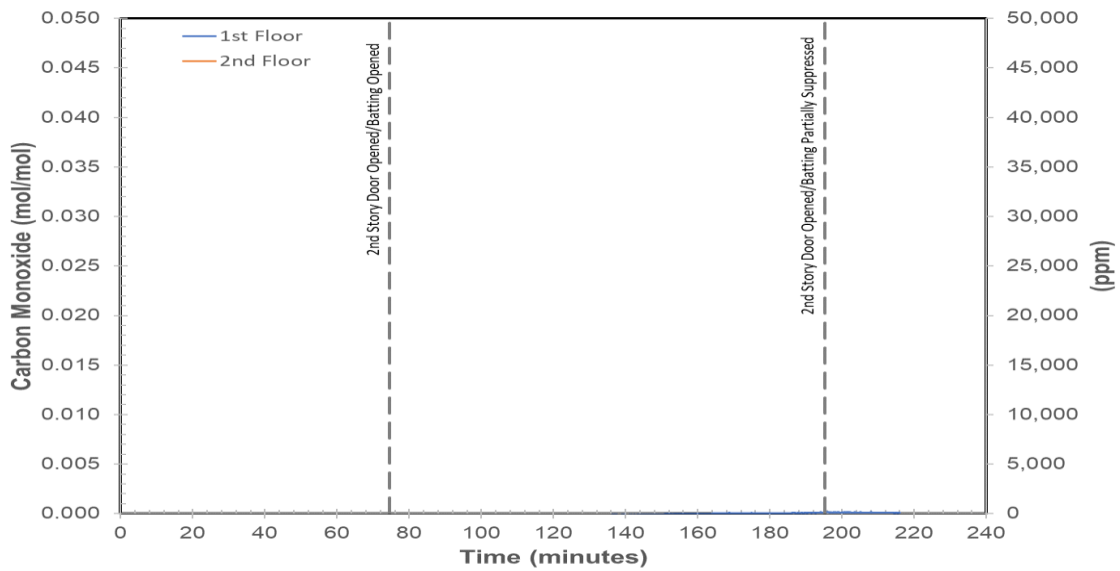


Figure 32. Carbon Monoxide Concentration(s)

The following chart shows the carbon dioxide concentration(s) measured during the experiment.

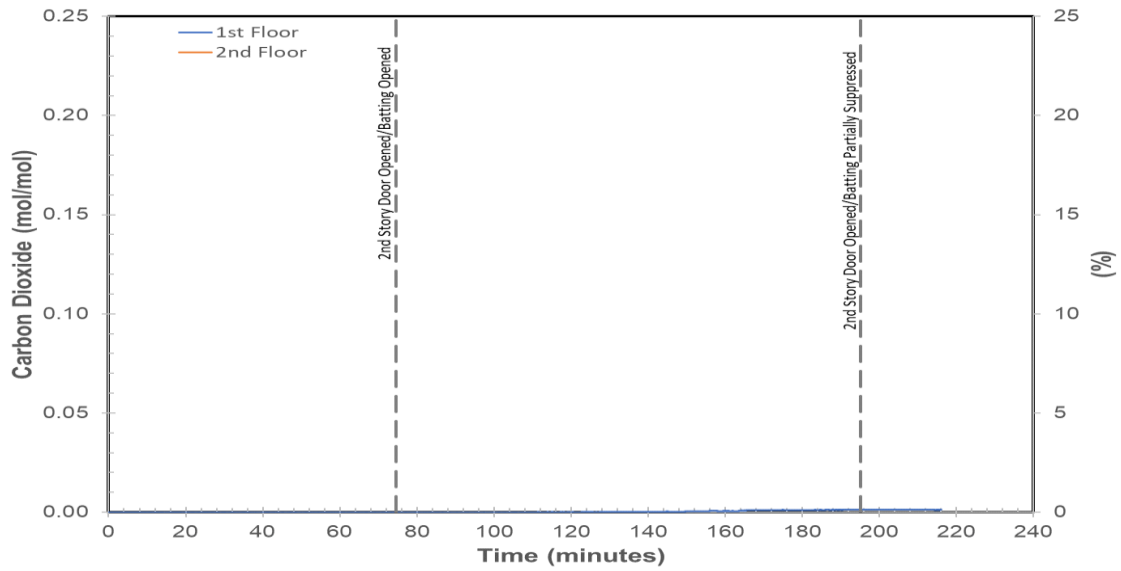


Figure 33. Carbon Dioxide Concentration(s)

The following table provides a description of the video(s) taken during this experiment.

Table 24. Video Log

Description	Start Time	Duration (s)	Filename
Stairs Looking down	09:56:34	13009	360079_20230306_095628_1A.mov
Ignition	09:56:42	13013	360079_20230306_095635_2A.mov
Stairs looking up	09:56:49	13017	360079_20230306_095643_3A.mov
Wide View 2nd	09:56:56	13081	360079_20230306_095650_4A.mov
Smoke Detector 2nd floor	09:57:04	13084	360079_20230306_095657_5A.mov
Smoke Detector 1st floor	09:57:11	13089	360079_20230306_095705_6A.mov
Wide View 1st	09:57:19	13093	360079_20230306_095712_7A.mov
HD outside view	09:57:26	13097	360079_20230306_095719_8A.mov
Custom - Master Sped Up 60X			360079_1313285.MOV
Master			360079_1313286.MOV

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture's filename as well as any description and elapsed test time associated with the picture.

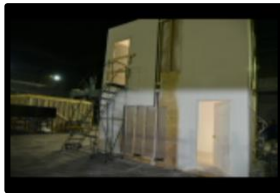


Figure 34. Pre test
1:20 hr:min,
360079_1304634



Figure 35. Pre test
1:20 hr:min,
360079_1304635



Figure 36. Pre test
1:20 hr:min,
360079_1304636



Figure 37. Pre test
1:20 hr:min,
360079_1304637



Figure 38. Pre test
1:19 hr:min,
360079_1304638



Figure 39. Pre test
1:19 hr:min,
360079_1304639



Figure 40. Pre test
1:19 hr:min,
360079_1304640



Figure 41. Pre test
1:19 hr:min,
360079_1304641



Figure 42. Pre test
1:19 hr:min,
360079_1304642



Figure 43. Pre test
1:19 hr:min,
360079_1304643



Figure 44. Pre test
1:19 hr:min,
360079_1304644



Figure 45. Pre test
1:18 hr:min,
360079_1304645



Figure 46. Pre test
1:18 hr:min,
360079_1304646



Figure 47. Pre test
1:18 hr:min,
360079_1304647



Figure 48. Pre test
1:18 hr:min,
360079_1304648



Figure 49. Pre test
1:17 hr:min,
360079_1304649



Figure 50. Pre test
1:17 hr:min,
360079_1304650



Figure 51. Pre test
1:17 hr:min,
360079_1304651



Figure 52. Pre test
1:17 hr:min,
360079_1304652



Figure 53. Pre test
1:17 hr:min,
360079_1304653



Figure 54. Pre test
1:16 hr:min,
360079_1304654



Figure 55. Pre test
1:16 hr:min,
360079_1304655



Figure 56. Pre test
1:16 hr:min,
360079_1304656



Figure 57. Pre test
1:15 hr:min,
360079_1304657

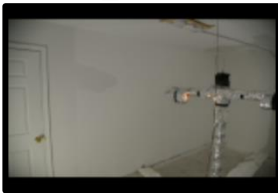


Figure 58. Pre test
1:15 hr:min,
360079_1304658

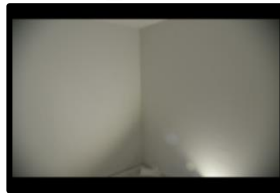


Figure 59. Pre test
1:15 hr:min,
360079_1304659



Figure 60. Pre test
1:15 hr:min,
360079_1304660



Figure 61. Pre test
1:15 hr:min,
360079_1304661



Figure 62. Pre test
1:15 hr:min,
360079_1304662

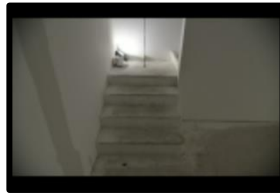


Figure 63. Pre test
1:15 hr:min,
360079_1304663



Figure 64. Pre test
1:15 hr:min,
360079_1304664



Figure 65. Pre test
1:15 hr:min,
360079_1304665



Figure 66. Pre test
1:15 hr:min,
360079_1304666

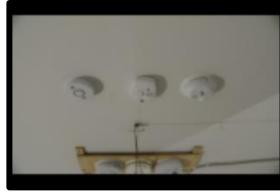


Figure 67. Pre test
1:15 hr:min,
360079_1304667



Figure 68. Pre test
1:15 hr:min,
360079_1304668



Figure 69. Pre test
1:15 hr:min,
360079_1304669

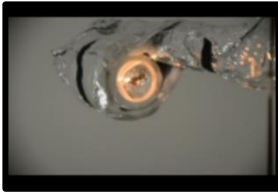


Figure 70. Pre test
1:15 hr:min,
360079_1304670

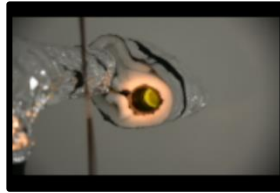


Figure 71. Pre test
1:15 hr:min,
360079_1304671

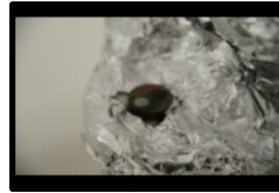


Figure 72. Pre test
1:14 hr:min,
360079_1304672



Figure 73. Pre test
1:14 hr:min,
360079_1304673



Figure 74. Pre test
1:14 hr:min,
360079_1304674



Figure 75. Pre test
1:14 hr:min,
360079_1304675



Figure 76. Pre test
1:14 hr:min,
360079_1304676



Figure 77. Pre test
1:14 hr:min,
360079_1304677

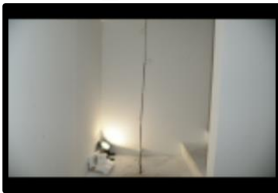


Figure 78. Pre test
1:14 hr:min,
360079_1304678



Figure 79. Pre test
1:14 hr:min,
360079_1304679



Figure 80. Pre test
1:14 hr:min,
360079_1304680



Figure 81. Pre test
1:14 hr:min,
360079_1304681



Figure 82. Pre test
1:14 hr:min,
360079_1304682

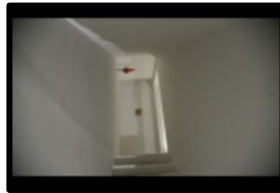


Figure 83. Pre test
1:13 hr:min,
360079_1304683



Figure 84. Pre test
1:13 hr:min,
360079_1304684



Figure 85. Pre test
1:13 hr:min,
360079_1304685



Figure 86. Pre test
1:13 hr:min,
360079_1304686



Figure 87. Pre test
1:13 hr:min,
360079_1304687



Figure 88. Pre test
1:13 hr:min,
360079_1304688



Figure 89. Pre test
1:13 hr:min,
360079_1304689



Figure 90. Pre test
1:13 hr:min,
360079_1304690



Figure 91. Pre test
1:13 hr:min,
360079_1304691



Figure 92. Pre test
1:13 hr:min,
360079_1304692



Figure 93. Pre test
1:13 hr:min,
360079_1304693



Figure 94. Pre test
1:13 hr:min,
360079_1304694



Figure 95. Pre test
1:13 hr:min,
360079_1304695



Figure 96. Pre test
1:13 hr:min,
360079_1304696



Figure 97. Pre test
1:13 hr:min,
360079_1304697



Figure 98. Pre test
1:13 hr:min,
360079_1304698



Figure 99. Pre test
1:13 hr:min,
360079_1304699



Figure 100. Pre test
1:12 hr:min,
360079_1304700



Figure 101. Pre test
1:12 hr:min,
360079_1304701

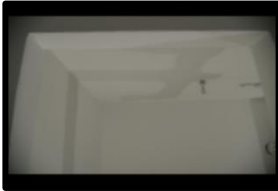


Figure 102. Pre test
1:12 hr:min,
360079_1304702



Figure 103. Pre test
1:12 hr:min,
360079_1304703



Figure 104. Pre test
1:12 hr:min,
360079_1304704



Figure 105. Pre test
1:12 hr:min,
360079_1304705



Figure 106. Pre test
1:12 hr:min,
360079_1304706



Figure 107. Pre test
1:12 hr:min,
360079_1304707



Figure 108. Pre test
1:12 hr:min,
360079_1304708

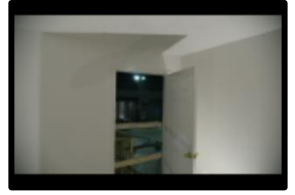


Figure 109. Pre test
1:12 hr:min,
360079_1304709

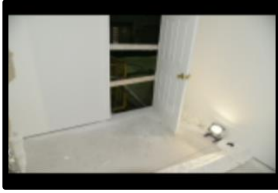


Figure 110. Pre test
1:12 hr:min,
360079_1304710



Figure 111. Pre test
1:12 hr:min,
360079_1304711



Figure 112. Pre test
1:12 hr:min,
360079_1304712

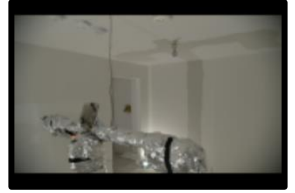


Figure 113. Pre test
1:12 hr:min,
360079_1304713



Figure 114. Pre test
1:12 hr:min,
360079_1304714



Figure 115. Pre test
1:12 hr:min,
360079_1304715



Figure 116. Pre test
1:12 hr:min,
360079_1304716



Figure 117. Pre test
1:11 hr:min,
360079_1304717



Figure 118. Pre test
1:11 hr:min,
360079_1304718



Figure 119. Pre test
1:11 hr:min,
360079_1304719



Figure 120. Pre test
1:11 hr:min,
360079_1304720



Figure 121. Pre test
1:11 hr:min,
360079_1304721



Figure 122. Pre test
1:11 hr:min,
360079_1304722



Figure 123. Pre test
1:11 hr:min,
360079_1304723



Figure 124. Pre test
1:11 hr:min,
360079_1304724



Figure 125. Pre test
1:11 hr:min,
360079_1304725



Figure 126. Pre test 1:10 hr:min, 360079_1304726



Figure 127. Pre test 1:10 hr:min, 360079_1304727



Figure 128. Pre test 1:10 hr:min, 360079_1304728



Figure 129. Pre test 1:10 hr:min, 360079_1304729



Figure 130. Pre test 1:10 hr:min, 360079_1304730



Figure 131. Pre test 1:09 hr:min, 360079_1304731



Figure 132. Pre test 1:09 hr:min, 360079_1304732



Figure 133. Pre test 1:09 hr:min, 360079_1304733



Figure 134. Pre test 1:09 hr:min, 360079_1304734



Figure 135. Pre test 1:08 hr:min, 360079_1304735



Figure 136. Pre test 1:08 hr:min, 360079_1304736



Figure 137. Pre test 1:08 hr:min, 360079_1304737



Figure 138. Pre test 1:08 hr:min, 360079_1304738



Figure 139. Pre test 1:08 hr:min, 360079_1304739



Figure 140. Pre test 1:08 hr:min, 360079_1304740



Figure 141. Pre test 1:08 hr:min, 360079_1304741



Figure 142. Pre test 57 minutes, 360079_1304742



Figure 143. Pre test 57 minutes, 360079_1304743



Figure 144. Pre test 57 minutes, 360079_1304744



Figure 145. Pre test 57 minutes, 360079_1304745



Figure 146. Pre test 57 minutes, 360079_1304746



Figure 147. Pre test 56 minutes, 360079_1304747



Figure 148. Pre test 56 minutes, 360079_1304748



Figure 149. Pre test 56 minutes, 360079_1304749



Figure 150. Pre test 55 minutes, 360079_1304750



Figure 151. Pre test 55 minutes, 360079_1304751



Figure 152. Pre test 55 minutes, 360079_1304752

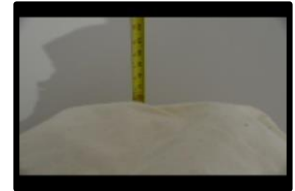


Figure 153. Pre test 55 minutes, 360079_1304753



Figure 154. Pre test 55 minutes, 360079_1304754



Figure 155. Pre test 55 minutes, 360079_1304755



Figure 156. Pre test 55 minutes, 360079_1304756



Figure 157. Pre test 54 minutes, 360079_1304757



Figure 158. Pre test 54 minutes, 360079_1304758

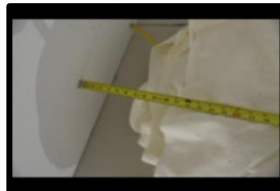


Figure 159. Pre test 54 minutes, 360079_1304759



Figure 160. Pre test 54 minutes, 360079_1304760



Figure 161. Pre test 54 minutes, 360079_1304761



Figure 162. Pre test 16 minutes, 360079_1304762



Figure 163. Pre test 16 minutes, 360079_1304763



Figure 164. Pre test 8 minutes, 360079_1304764



Figure 165. Pre test 8 minutes, 360079_1304765



Figure 166. Pre test 7 minutes, 360079_1304766



Figure 167. Pre test 7 minutes, 360079_1304767



Figure 168. Pre test 7 minutes, 360079_1304768



Figure 169. Pre test 3 minutes, 360079_1304769



Figure 170. Pre test 3 minutes, 360079_1304770



Figure 171. Pre test 3 minutes, 360079_1304771



Figure 172. Pre test 3 minutes, 360079_1304772



Figure 173. Post test 49 minutes, 360079_1304773



Figure 174. Post test 49 minutes, 360079_1304774



Figure 175. Post test 49 minutes, 360079_1304775



Figure 176. Post test 49 minutes, 360079_1304776



Figure 177. Post test 49 minutes, 360079_1304777



Figure 178. Post test 49 minutes, 360079_1304778



Figure 179. Post test 49 minutes, 360079_1304779

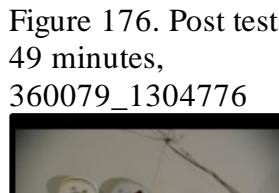


Figure 180. Post test 50 minutes, 360079_1304780

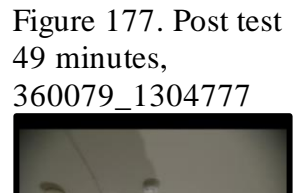


Figure 181. Post test 50 minutes, 360079_1304781



Figure 182. Post test 1:15 hr:min, 360079_1304782



Figure 183. Post test 1:15 hr:min, 360079_1304783



Figure 184. Post test 1:15 hr:min, 360079_1304784

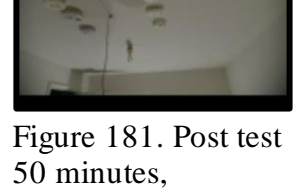


Figure 185. Post test 1:16 hr:min, 360079_1304785



Figure 186. Post test
1:16 hr:min,
360079_1304786



Figure 187. Post test
1:16 hr:min,
360079_1304787



Figure 188. Post test
1:16 hr:min,
360079_1304788



Figure 189. Post test
1:17 hr:min,
360079_1304789



Figure 190. Post test
1:17 hr:min,
360079_1304790



Figure 191. Post test
1:17 hr:min,
360079_1304791



Figure 192.
360079_1307030



Figure 193.
360079_1307031



Figure 194.
360079_1307032



Figure 195.
360079_1307033



Figure 196.
360079_1307034



Figure 197.
360079_1307035



Figure 198.
360079_1307036



Figure 199.
360079_1307037



Figure 200.
360079_1307038



Figure 201.
360079_1307039



Figure 202.
360079_1307040



Figure 203.
360079_1307041



Figure 204.
360079_1307042



Figure 205.
360079_1307043



Figure 206.
360079_1307044



Figure 207.
360079_1307045



Figure 208.
360079_1307046

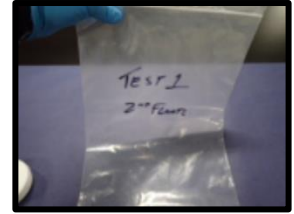


Figure 209.
360079_1307047



Figure 210.
360079_1307048

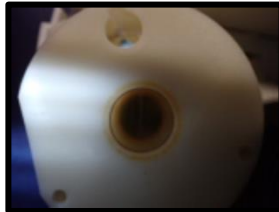


Figure 211.
360079_1307049



Figure 212.
360079_1307050



Figure 213.
360079_1307051



Figure 214.
360079_1307052



Figure 215.
360079_1307053

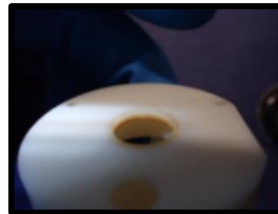


Figure 216.
360079_1307054

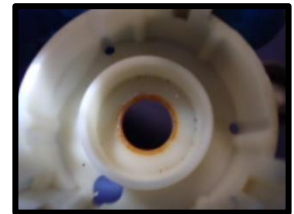


Figure 217.
360079_1307055

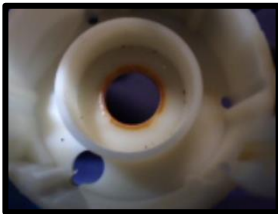


Figure 218.
360079_1307056



Figure 219.
360079_1307057



Figure 220.
360079_1307058



Figure 221.
360079_1307059



Figure 222.
360079_1307060



Figure 223.
360079_1307061

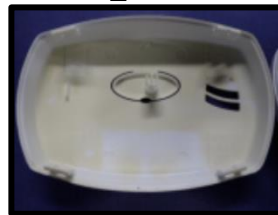


Figure 224.
360079_1307062

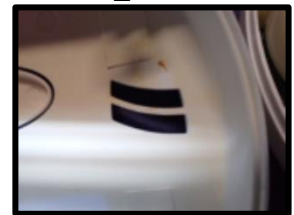


Figure 225.
360079_1307063



Figure 226.
360079_1307064



Figure 227.
360079_1307065

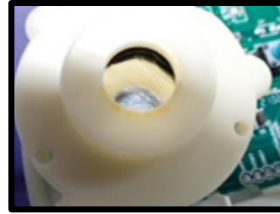


Figure 228.
360079_1307066

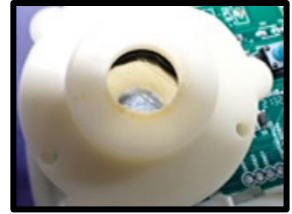


Figure 229.
360079_1307067

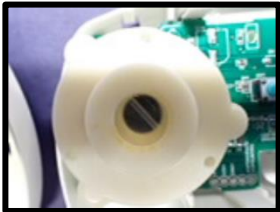


Figure 230.
360079_1307068

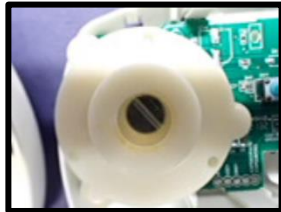


Figure 231.
360079_1307069



Figure 232.
360079_1307070



Figure 233.
360079_1307071

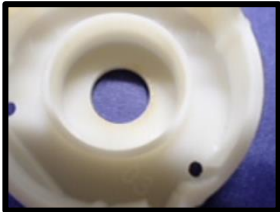


Figure 234.
360079_1307072

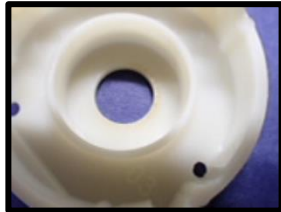


Figure 235.
360079_1307073

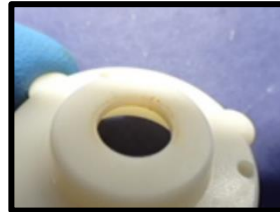


Figure 236.
360079_1307074

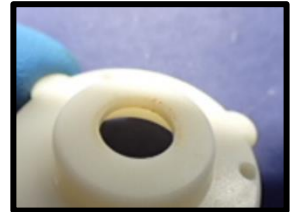


Figure 237.
360079_1307075



Figure 238.
360079_1307076



Figure 239.
360079_1307077



Figure 240.
360079_1307078

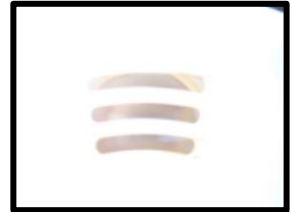


Figure 241.
360079_1307079

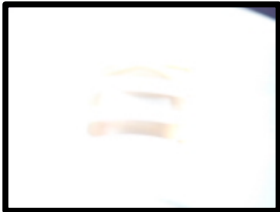


Figure 242.
360079_1307080



Figure 243.
360079_1307081



Figure 244.
360079_1307082



Figure 245.
360079_1307083



Figure 246.
360079_1307084



Figure 247.
360079_1307085



Figure 248.
360079_1307086



Figure 249.
360079_1307087

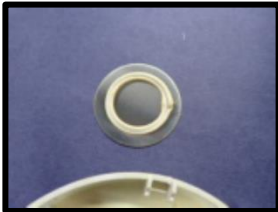


Figure 250.
360079_1307088



Figure 251.
360079_1307089



Figure 252.
360079_1307090



Figure 253.
360079_1307091



Figure 254.
360079_1307092



Figure 255.
360079_1307093

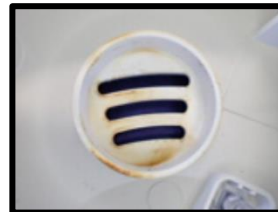


Figure 256.
360079_1307094



Figure 257.
360079_1307095

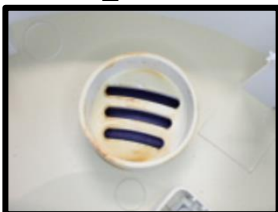


Figure 258.
360079_1307096

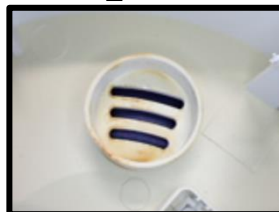


Figure 259.
360079_1307097



Figure 260.
360079_1307098

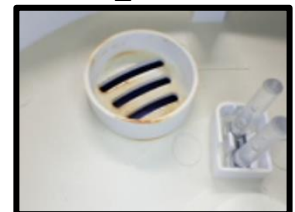


Figure 261.
360079_1307099



Figure 262.
360079_1307100



Figure 263.
360079_1307101



Figure 264.
360079_1307102



Figure 265.
360079_1307103



Figure 266.
360079_1307104



Figure 267.
360079_1307105



Figure 268.
360079_1307106



Figure 269.
360079_1307107



Figure 270.
360079_1307108



Figure 271.
360079_1307109



Figure 272.
360079_1307110



Figure 273.
360079_1307111



Figure 274.
360079_1307112



Figure 275.
360079_1307113



Figure 276.
360079_1307114



Figure 277.
360079_1307115



Figure 278.
360079_1307116



Figure 279.
360079_1307117



Figure 280.
360079_1307118



Figure 281.
360079_1307119



Figure 282.
360079_1307120

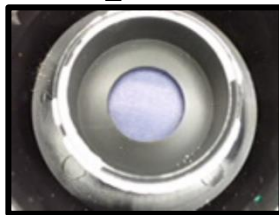


Figure 283.
360079_1307121

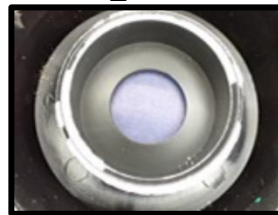


Figure 284.
360079_1307122

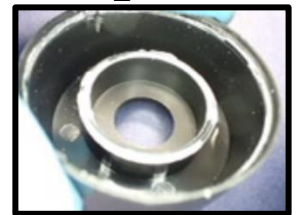


Figure 285.
360079_1307123

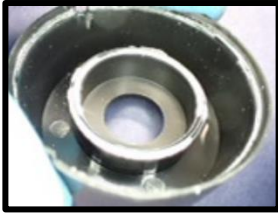


Figure 286.
360079_1307124



Figure 287.
360079_1307125



Figure 288.
360079_1307126

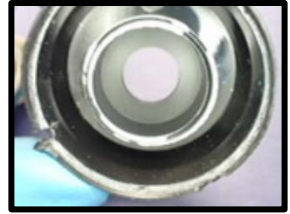


Figure 289.
360079_1307127

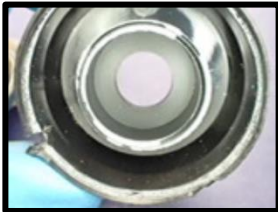


Figure 290.
360079_1307128

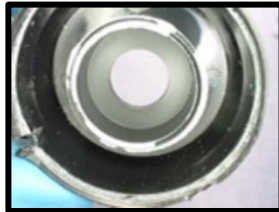


Figure 291.
360079_1307129



Figure 292.
360079_1307130



Figure 293.
360079_1307131



Figure 294.
360079_1307132



Figure 295.
360079_1307133



Figure 296.
360079_1307134



Figure 297.
360079_1307135



Figure 298.
360079_1307136



Figure 299.
360079_1307137



Figure 300.
360079_1307138



Figure 301.
360079_1307139



Figure 302.
360079_1307140



Figure 303.
360079_1307141



Figure 304.
360079_1307142



Figure 305.
360079_1307143



Figure 306.
360079_1307144



Figure 307.
360079_1307145



Figure 308.
360079_1307146

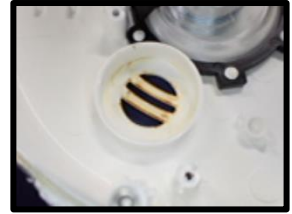


Figure 309.
360079_1307147

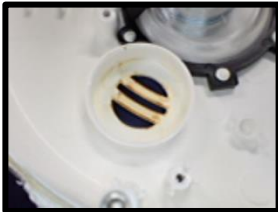


Figure 310.
360079_1307148



Figure 311.
360079_1307149



Figure 312.
360079_1307150



Figure 313.
360079_1307151



Figure 314.
360079_1307152

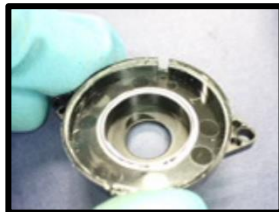


Figure 315.
360079_1307153

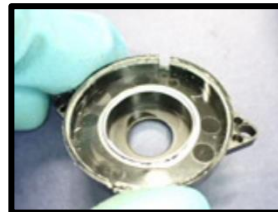


Figure 316.
360079_1307154

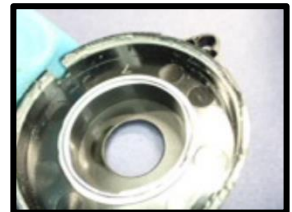


Figure 317.
360079_1307155

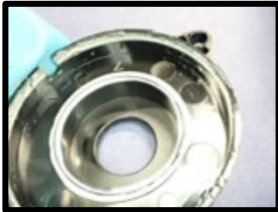


Figure 318.
360079_1307156



Figure 319.
360079_1307157



Figure 320.
360079_1307158



Figure 321.
360079_1307159



Figure 322.
360079_1307160



Figure 323.
360079_1307161



Figure 324.
360079_1307162



Figure 325.
360079_1307163

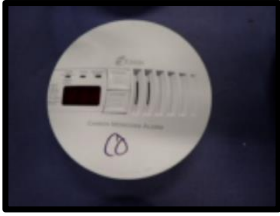


Figure 326.
360079_1307164

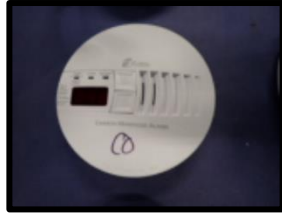


Figure 327.
360079_1307165



Figure 328.
360079_1307166



Figure 329.
360079_1307167



Figure 330.
360079_1307168



Figure 331.
360079_1307169

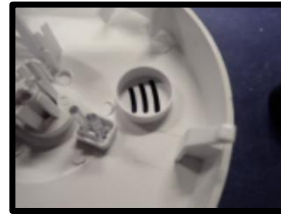


Figure 332.
360079_1307170



Figure 333.
360079_1307171

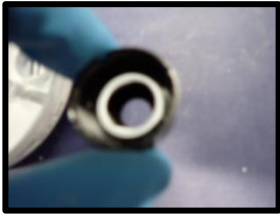


Figure 334.
360079_1307172

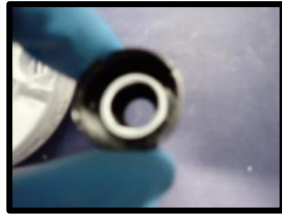


Figure 335.
360079_1307173

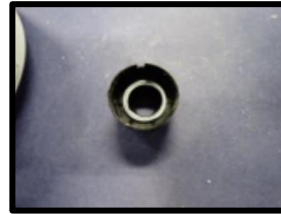


Figure 336.
360079_1307174



Figure 337.
360079_1307175



Figure 338.
360079_1307176



Figure 339.
360079_1307177



Figure 340.
360079_1307178



Figure 341.
360079_1307179



Figure 342.
360079_1307180

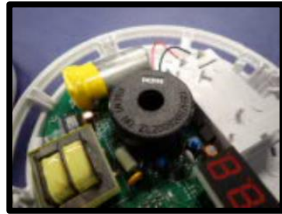


Figure 343.
360079_1307181



Figure 344.
360079_1307182

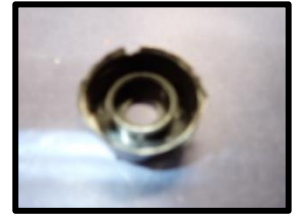


Figure 345.
360079_1307183



Figure 346.
360079_1307184



Figure 347.
360079_1307185



Figure 348.
360079_1307186



Figure 349.
360079_1307187



Figure 350.
360079_1307188



Figure 351.
360079_1307189



Figure 352.
360079_1307190



Figure 353.
360079_1307191

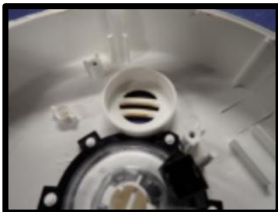


Figure 354.
360079_1307192



Figure 355.
360079_1307193



Figure 356.
360079_1307194



Figure 357.
360079_1307195



Figure 358.
360079_1307196



Figure 359.
360079_1307197



Figure 360.
360079_1307198



Figure 361.
360079_1307199



Figure 362.
360079_1307200



Figure 363.
360079_1307201



Figure 364.
360079_1307202



Figure 365.
360079_1307203



Figure 366.
360079_1307204



Figure 367.
360079_1307205



Figure 368.
360079_1307206



Figure 369.
360079_1307207



Figure 370.
360079_1307208



Figure 371.
360079_1307209



Figure 372.
360079_1307210



Figure 373.
360079_1307211



Figure 374.
360079_1307212



Figure 375.
360079_1307213



Figure 376.
360079_1307214



Figure 377.
360079_1307215



Figure 378.
360079_1307216



Figure 379.
360079_1307217



Figure 380.
360079_1307218



Figure 381.
360079_1307219

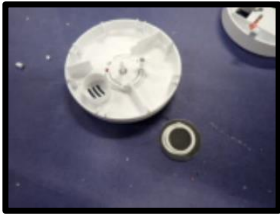


Figure 382.
360079_1307220



Figure 383.
360079_1307221

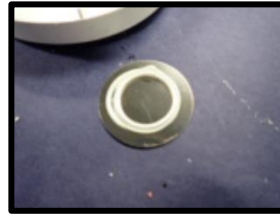


Figure 384.
360079_1307222

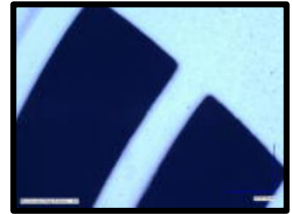


Figure 385.
360079_1307479



Figure 386.
360079_1307480



Figure 387.
360079_1307481

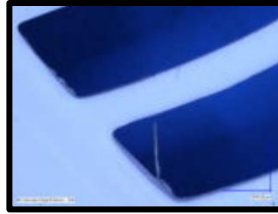


Figure 388.
360079_1307482



Figure 389.
360079_1307483

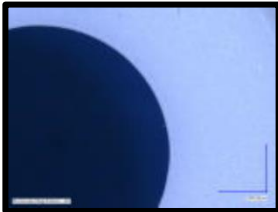


Figure 390.
360079_1307484

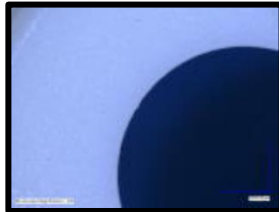


Figure 391.
360079_1307485

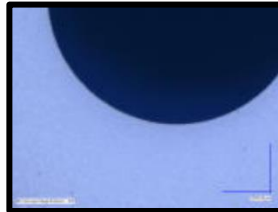


Figure 392.
360079_1307486

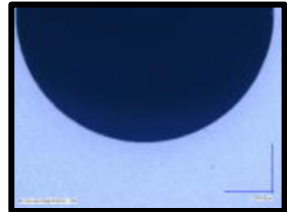


Figure 393.
360079_1307487

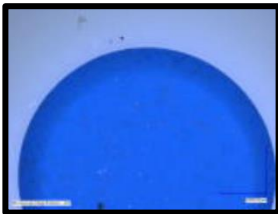


Figure 394.
360079_1307488

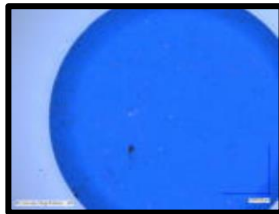


Figure 395.
360079_1307489



Figure 396.
360079_1307490



Figure 397.
360079_1307491

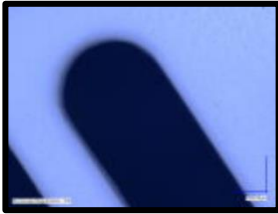


Figure 398.
360079_1307492

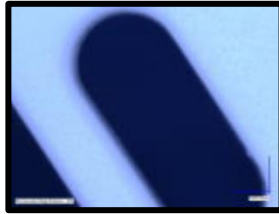


Figure 399.
360079_1307493

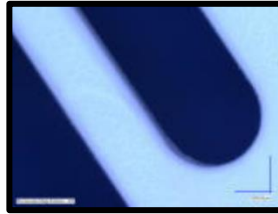


Figure 400.
360079_1307494



Figure 401.
360079_1307495



Figure 402.
360079_1307496



Figure 403.
360079_1307497



Figure 404.
360079_1307498



Figure 405.
360079_1307499

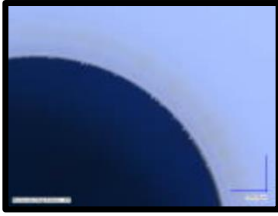


Figure 406.
360079_1307500



Figure 407.
360079_1307501

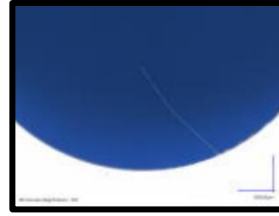


Figure 408.
360079_1307502



Figure 409.
360079_1307503

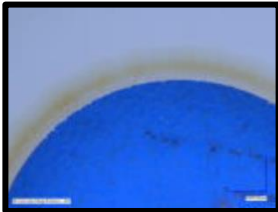


Figure 410.
360079_1307504

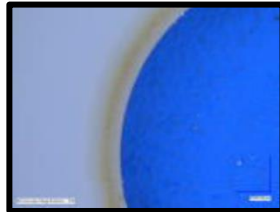


Figure 411.
360079_1307505

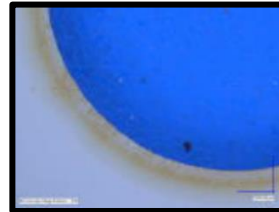


Figure 412.
360079_1307506

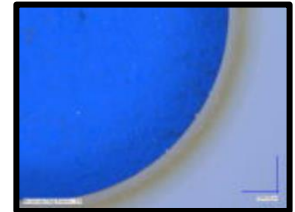


Figure 413.
360079_1307507

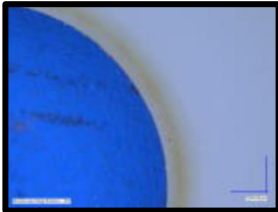


Figure 414.
360079_1307508

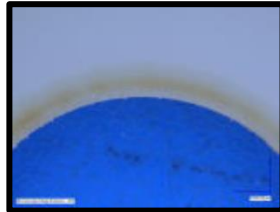


Figure 415.
360079_1307509

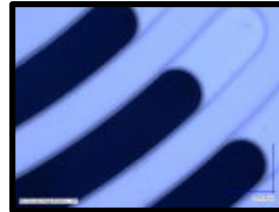


Figure 416.
360079_1307510



Figure 417.
360079_1307511



Figure 418.
360079_1307512



Figure 419.
360079_1307513



Figure 420.
360079_1307514

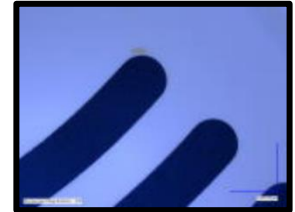


Figure 421.
360079_1307515



Figure 422.
360079_1307516



Figure 423.
360079_1307517

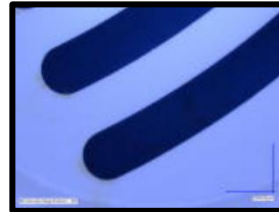


Figure 424.
360079_1307518



Figure 425.
360079_1307519



Figure 426.
360079_1307520



Figure 427.
360079_1307521



Figure 428.
360079_1307522



Figure 429.
360079_1307523



Figure 430.
360079_1307524



Figure 431.
360079_1307525

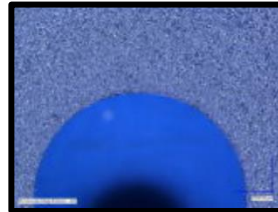


Figure 432.
360079_1307526

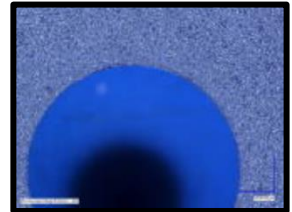


Figure 433.
360079_1307527

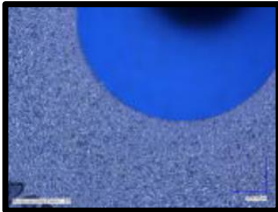


Figure 434.
360079_1307528

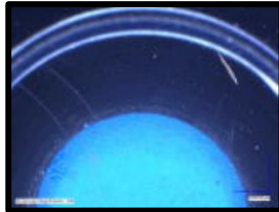


Figure 435.
360079_1307529

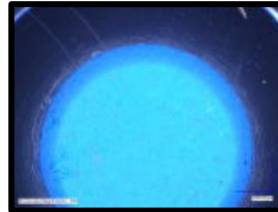


Figure 436.
360079_1307530

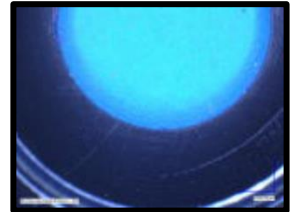


Figure 437.
360079_1307531



Figure 438.
360079_1307532

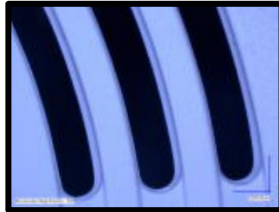


Figure 439.
360079_1307533



Figure 440.
360079_1307534



Figure 441.
360079_1307535



Figure 442.
360079_1307536



Figure 443.
360079_1307537

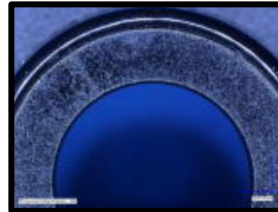


Figure 444.
360079_1307538

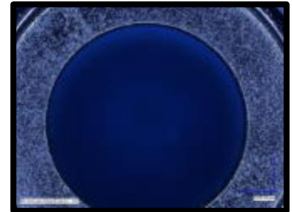


Figure 445.
360079_1307539



Figure 446.
360079_1307540

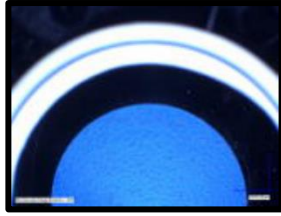


Figure 447.
360079_1307541

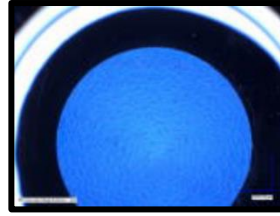


Figure 448.
360079_1307542

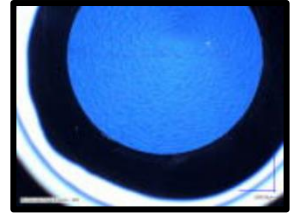


Figure 449.
360079_1307543



Figure 450.
360079_1307544



Figure 451.
360079_1307545



Figure 452.
360079_1307546



Figure 453.
360079_1307547

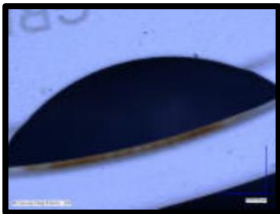


Figure 454.
360079_1307548

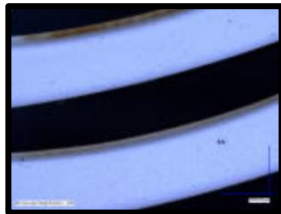


Figure 455.
360079_1307549

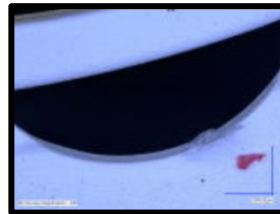


Figure 456.
360079_1307550



Figure 457.
360079_1307551



Figure 458.
360079_1307552



Figure 459.
360079_1307553



Figure 460.
360079_1307554

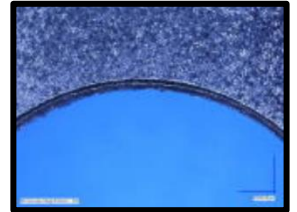


Figure 461.
360079_1307555

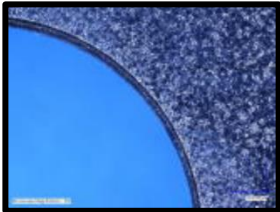


Figure 462.
360079_1307556

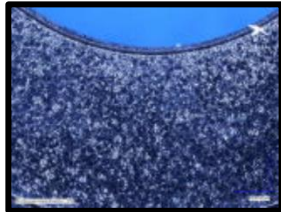


Figure 463.
360079_1307557

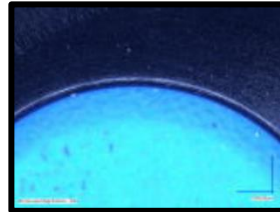


Figure 464.
360079_1307558

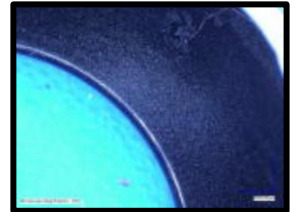


Figure 465.
360079_1307559

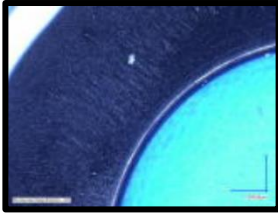


Figure 466.
360079_1307560

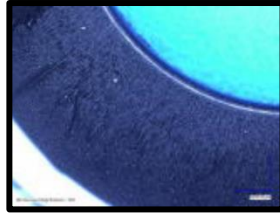


Figure 467.
360079_1307561

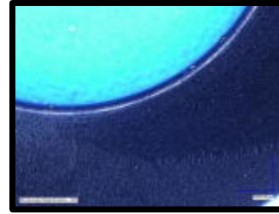


Figure 468.
360079_1307562



Figure 469.
360079_1307563

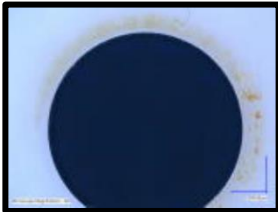


Figure 470.
360079_1307564

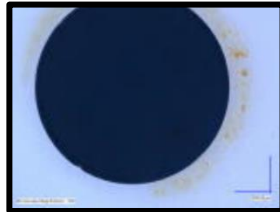


Figure 471.
360079_1307565

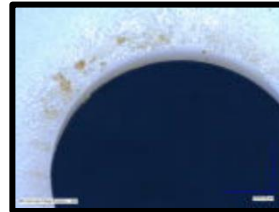


Figure 472.
360079_1307566

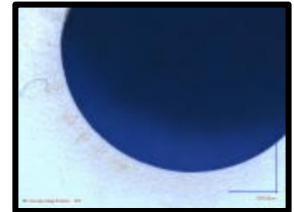


Figure 473.
360079_1307567

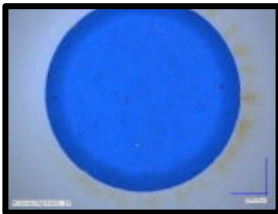


Figure 474.
360079_1307568

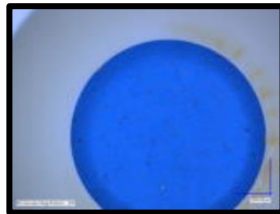


Figure 475.
360079_1307569



Figure 476.
360079_1307570

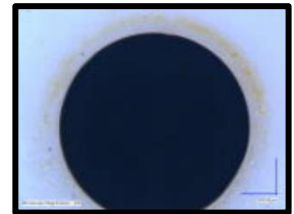


Figure 477.
360079_1307571



Figure 478.
360079_1307572

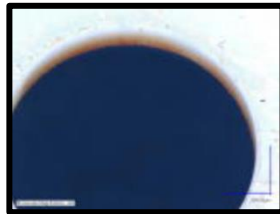


Figure 479.
360079_1307573

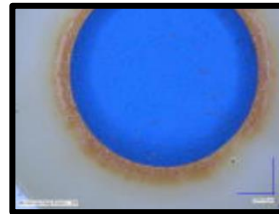


Figure 480.
360079_1307574

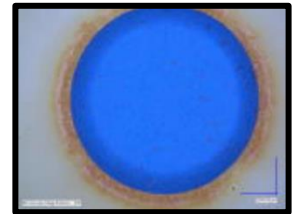


Figure 481.
360079_1307575



Figure 482.
360079_1307576

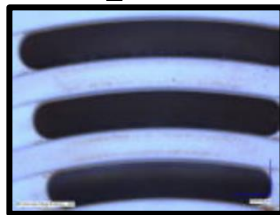


Figure 483.
360079_1307577

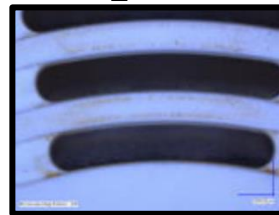


Figure 484.
360079_1307578

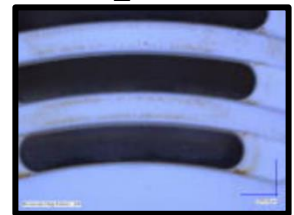


Figure 485.
360079_1307579

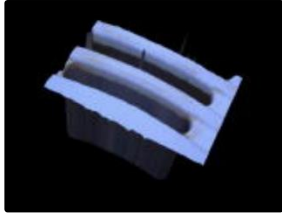


Figure 486.
360079_1307580



Figure 487.
360079_1307581



Figure 488.
360079_1307582



Figure 489.
360079_1307583

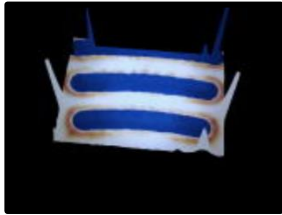


Figure 490.
360079_1307584

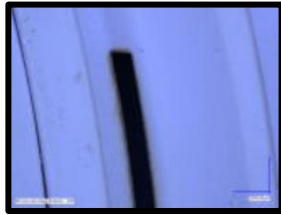


Figure 491.
360079_1307585

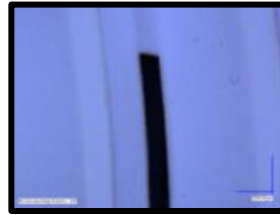


Figure 492.
360079_1307586



Figure 493.
360079_1307587



Figure 494.
360079_1307588



Figure 495.
360079_1307589



Figure 496.
360079_1307590

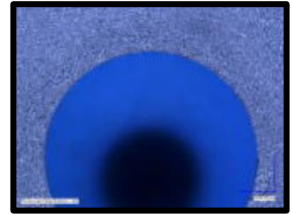


Figure 497.
360079_1307591

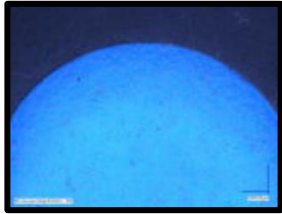


Figure 498.
360079_1307592

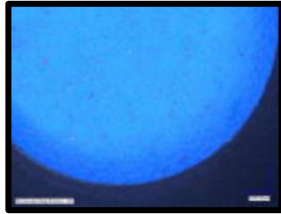


Figure 499.
360079_1307593

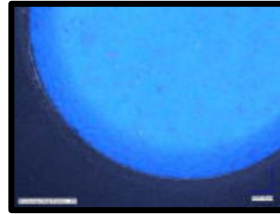


Figure 500.
360079_1307594

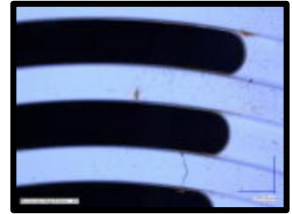


Figure 501.
360079_1307595



Figure 502.
360079_1307596



Figure 503.
360079_1307597

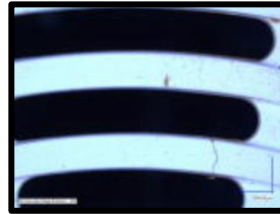


Figure 504.
360079_1307598

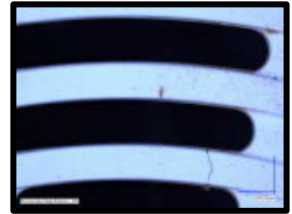


Figure 505.
360079_1307599



Figure 506.
360079_1307600



Figure 507.
360079_1307601



Figure 508.
360079_1307602



Figure 509.
360079_1307603



Figure 510.
360079_1307604

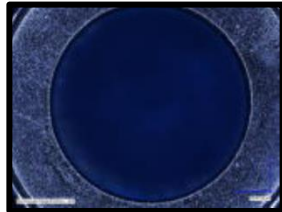


Figure 511.
360079_1307605

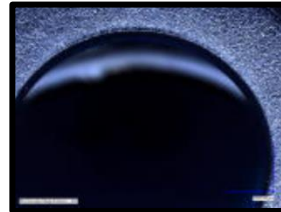


Figure 512.
360079_1307606

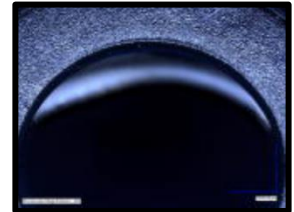


Figure 513.
360079_1307607

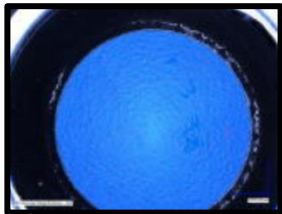


Figure 514.
360079_1307608



Figure 515.
360079_1307609

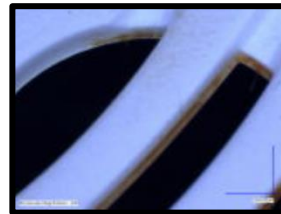


Figure 516.
360079_1307610

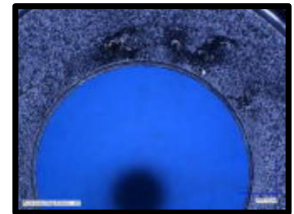


Figure 517.
360079_1307611

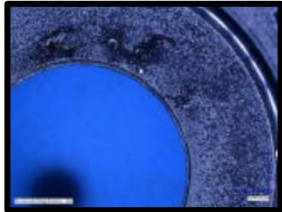


Figure 518.
360079_1307612

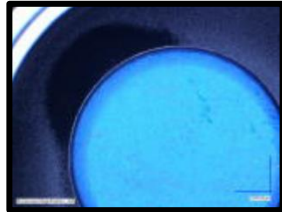


Figure 519.
360079_1307613

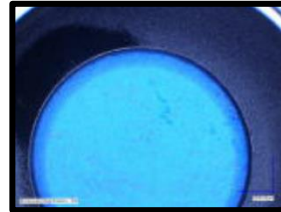


Figure 520.
360079_1307614

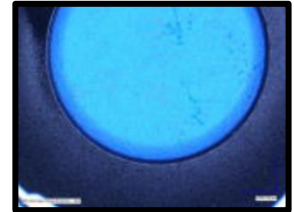


Figure 521.
360079_1307615

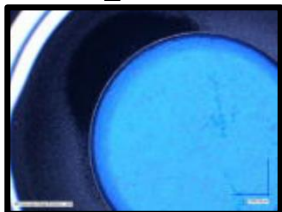


Figure 522.
360079_1307616



Figure 523.
360079_1313694



Figure 524.
360079_1313695



Figure 525.
360079_1313696



Figure 526.
360079_1313697



Figure 527.
360079_1313698



Figure 528.
360079_1313699

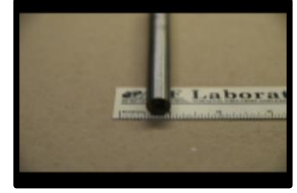


Figure 529.
360079_1313700



Figure 530.
360079_1313701

Results for Test 2 (ID 360082)

The following table lists selected events that occurred during the experiment.

Table 25. Experiment Events

Description	Time (s)
Variable Transformer Setting 50%	0
Variable Transformer Off	308
Variable Transformer Setting 50%	753
Variable Transformer Off	1402

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures over pre-determined time spans.

Table 26. Temperature Value Result Summary

Description	Initial (C)	Max (C)	30 second max average (C)	1 minute max average (C)	5 minute max average (C)	10 minute max average (C)
Landing 0'	11.2	11.3	11.3	11.3	11.2	11.2
Landing 1'	11.1	11.3	11.3	11.3	11.3	11.3
Landing 2'	11.0	11.3	11.2	11.2	11.2	11.2
Landing 3'	10.9	11.2	11.2	11.2	11.2	11.2
Landing 4'	10.9	11.2	11.2	11.2	11.2	11.1
Landing 5'	10.9	11.2	11.2	11.2	11.2	11.1
Landing 6'	10.9	11.3	11.3	11.3	11.3	11.3
Landing 7'	11.0	11.6	11.6	11.6	11.5	11.5
1st Floor 0'	10.9	11.3	11.3	11.3	11.2	11.2
1st Floor 1'	10.8	11.0	11.0	11.0	11.0	11.0
1st Floor 2'	11.0	11.2	11.2	11.2	11.1	11.1
1st Floor 3'	10.8	11.0	11.0	11.0	10.9	10.9
1st Floor 4'	10.8	10.9	10.9	10.9	10.9	10.8
1st Floor 5'	10.8	11.0	10.9	10.9	10.9	10.9
1st Floor 6'	10.7	11.0	11.0	11.0	10.9	10.9
1st Floor 7'	10.7	11.0	11.0	11.0	11.0	10.9
1st Floor 8'	10.8	11.0	11.0	11.0	11.0	11.0
2nd Floor 0'	11.0	14.3	14.2	14.2	14.1	13.9
2nd Floor 1'	10.8	14.9	14.8	14.8	14.5	14.3
2nd Floor 2'	10.8	15.5	15.4	15.3	15.2	15.0
2nd Floor 3'	10.8	16.2	16.2	16.1	15.8	15.6
2nd Floor 4'	11.0	18.7	18.6	18.5	18.3	18.1
2nd Floor 5'	11.2	19.8	19.8	19.7	19.6	19.6
2nd Floor 6'	11.3	19.6	19.5	19.4	19.4	19.3
2nd Floor 7'	11.5	19.8	19.7	19.7	19.6	19.6
2nd Floor 8'	11.8	20.3	20.2	20.2	20.1	20.0
Tenability 1st Floor 5'	10.8	11.3	11.3	11.2	11.2	11.2
Tenability 2nd Floor 5'	11.3	18.7	18.6	18.6	18.5	18.5
Smolder TC 1	12.0	932.8	932.3	931.6	917.8	873.8
Smolder TC 2	11.8	526.5	526.4	526.2	524.3	521.7

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

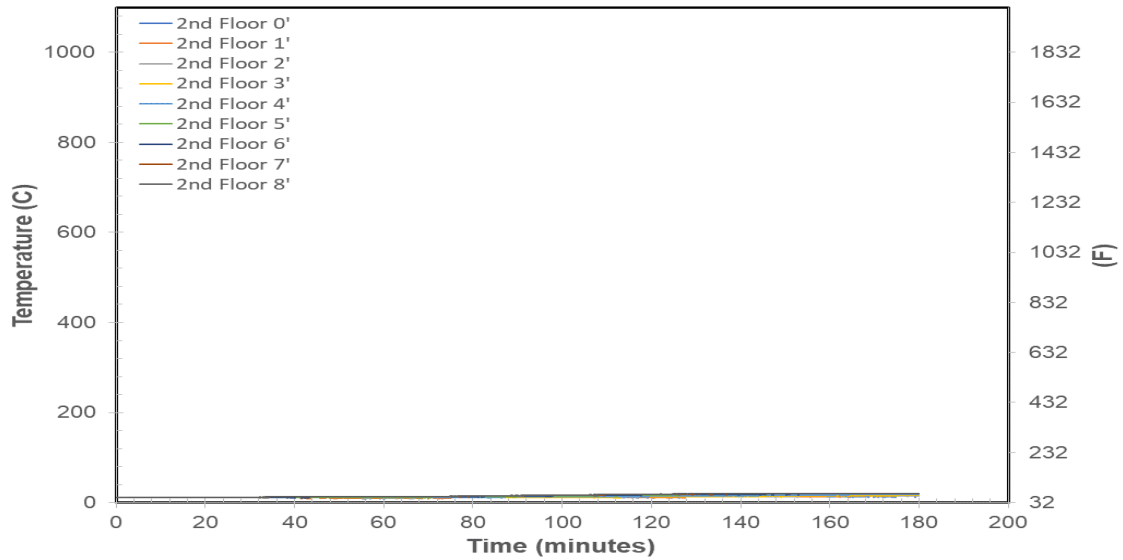


Figure 531. Temperature – 2nd Floor

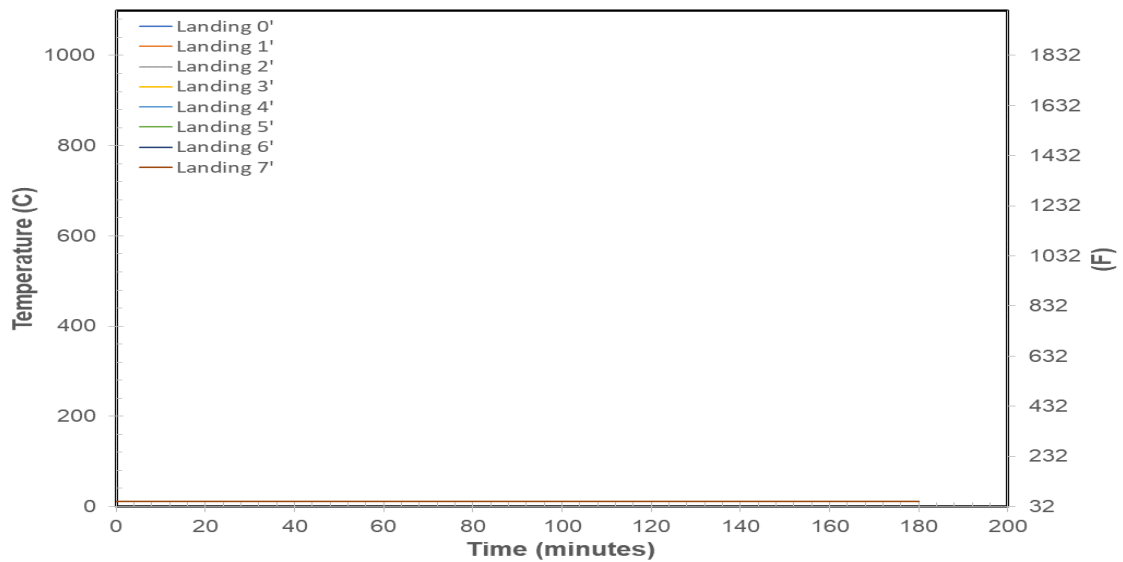


Figure 532. Temperature – Landing

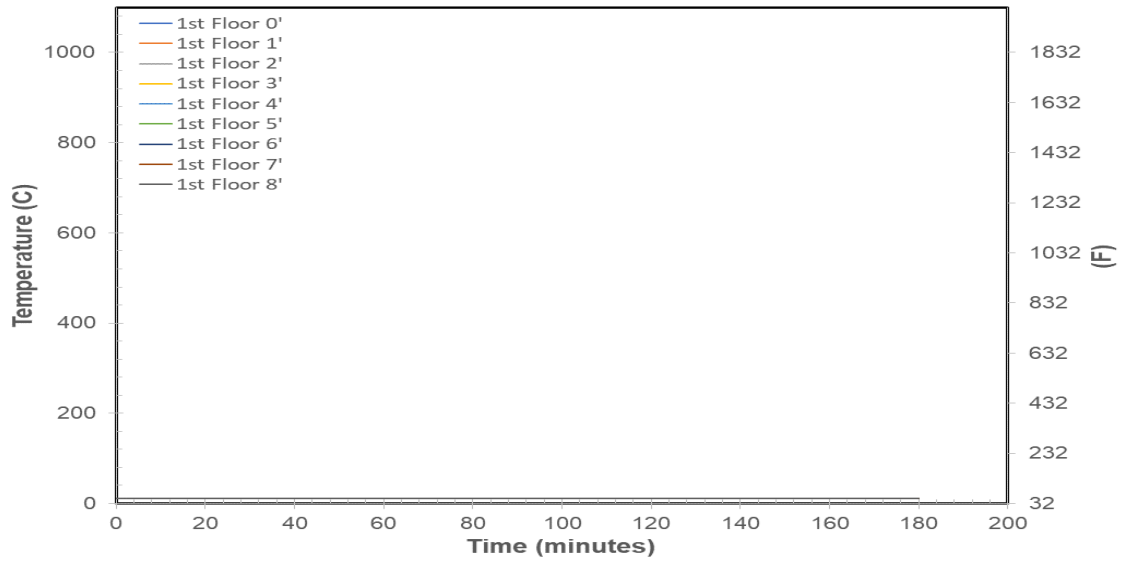


Figure 533. Temperature – 1st Floor

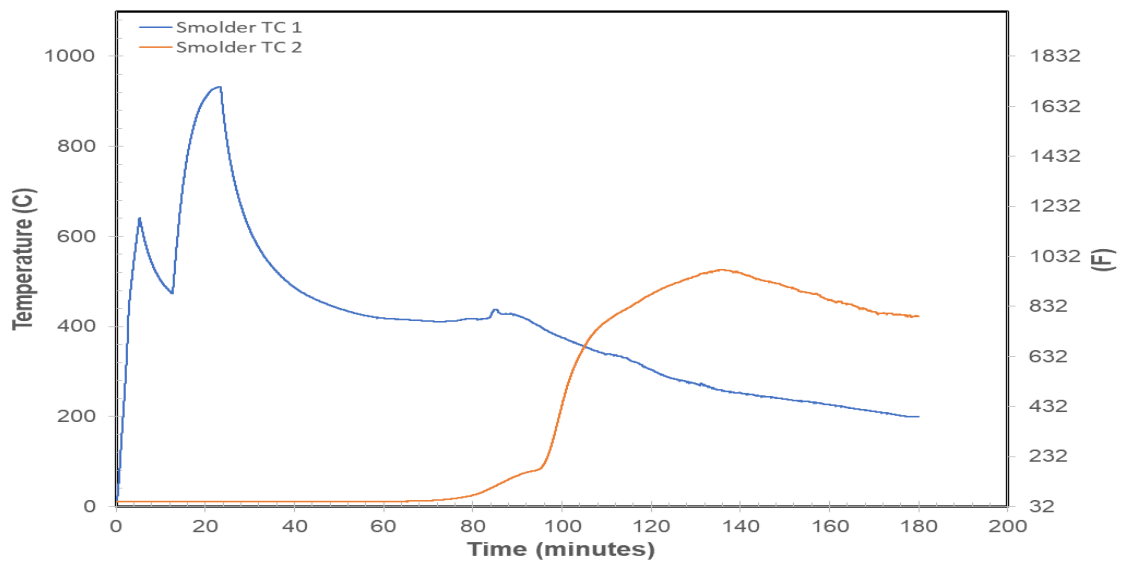


Figure 534. Temperature – Cotton Batting

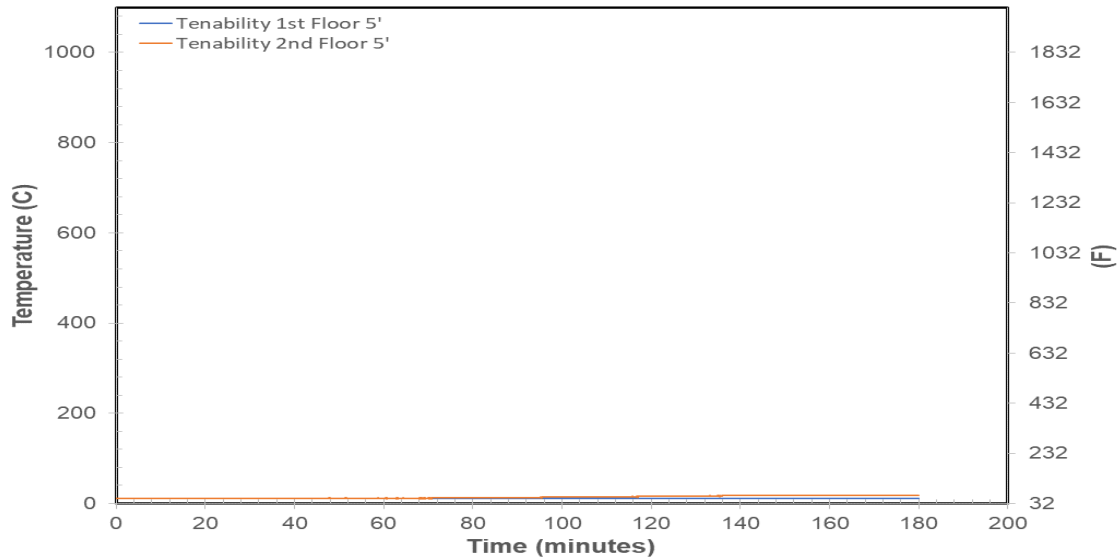


Figure 535. Temperature - Tenability

The following table provides a summary of the heat flux results. The “Description” column typically describes the location of the heat flux transducer. The time at which the heat flux first changes by a pre-determined amount is provided in the “Time of Initial Change” column. The pre-determined amount of change in heat flux is provided in the “Initial Change Amount” column. The maximum heat flux recorded during the test is provided in the “Maximum” column. The “Maximum Average” columns are calculated over pre-determined time spans. A “SC” indicates that the values did not change sufficiently for this value to be calculated.

Table 27. Heat Flux Result Summary

Description	Time of Initial Change (s)	Initial Change Value (kW/m ²)	Maximum (kW/m ²)	10 Second Maximum Average (kW/m ²)	30 Second Maximum Average (kW/m ²)	1 Minute Maximum Average (kW/m ²)	5 Minute Maximum Average (kW/m ²)	10 Minute Maximum Average (kW/m ²)
1st Floor Total	SC	1	0.1	0.0	0.0	0.0	0.0	0.0
1st Floor Rad	SC	1	0.0	0.0	0.0	0.0	0.0	0.0
2nd Floor Total	SC	1	0.1	0.1	0.1	0.1	0.0	0.0
2nd Floor Rad	SC	1	0.0	0.0	0.0	0.0	0.0	0.0

The following chart(s) shows a time dependent representation of the baseline corrected instantaneous heat flux measured during the experiment.

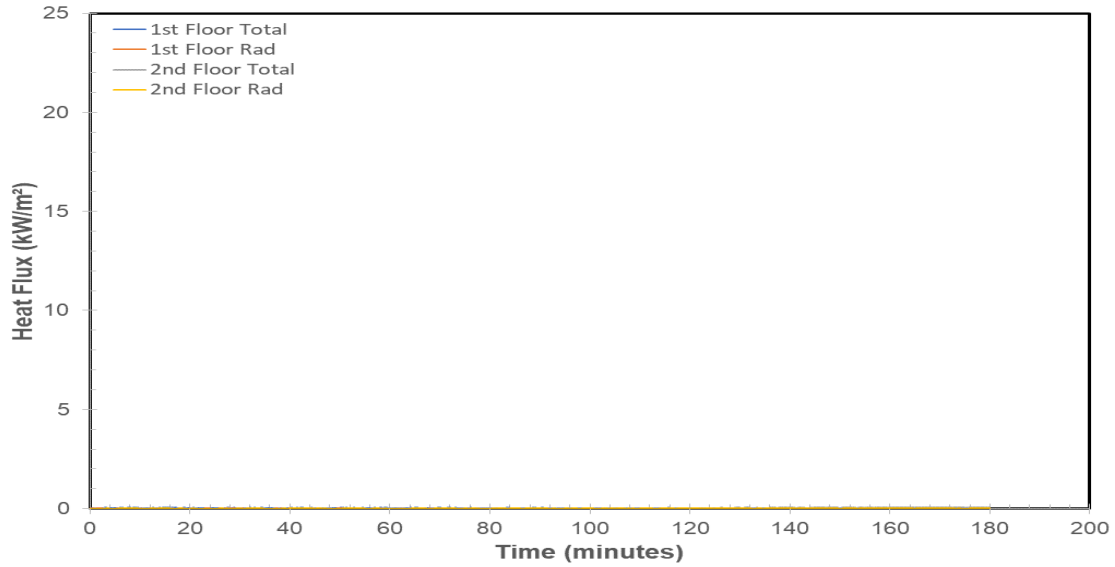


Figure 536. Heat Flux

The following table provides a summary of the optical density.

Table 28. Optical Density Results Summary

Description	Average Optical Density (1/m)	Maximum Optical Density (1/m)
1st Floor ODM	0.00	0.06
2nd Floor ODM	0.08	0.19

The following chart provides a time dependent representation of the optical density measured during the experiment.

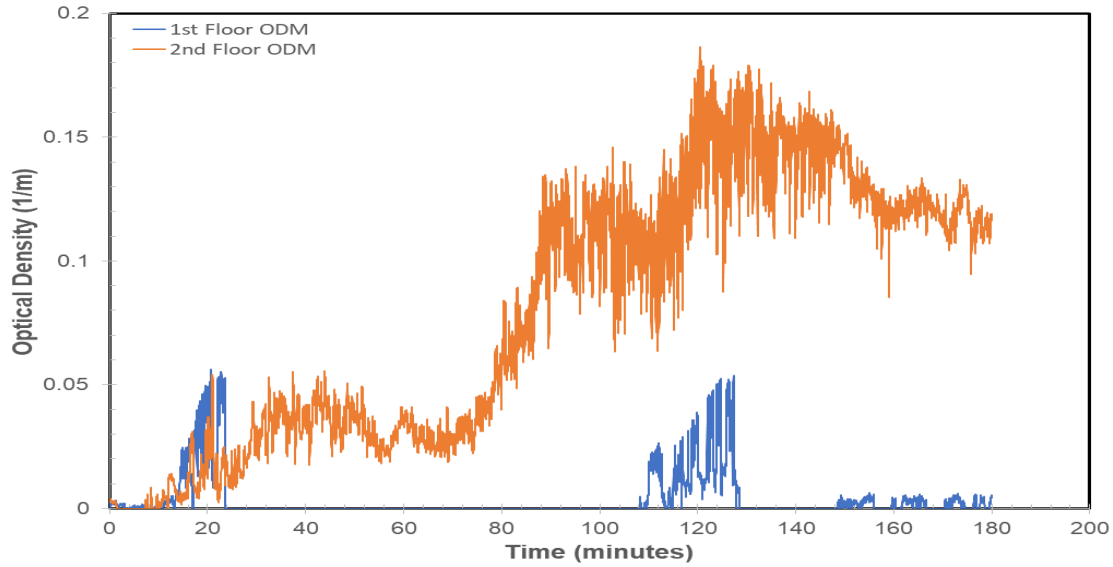


Figure 537. Optical Density

The following chart shows the obscuration during the experiment.

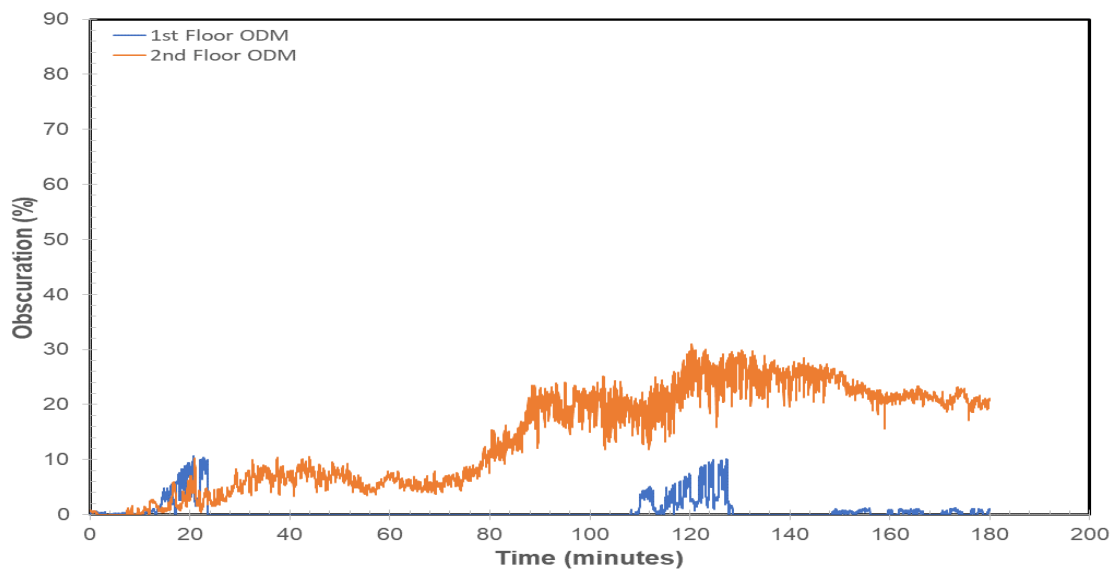


Figure 538. Obscuration

The following table provides a summary of the oxygen measurement results.

Table 29. Oxygen Measurement Results

Description	Full Scale Range (%)	Minimum Value (%)	Average (%)
1st Floor	25	20.43125	20.75863
2nd Floor	25	20.5	20.67812

The following chart presents the oxygen concentration(s) measured during the test.

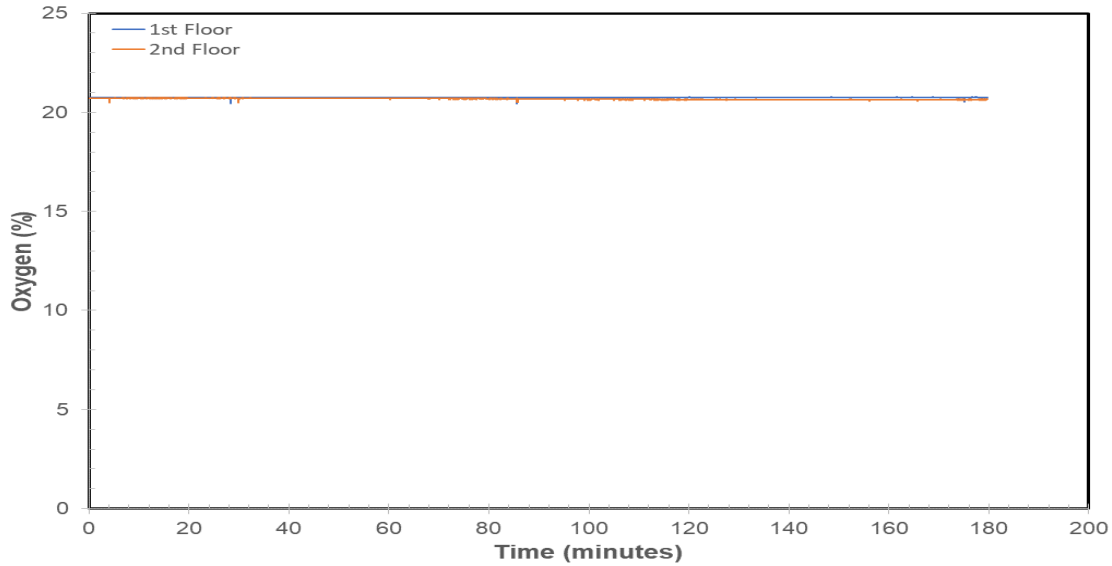


Figure 539. Oxygen Concentration

The following table provides a summary of the carbon monoxide gas measurement results.

Table 30. CO Measurement Results

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
1st Floor	0.05	-0.0003	-0.0004
2nd Floor	0.05	-0.0001	-0.0002

The following table provides a summary of the carbon dioxide gas measurement results.

Table 31. CO2 Measurement Results

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
1st Floor	0.25	-0.0001	-0.0004
2nd Floor	0.25	0.0004	0.0000

The following chart shows the carbon monoxide concentration(s) measured during the experiment.

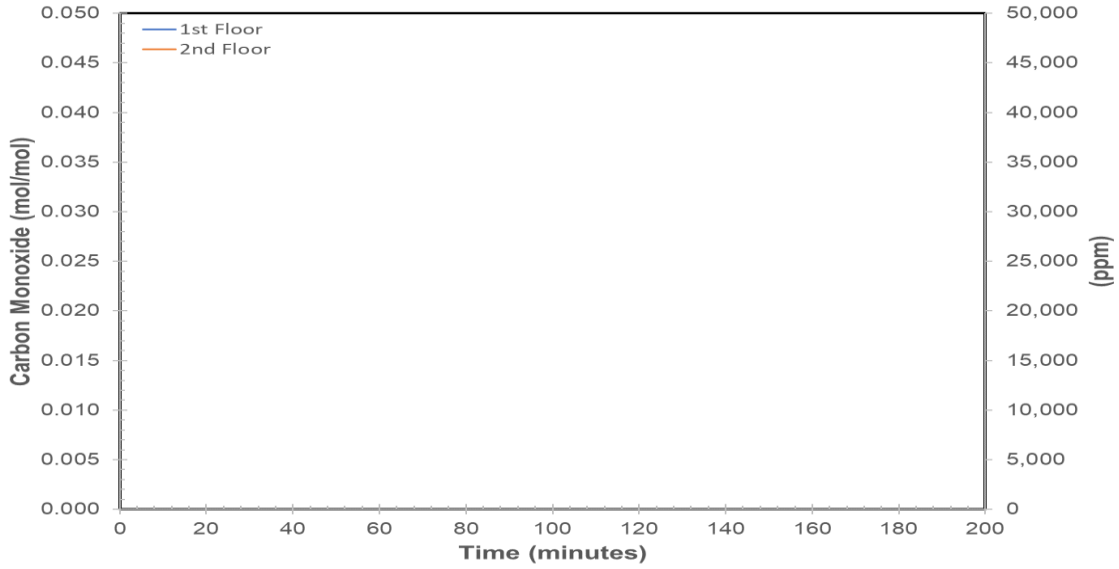


Figure 540. Carbon Monoxide Concentration(s)

The following chart shows the carbon dioxide concentration(s) measured during the experiment.

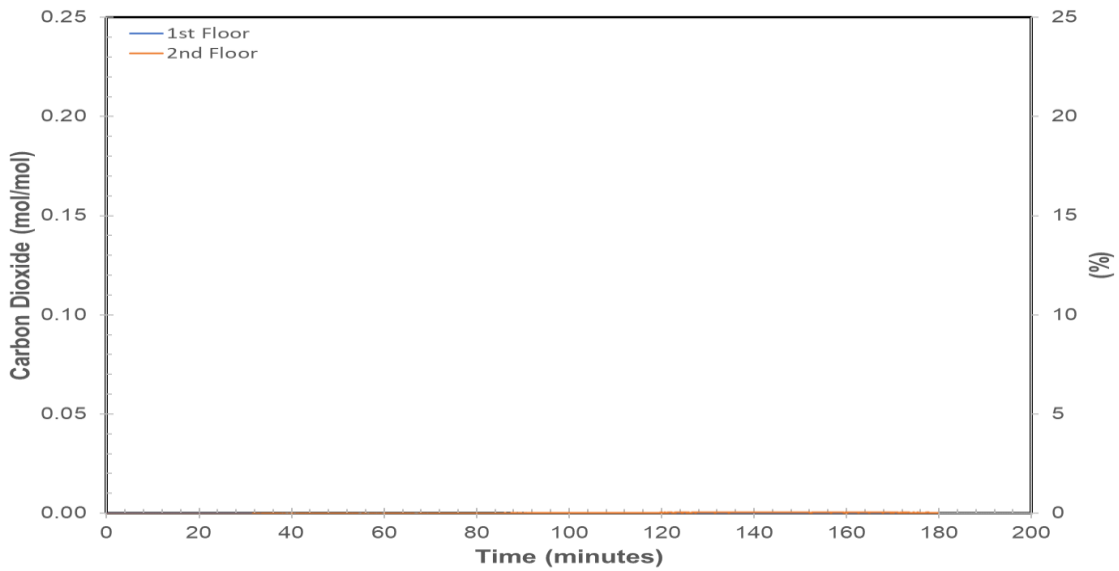


Figure 541. Carbon Dioxide Concentration(s)

The following table provides a description of the video(s) taken during this experiment.

Table 32. Video Log

Description	Start Time	Duration (s)	Filename
Stairs Looking down	08:58:22	10876	360082_20230307_085816_1A.mov
Ignition	08:58:30	10877	360082_20230307_085823_2A.mov
Stairs looking up	08:58:37	10881	360082_20230307_085831_3A.mov
Wide View 2nd	08:58:45	10884	360082_20230307_085839_4A.mov
Smoke Detector 2nd floor	08:58:53	10885	360082_20230307_085846_5A.mov
Smoke Detector 1st floor	08:59:00	10889	360082_20230307_085854_6A.mov
Wide View 1st	08:59:08	10893	360082_20230307_085901_7A.mov
HD outside view	08:59:15	10897	360082_20230307_085909_8A.mov
Custom - Master Sped Up 60X			360082_1313283.MOV
Master			360082_1313284.MOV

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture's filename as well as any description and elapsed test time associated with the picture.



Figure 542. Pre test 48 minutes, 360082_1304914



Figure 543. Pre test 48 minutes, 360082_1304915



Figure 544. Pre test 48 minutes, 360082_1304916



Figure 545. Pre test 48 minutes, 360082_1304917



Figure 546. Pre test 38 minutes, 360082_1304918



Figure 547. Pre test 38 minutes, 360082_1304919



Figure 548. Pre test 38 minutes, 360082_1304920



Figure 549. Pre test 38 minutes, 360082_1304921



Figure 550. Pre test 38 minutes, 360082_1304922



Figure 551. Pre test 38 minutes, 360082_1304923



Figure 552. Pre test 38 minutes, 360082_1304924



Figure 553. Pre test 37 minutes, 360082_1304925



Figure 554. Pre test 37 minutes, 360082_1304926



Figure 555. Pre test 36 minutes, 360082_1304927



Figure 556. Pre test 36 minutes, 360082_1304928



Figure 557. Pre test 36 minutes, 360082_1304929



Figure 558. Pre test 36 minutes, 360082_1304930

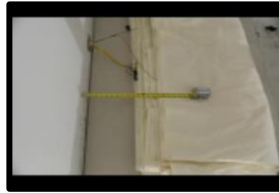


Figure 559. Pre test 35 minutes, 360082_1304931

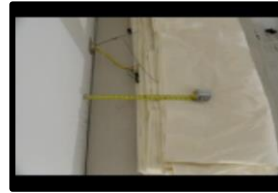


Figure 560. Pre test 35 minutes, 360082_1304932



Figure 561. Pre test 35 minutes, 360082_1304933



Figure 562. Pre test 31 minutes, 360082_1304934



Figure 563. Pre test 31 minutes, 360082_1304935



Figure 564. Pre test 31 minutes, 360082_1304936



Figure 565. Pre test 30 minutes, 360082_1304937

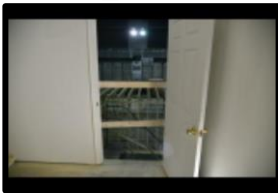


Figure 566. Pre test 30 minutes, 360082_1304938



Figure 567. Pre test 30 minutes, 360082_1304939



Figure 568. Pre test 30 minutes, 360082_1304940



Figure 569. Pre test 29 minutes, 360082_1304941



Figure 570. Pre test 29 minutes, 360082_1304942



Figure 571. Pre test 29 minutes, 360082_1304943



Figure 572. Pre test 29 minutes, 360082_1304944



Figure 573. Pre test 29 minutes, 360082_1304945



Figure 574. Pre test 29 minutes, 360082_1304946



Figure 575. Pre test 29 minutes, 360082_1304947



Figure 576. Pre test 13 minutes, 360082_1304948



Figure 577. Pre test 7 minutes, 360082_1304949



Figure 578. Pre test 7 minutes, 360082_1304950

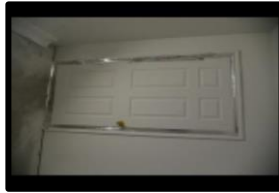


Figure 579. Pre test 7 minutes, 360082_1304951



Figure 580. Pre test 6 minutes, 360082_1304952



Figure 581. 27 seconds, 360082_1304953



Figure 582. 49 seconds, 360082_1304954



Figure 583. 79 seconds, 360082_1304955



Figure 584. 81 seconds, 360082_1304956



Figure 585. 83 seconds, 360082_1304957



Figure 586. 91 seconds, 360082_1304958



Figure 587. 101 seconds, 360082_1304959



Figure 588. Post test 1:15 hr:min, 360082_1304961



Figure 589. Post test 1:16 hr:min, 360082_1304962



Figure 590. Post test 1:16 hr:min, 360082_1304963



Figure 591. Post test 2:38 hr:min, 360082_1304964



Figure 592. Post test 2:38 hr:min, 360082_1304965



Figure 593. 360082_1307223



Figure 594.
360082_1307224



Figure 595.
360082_1307225



Figure 596.
360082_1307226



Figure 597.
360082_1307227



Figure 598.
360082_1307228

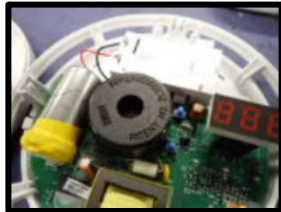


Figure 599.
360082_1307229



Figure 600.
360082_1307230



Figure 601.
360082_1307231



Figure 602.
360082_1307232



Figure 603.
360082_1307233

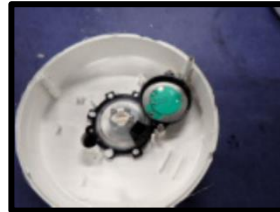


Figure 604.
360082_1307234



Figure 605.
360082_1307235

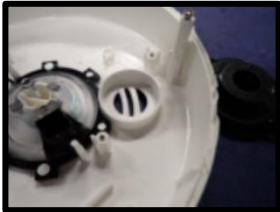


Figure 606.
360082_1307236

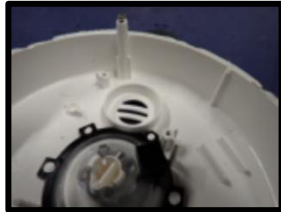


Figure 607.
360082_1307237



Figure 608.
360082_1307238

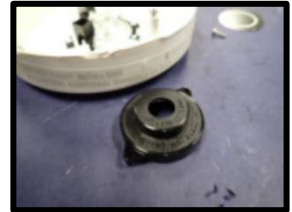


Figure 609.
360082_1307239



Figure 610.
360082_1307240



Figure 611.
360082_1307241



Figure 612.
360082_1307242



Figure 613.
360082_1307243



Figure 614.
360082_1307244



Figure 615.
360082_1307245



Figure 616.
360082_1307246



Figure 617.
360082_1307247



Figure 618.
360082_1307248



Figure 619.
360082_1307249



Figure 620.
360082_1307250



Figure 621.
360082_1307251



Figure 622.
360082_1307252

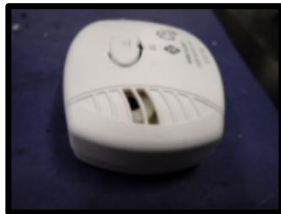


Figure 623.
360082_1307253



Figure 624.
360082_1307254



Figure 625.
360082_1307255



Figure 626.
360082_1307256



Figure 627.
360082_1307257

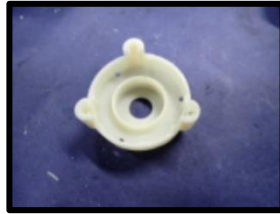


Figure 628.
360082_1307258



Figure 629.
360082_1307259



Figure 630.
360082_1307260



Figure 631.
360082_1307261



Figure 632.
360082_1307262

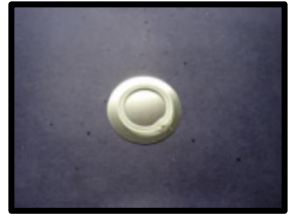


Figure 633.
360082_1307263



Figure 634.
360082_1307264



Figure 635.
360082_1307265



Figure 636.
360082_1307266



Figure 637.
360082_1307267



Figure 638.
360082_1307268



Figure 639.
360082_1307269



Figure 640.
360082_1307270



Figure 641.
360082_1307271



Figure 642.
360082_1307272



Figure 643.
360082_1307273



Figure 644.
360082_1307274



Figure 645.
360082_1307275



Figure 646.
360082_1307276



Figure 647.
360082_1307277



Figure 648.
360082_1307278



Figure 649.
360082_1307279



Figure 650.
360082_1307280



Figure 651.
360082_1307281

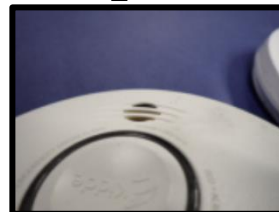


Figure 652.
360082_1307282



Figure 653.
360082_1307283



Figure 654.
360082_1307284



Figure 655.
360082_1307285



Figure 656.
360082_1307286



Figure 657.
360082_1307287



Figure 658.
360082_1307288



Figure 659.
360082_1307289



Figure 660.
360082_1307290



Figure 661.
360082_1307291



Figure 662.
360082_1307292



Figure 663.
360082_1307293



Figure 664.
360082_1307294



Figure 665.
360082_1307295



Figure 666.
360082_1307296



Figure 667.
360082_1307297



Figure 668.
360082_1307298



Figure 669.
360082_1307299

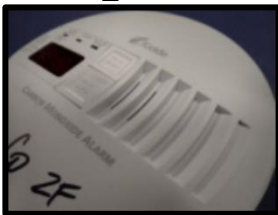


Figure 670.
360082_1307300



Figure 671.
360082_1307301

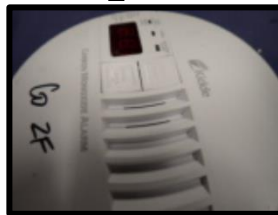


Figure 672.
360082_1307302



Figure 673.
360082_1307303



Figure 674.
360082_1307304

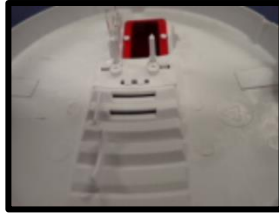


Figure 675.
360082_1307305



Figure 676.
360082_1307306

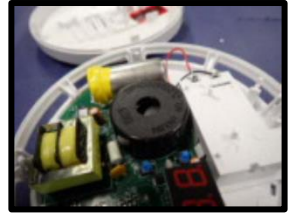


Figure 677.
360082_1307307



Figure 678.
360082_1307308



Figure 679.
360082_1307309



Figure 680.
360082_1307310



Figure 681.
360082_1307311



Figure 682.
360082_1307312



Figure 683.
360082_1307313



Figure 684.
360082_1307314



Figure 685.
360082_1307315



Figure 686.
360082_1307316

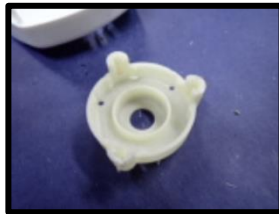


Figure 687.
360082_1307317



Figure 688.
360082_1307318



Figure 689.
360082_1307319



Figure 690.
360082_1307320



Figure 691.
360082_1307321



Figure 692.
360082_1307322



Figure 693.
360082_1307323



Figure 694.
360082_1307324



Figure 695.
360082_1307325

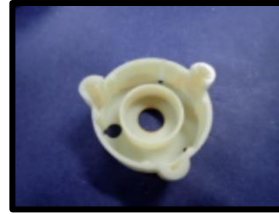


Figure 696.
360082_1307326



Figure 697.
360082_1307327

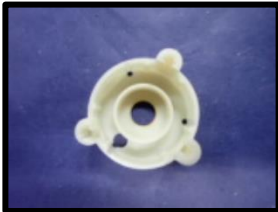


Figure 698.
360082_1307328



Figure 699.
360082_1307329



Figure 700.
360082_1307330



Figure 701.
360082_1307331



Figure 702.
360082_1307332



Figure 703.
360082_1307333



Figure 704.
360082_1307334



Figure 705.
360082_1307335



Figure 706.
360082_1307336

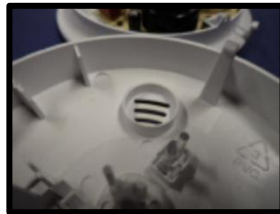


Figure 707.
360082_1307337



Figure 708.
360082_1307338

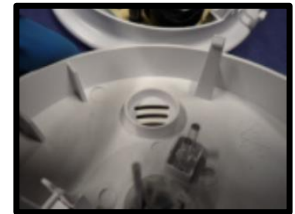


Figure 709.
360082_1307339

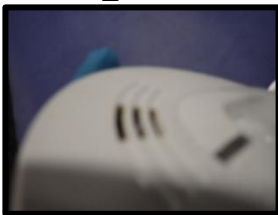


Figure 710.
360082_1307340



Figure 711.
360082_1307341



Figure 712.
360082_1307342



Figure 713.
360082_1307343



Figure 714.
360082_1307344



Figure 715.
360082_1307345



Figure 716.
360082_1307346



Figure 717.
360082_1308029



Figure 718.
360082_1308030



Figure 719.
360082_1308031

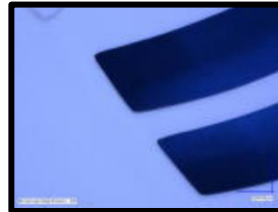


Figure 720.
360082_1308032



Figure 721.
360082_1308033



Figure 722.
360082_1308034

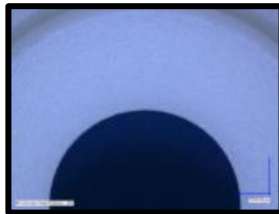


Figure 723.
360082_1308035



Figure 724.
360082_1308036

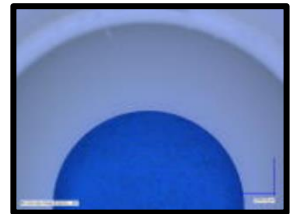


Figure 725.
360082_1308037



Figure 726.
360082_1308038

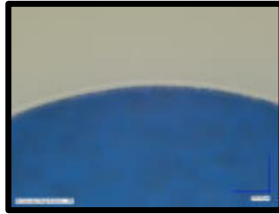


Figure 727.
360082_1308039



Figure 728.
360082_1308040



Figure 729.
360082_1308041



Figure 730.
360082_1308042



Figure 731.
360082_1308043



Figure 732.
360082_1308044

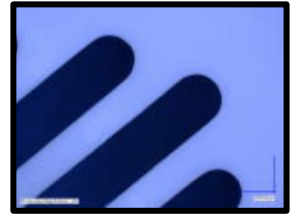


Figure 733.
360082_1308045



Figure 734.
360082_1308046



Figure 735.
360082_1308047



Figure 736.
360082_1308048



Figure 737.
360082_1308049

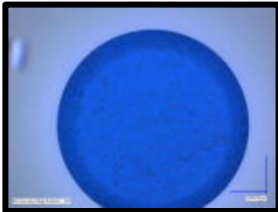


Figure 738.
360082_1308050



Figure 739.
360082_1308051

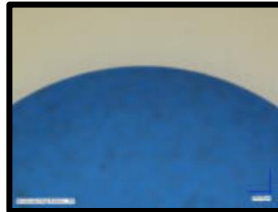


Figure 740.
360082_1308052



Figure 741.
360082_1308053



Figure 742.
360082_1308054

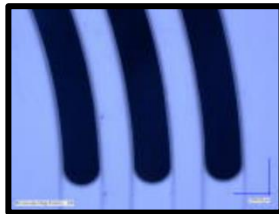


Figure 743.
360082_1308055

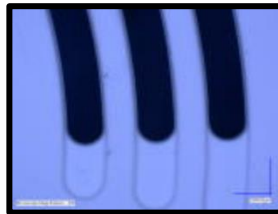


Figure 744.
360082_1308056



Figure 745.
360082_1308057



Figure 746.
360082_1308058

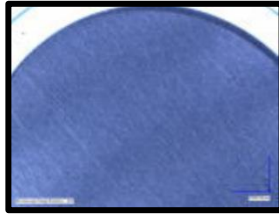


Figure 747.
360082_1308059

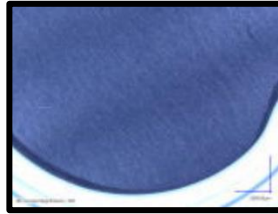


Figure 748.
360082_1308060



Figure 749.
360082_1308061

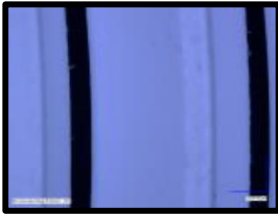


Figure 750.
360082_1308062

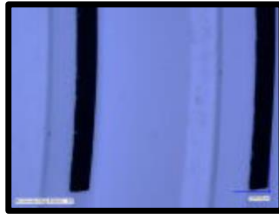


Figure 751.
360082_1308063



Figure 752.
360082_1308064

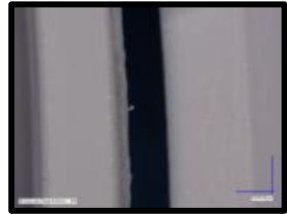


Figure 753.
360082_1308065

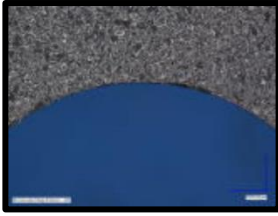


Figure 754.
360082_1308066

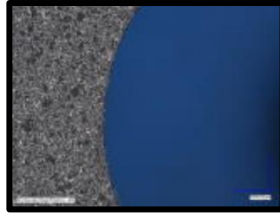


Figure 755.
360082_1308067

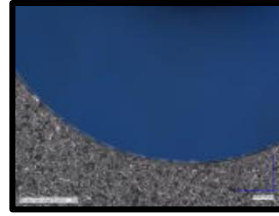


Figure 756.
360082_1308068



Figure 757.
360082_1308069

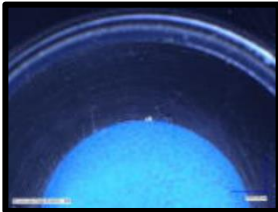


Figure 758.
360082_1308070

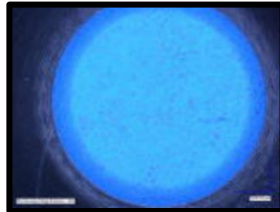


Figure 759.
360082_1308071

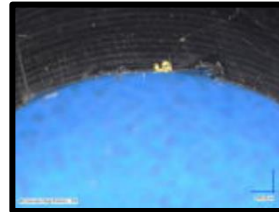


Figure 760.
360082_1308072



Figure 761.
360082_1308073

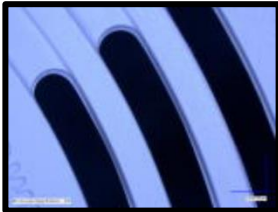


Figure 762.
360082_1308074



Figure 763.
360082_1308075



Figure 764.
360082_1308076



Figure 765.
360082_1308077



Figure 766.
360082_1308078



Figure 767.
360082_1308079

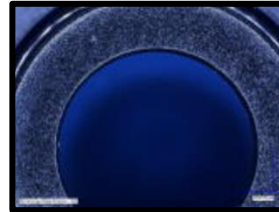


Figure 768.
360082_1308080

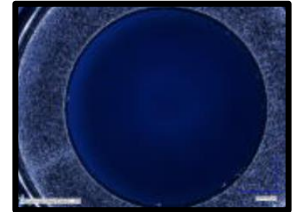


Figure 769.
360082_1308081

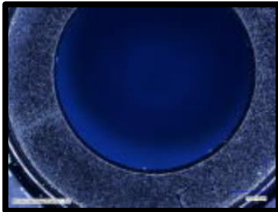


Figure 770.
360082_1308082

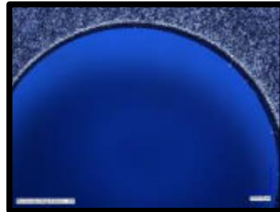


Figure 771.
360082_1308083

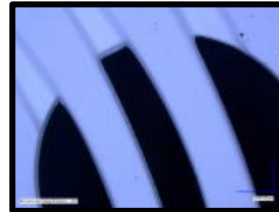


Figure 772.
360082_1308084

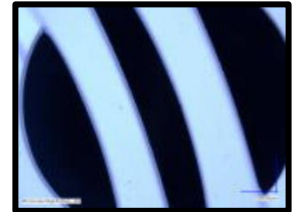


Figure 773.
360082_1308085



Figure 774.
360082_1308086



Figure 775.
360082_1308087



Figure 776.
360082_1308088



Figure 777.
360082_1308089



Figure 778.
360082_1308090

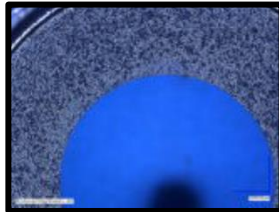


Figure 779.
360082_1308091

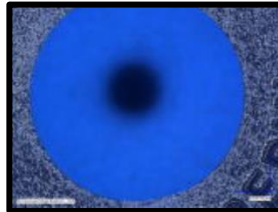


Figure 780.
360082_1308092

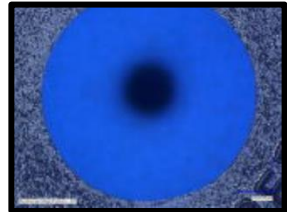


Figure 781.
360082_1308093

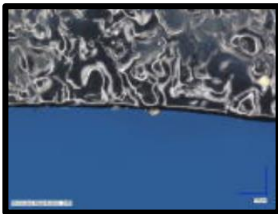


Figure 782.
360082_1308094



Figure 783.
360082_1308095

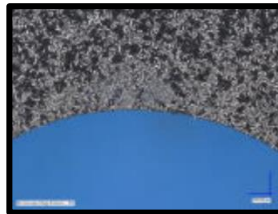


Figure 784.
360082_1308096

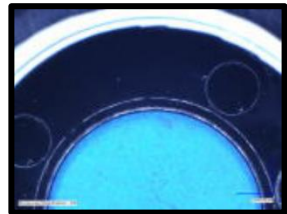


Figure 785.
360082_1308097

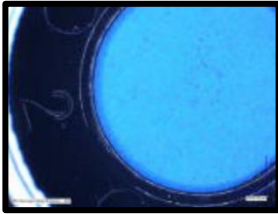


Figure 786.
360082_1308098

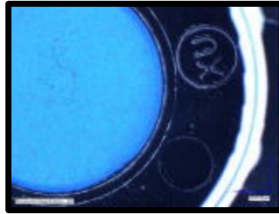


Figure 787.
360082_1308099

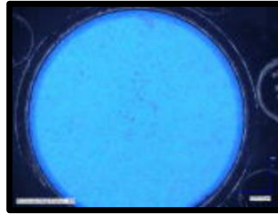


Figure 788.
360082_1308100



Figure 789.
360082_1308101



Figure 790.
360082_1308102



Figure 791.
360082_1308103



Figure 792.
360082_1308104

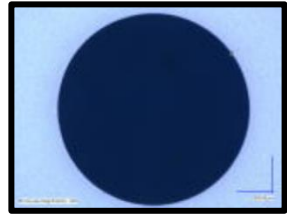


Figure 793.
360082_1308105



Figure 794.
360082_1308106



Figure 795.
360082_1308107



Figure 796.
360082_1308108

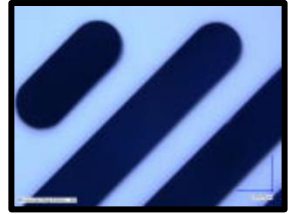


Figure 797.
360082_1308109



Figure 798.
360082_1308110



Figure 799.
360082_1308111



Figure 800.
360082_1308112



Figure 801.
360082_1308113



Figure 802.
360082_1308114



Figure 803.
360082_1308115



Figure 804.
360082_1308116



Figure 805.
360082_1308117



Figure 806.
360082_1308118



Figure 807.
360082_1308119



Figure 808.
360082_1308120

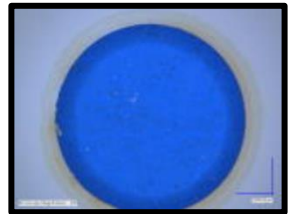


Figure 809.
360082_1308121

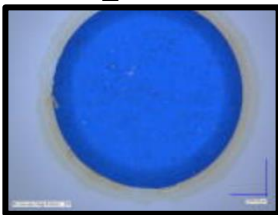


Figure 810.
360082_1308122

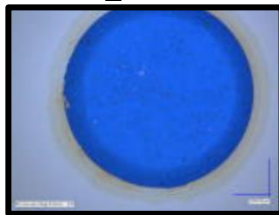


Figure 811.
360082_1308123

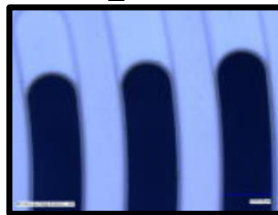


Figure 812.
360082_1308124

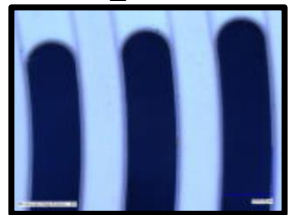


Figure 813.
360082_1308125



Figure 814.
360082_1308126



Figure 815.
360082_1308127



Figure 816.
360082_1308128



Figure 817.
360082_1308129



Figure 818.
360082_1308130



Figure 819.
360082_1308131



Figure 820.
360082_1308132



Figure 821.
360082_1308133

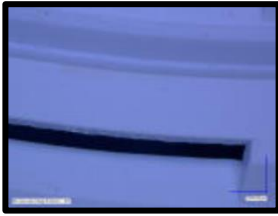


Figure 822.
360082_1308134

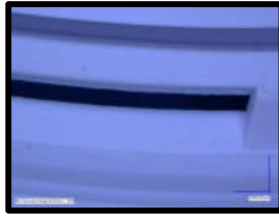


Figure 823.
360082_1308135

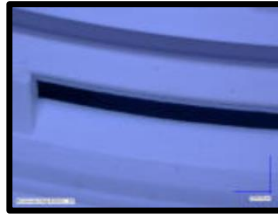


Figure 824.
360082_1308136

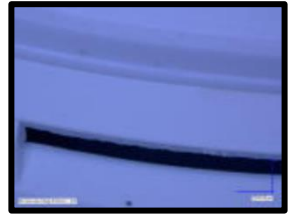


Figure 825.
360082_1308137

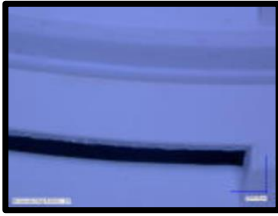


Figure 826.
360082_1308138

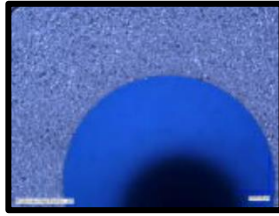


Figure 827.
360082_1308139

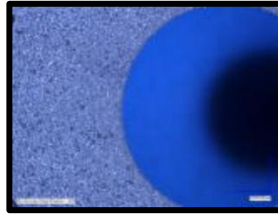


Figure 828.
360082_1308140

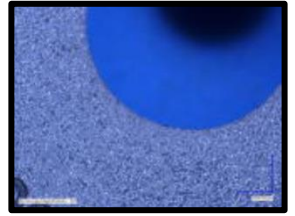


Figure 829.
360082_1308141

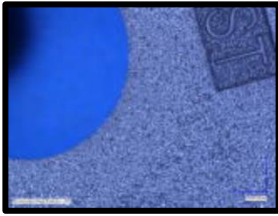


Figure 830.
360082_1308142

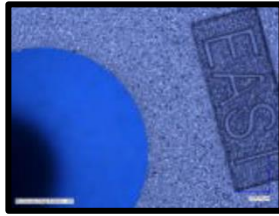


Figure 831.
360082_1308143

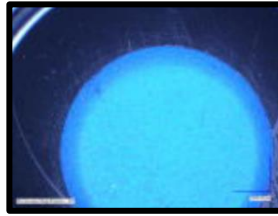


Figure 832.
360082_1308144

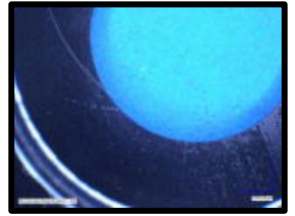


Figure 833.
360082_1308145

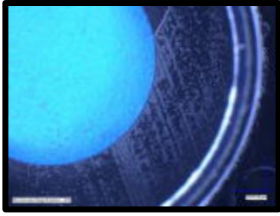


Figure 834.
360082_1308146

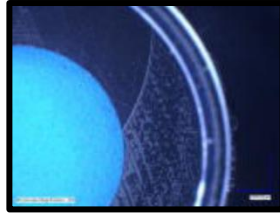


Figure 835.
360082_1308147

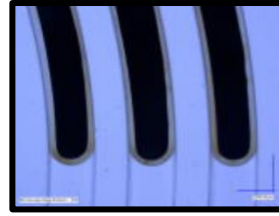


Figure 836.
360082_1308148

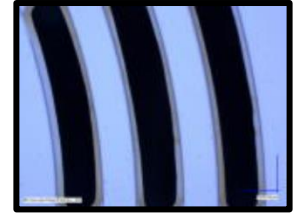


Figure 837.
360082_1308149

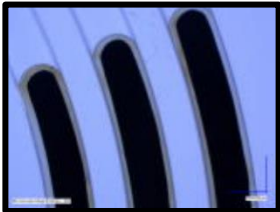


Figure 838.
360082_1308150



Figure 839.
360082_1308151



Figure 840.
360082_1308152



Figure 841.
360082_1308153



Figure 842.
360082_1308154

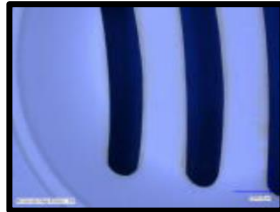


Figure 843.
360082_1308155

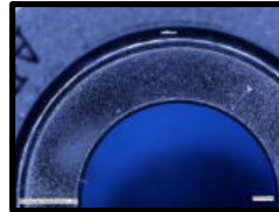


Figure 844.
360082_1308156

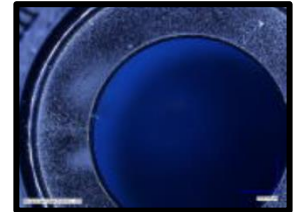


Figure 845.
360082_1308157

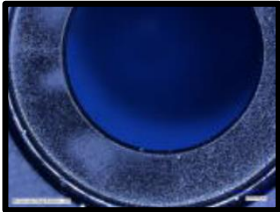


Figure 846.
360082_1308158

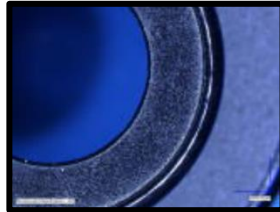


Figure 847.
360082_1308159

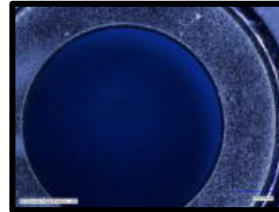


Figure 848.
360082_1308160

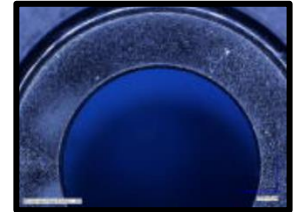


Figure 849.
360082_1308161

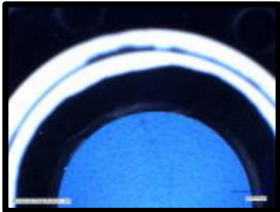


Figure 850.
360082_1308162

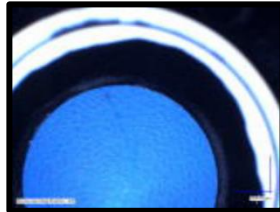


Figure 851.
360082_1308163

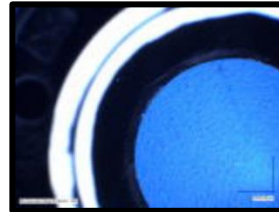


Figure 852.
360082_1308164

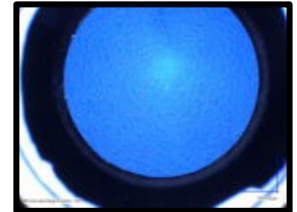


Figure 853.
360082_1308165



Figure 854.
360082_1308166



Figure 855.
360082_1308167

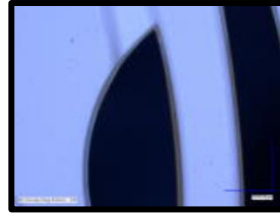


Figure 856.
360082_1308168



Figure 857.
360082_1308169



Figure 858.
360082_1308170



Figure 859.
360082_1308171



Figure 860.
360082_1308172

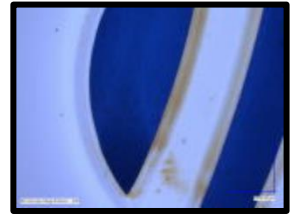


Figure 861.
360082_1308173

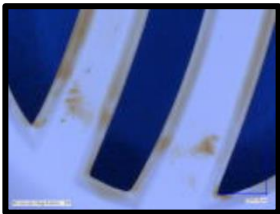


Figure 862.
360082_1308174



Figure 863.
360082_1308175



Figure 864.
360082_1308176

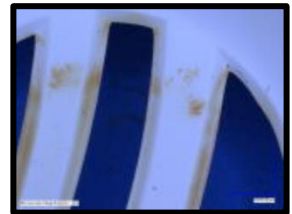


Figure 865.
360082_1308177

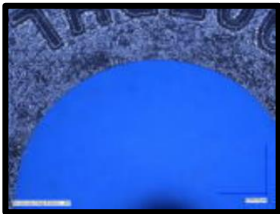


Figure 866.
360082_1308178

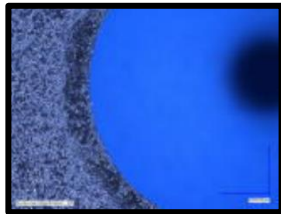


Figure 867.
360082_1308179

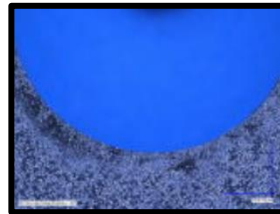


Figure 868.
360082_1308180



Figure 869.
360082_1308181

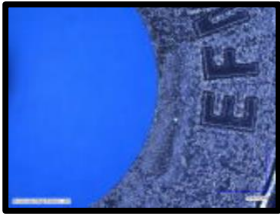


Figure 870.
360082_1308182

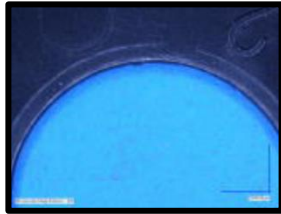


Figure 871.
360082_1308183

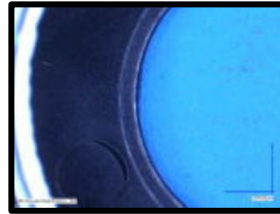


Figure 872.
360082_1308184

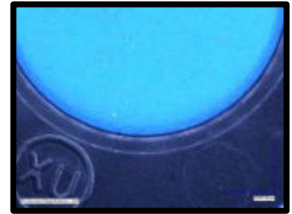


Figure 873.
360082_1308185

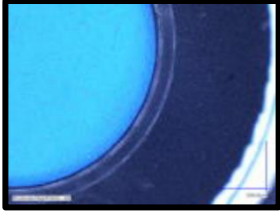


Figure 874.
360082_1308186

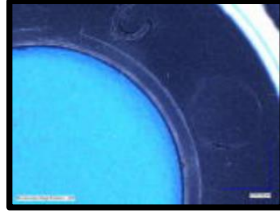


Figure 875.
360082_1308187

Results for Test 3 (ID 360086)

The following table lists selected events that occurred during the experiment.

Table 33. Experiment Events

Description	Time (s)
Gas Line Reconnected for 2nd floor	429
Gas Pumps Turned Off	2665
2nd Floor Door Opened/Suppression	2759
1st Floor Door Opened	2803

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures over pre-determined time spans.

Table 34. Temperature Value Result Summary

Description	Initial (C)	Max (C)	30 second max average (C)	1 minute max average (C)	5 minute max average (C)	10 minute max average (C)
Landing 0'	9.9	12.1	12.0	12.0	11.8	11.8
Landing 1'	9.7	11.4	11.3	11.3	11.3	11.2
Landing 2'	9.7	11.7	11.6	11.6	11.5	11.5
Landing 3'	9.6	11.9	11.9	11.9	11.8	11.8
Landing 4'	9.5	12.5	12.4	12.4	12.3	12.3
Landing 5'	9.5	13.4	13.3	13.3	13.0	13.0
Landing 6'	9.7	22.1	21.8	20.9	17.2	16.5
Landing 7'	9.9	42.2	41.0	38.8	28.8	27.0
1st Floor 0'	10.1	10.6	10.6	10.6	10.5	10.5
1st Floor 1'	9.6	10.3	10.3	10.3	10.3	10.2
1st Floor 2'	9.8	10.5	10.5	10.5	10.5	10.4
1st Floor 3'	9.6	10.5	10.5	10.5	10.4	10.4
1st Floor 4'	9.5	10.6	10.6	10.6	10.5	10.5
1st Floor 5'	9.5	10.8	10.8	10.8	10.7	10.7
1st Floor 6'	9.4	10.9	10.8	10.8	10.8	10.7
1st Floor 7'	9.4	11.0	10.9	10.9	10.9	10.8
1st Floor 8'	9.5	11.4	11.4	11.4	11.3	11.3
2nd Floor 0'	9.9	66.5	65.9	64.6	50.3	45.5
2nd Floor 1'	9.8	108.5	107.2	103.7	75.6	64.7
2nd Floor 2'	9.6	154.1	150.5	145.8	109.3	90.6
2nd Floor 3'	9.6	182.4	180.4	176.7	133.7	107.8
2nd Floor 4'	9.6	205.9	203.8	198.0	146.8	118.2
2nd Floor 5'	9.7	225.1	222.4	217.7	166.9	133.6
2nd Floor 6'	10.0	242.7	240.3	235.6	179.4	143.6
2nd Floor 7'	10.3	272.3	268.2	263.3	197.3	155.1
2nd Floor 8'	13.0	361.8	353.9	349.6	254.9	190.8
Tenability 1st Floor 5'	9.7	11.0	10.9	10.9	10.8	10.8
Tenability 2nd Floor 5'	10.2	195.2	191.3	188.6	151.2	126.4

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

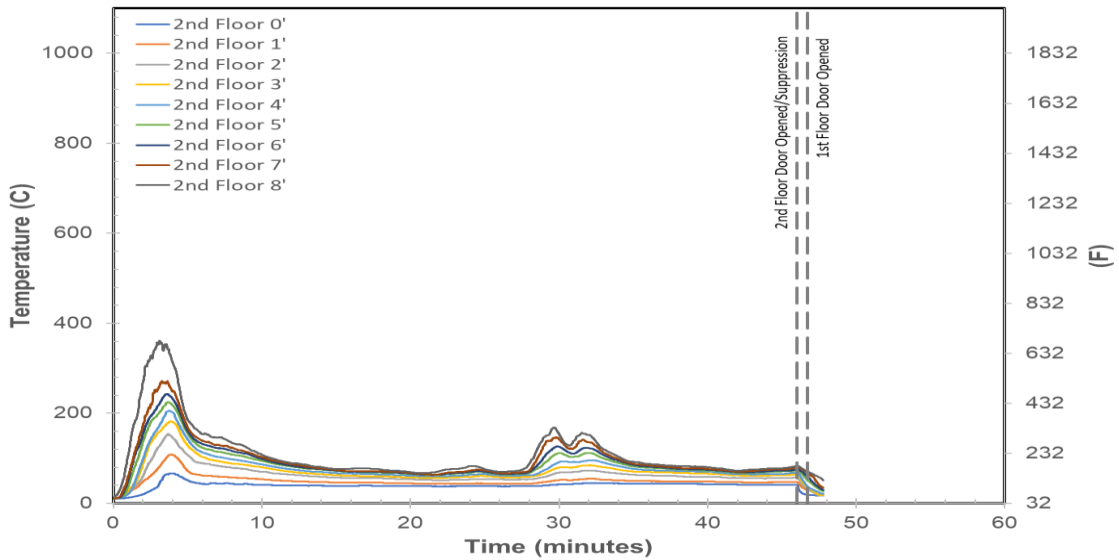


Figure 876. Temperature – 2nd Floor

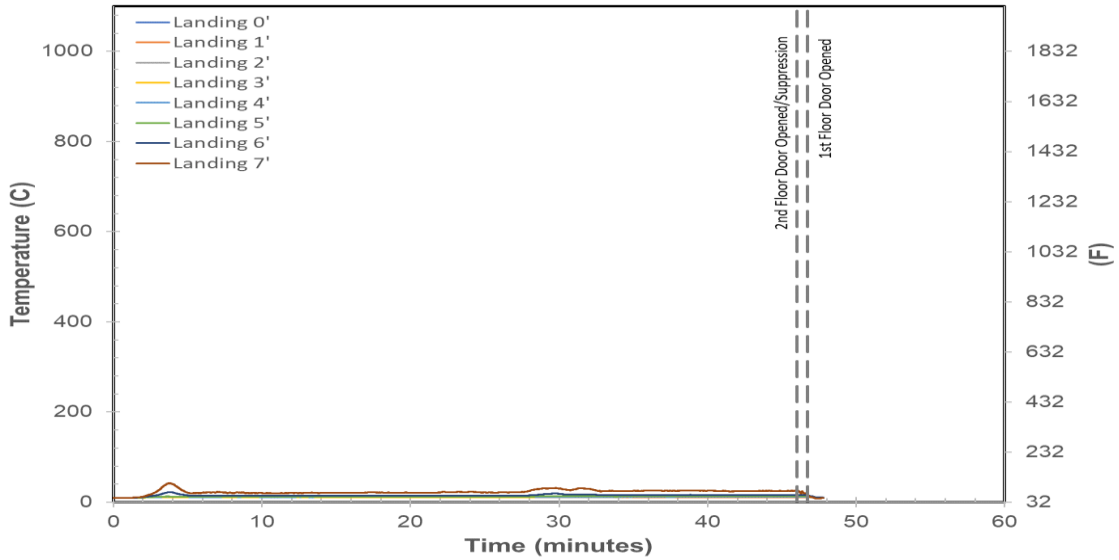


Figure 877. Temperature – Landing

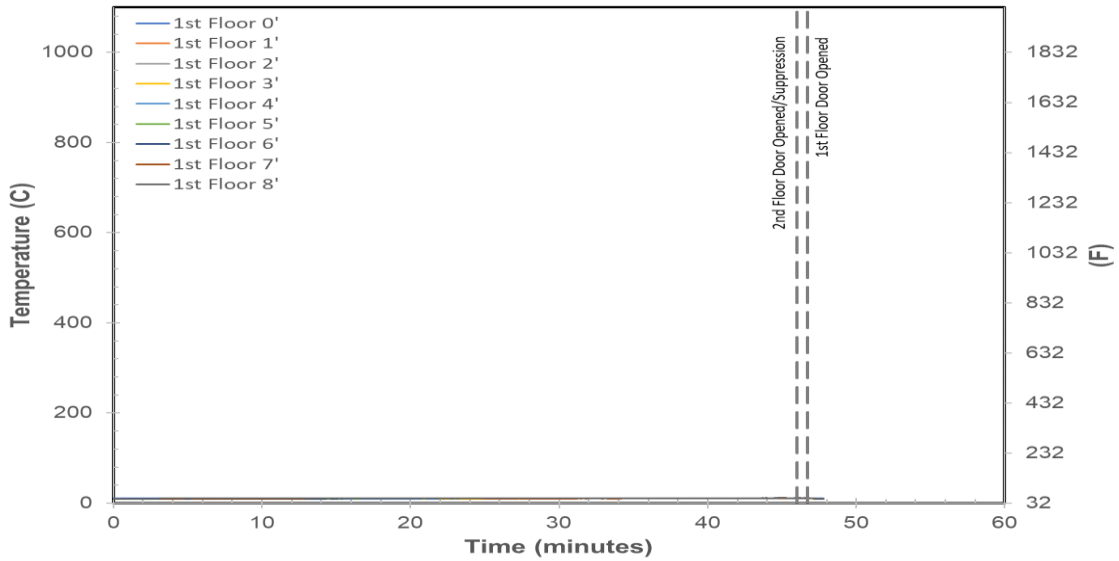


Figure 878. Temperature – 1st Floor

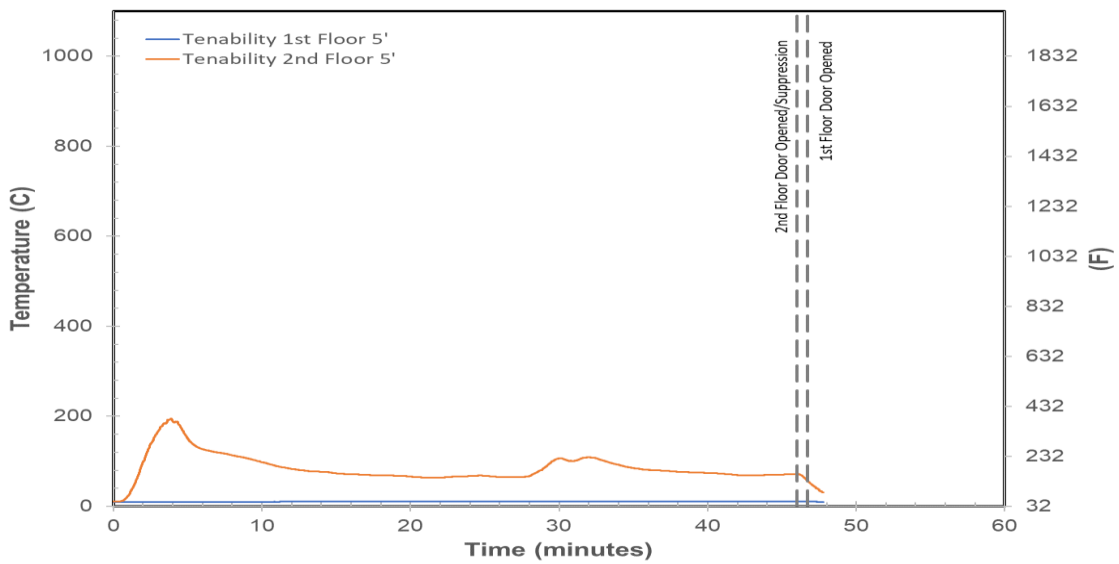


Figure 879. Temperature - Tenability

The following table provides a summary of the heat flux results. The “Description” column typically describes the location of the heat flux transducer. The time at which the heat flux first changes by a pre-determined amount is provided in the “Time of Initial Change” column. The pre-determined amount of change in heat flux is provided in the “Initial Change Amount” column. The maximum heat flux recorded during the test is provided in the “Maximum” column. The “Maximum Average” columns are calculated over pre-determined time spans.

Table 35. Heat Flux Result Summary

Description	Time of Initial Change (s)	Initial Change Value (kW/m ²)	Maximum (kW/m ²)	10 Second Maximum Average (kW/m ²)	30 Second Maximum Average (kW/m ²)	1 Minute Maximum Average (kW/m ²)	5 Minute Maximum Average (kW/m ²)	10 Minute Maximum Average (kW/m ²)
1st Floor Total	SC	1	0.0	0.0	0.0	0.0	0.0	0.0
1st Floor Rad	SC	1	0.0	0.0	0.0	0.0	0.0	0.0
2nd Floor Total	74	1	6.5	6.1	6.0	5.7	3.7	2.8
2nd Floor Rad	215	1	1.0	1.0	1.0	0.9	0.6	0.4

The following chart(s) shows a time dependent representation of the baseline corrected instantaneous heat flux measured during the experiment.

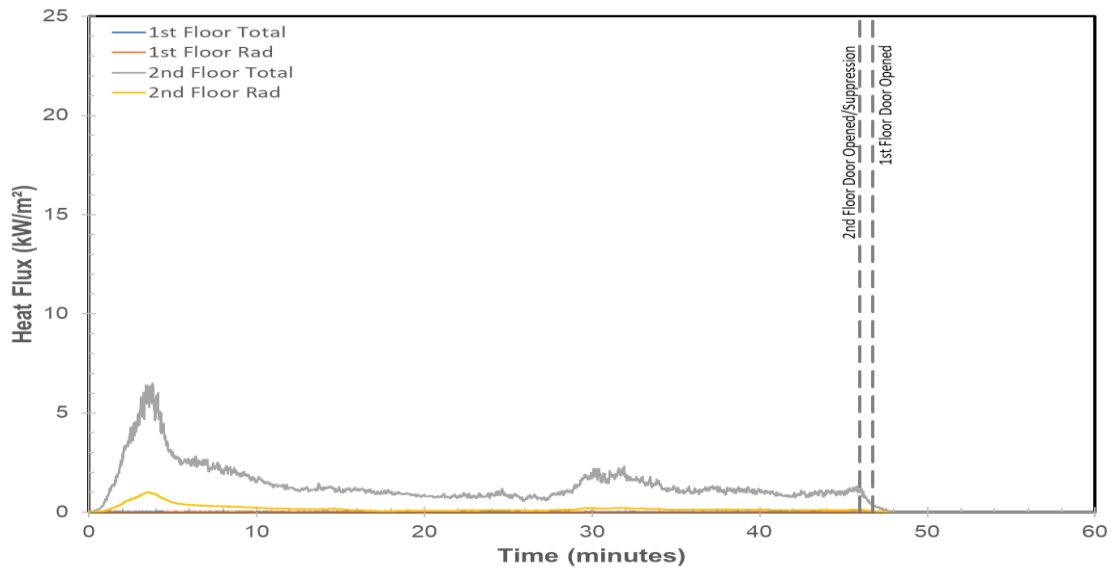


Figure 880. Heat Flux

The following table provides a summary of the optical density.

Table 36. Optical Density Results Summary

Description	Average Optical Density (1/m)	Maximum Optical Density (1/m)
1st Floor ODM	0.08	0.17

The following chart provides a time dependent representation of the optical density measured during the experiment.

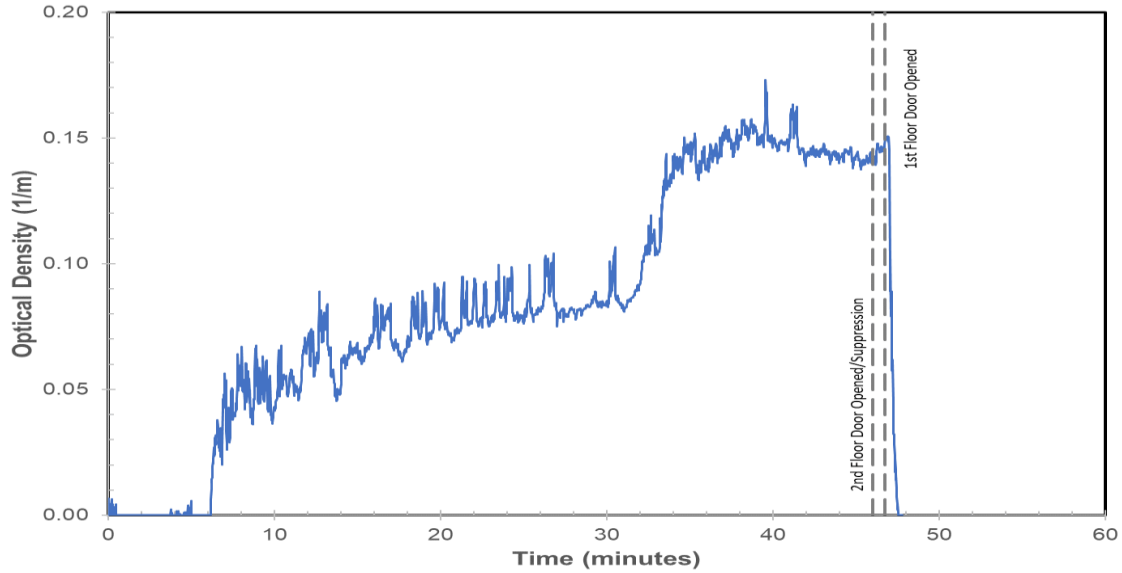


Figure 881. Optical Density

The following chart shows the obscuration during the experiment.

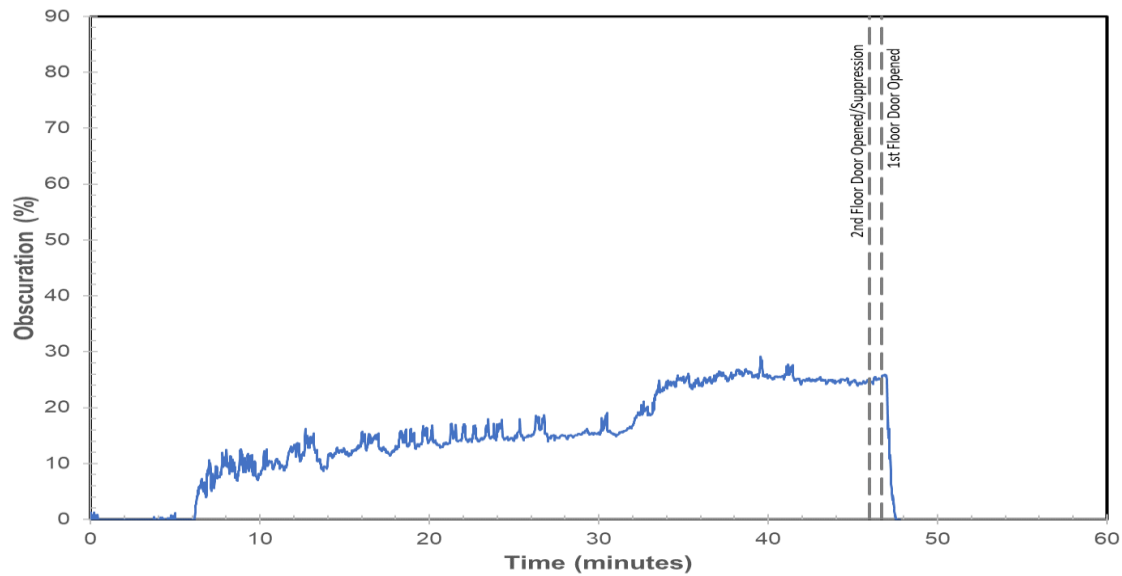


Figure 882. Obscuration

The following table provides a summary of the oxygen measurement results.

Table 37. Oxygen Measurement Results

Description	Full Scale Range (%)	Minimum Value (%)	Average (%)
2nd Floor	25	2.3	15.6871
1st Floor	25	3.43125	20.53035

The following table shows which oxygen analyzer(s) were taken out of service during the experiment.

Table 38. Out of Service

Description	Time out of service time (s)	Out of service reason
1st Floor	2674	Pump Off
2nd Floor	2674	Pump Off

The following chart presents the oxygen concentration(s) measured during the test.

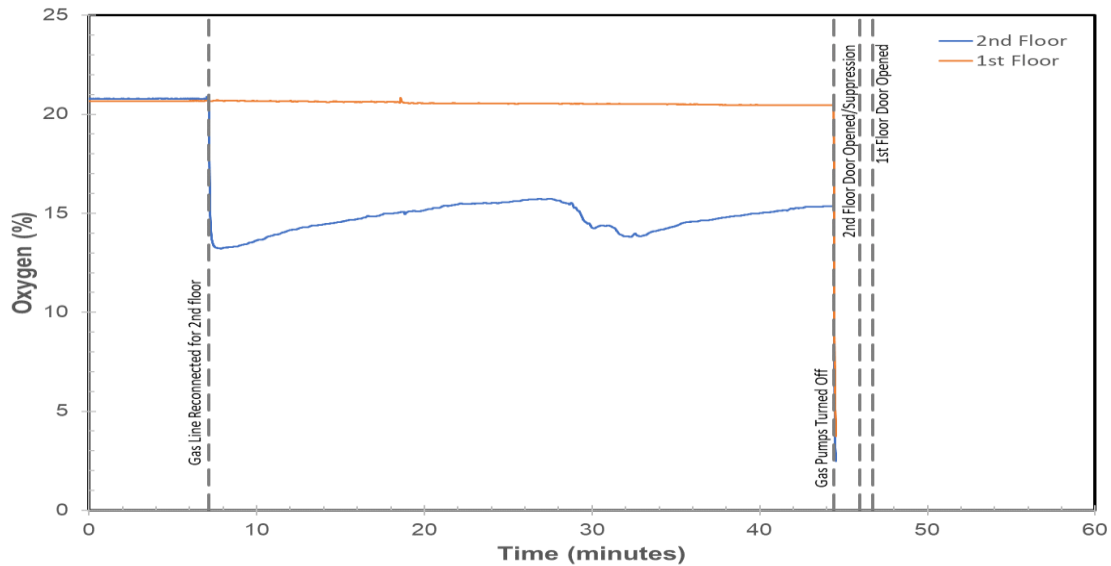


Figure 883. Oxygen Concentration

The following table provides a summary of the carbon monoxide gas measurement results.

Table 39. CO Measurement Results

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
2nd Floor	0.05	0.0022	0.0014
1st Floor	0.05	-0.0002	-0.0002

The following table provides a summary of the carbon dioxide gas measurement results.

Table 40. CO2 Measurement Results

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
2nd Floor	0.25	0.0550	0.0359
1st Floor	0.25	0.0014	0.0005

The following table shows which CO/CO2 gas analyzer(s) were taken out of service (OOS) during the experiment.

Table 41. Out of Service

Description	CO- Time OOS (s)	CO- Reason OOS
2nd Floor	2674	Pump Turned Off
1st Floor	2674	Pump Turned Off

The following chart shows the carbon monoxide concentration(s) measured during the experiment.

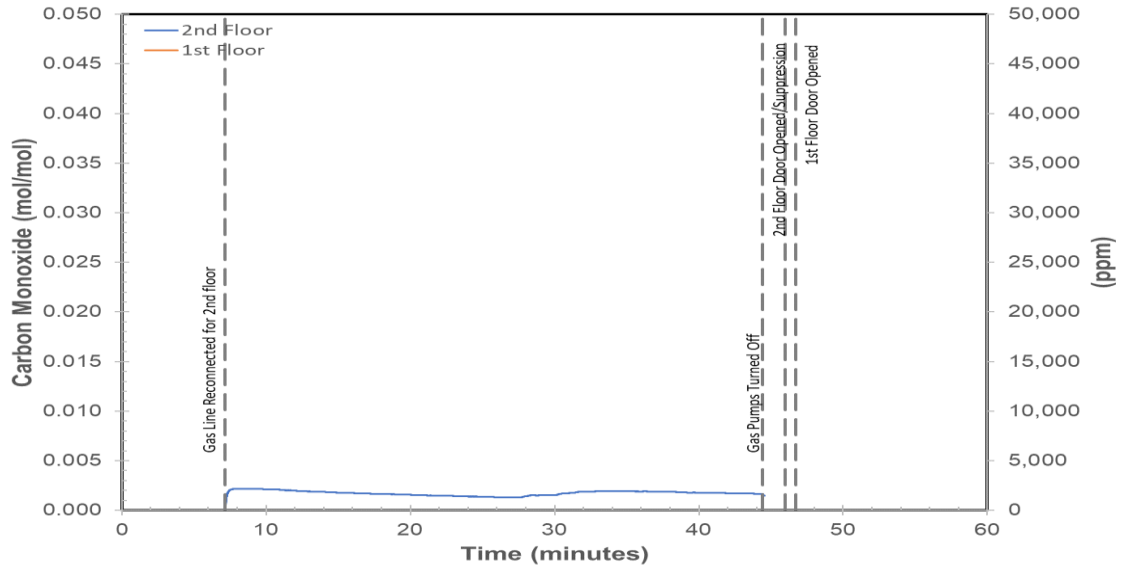


Figure 884. Carbon Monoxide Concentration(s)

The following chart shows the carbon dioxide concentration(s) measured during the experiment.

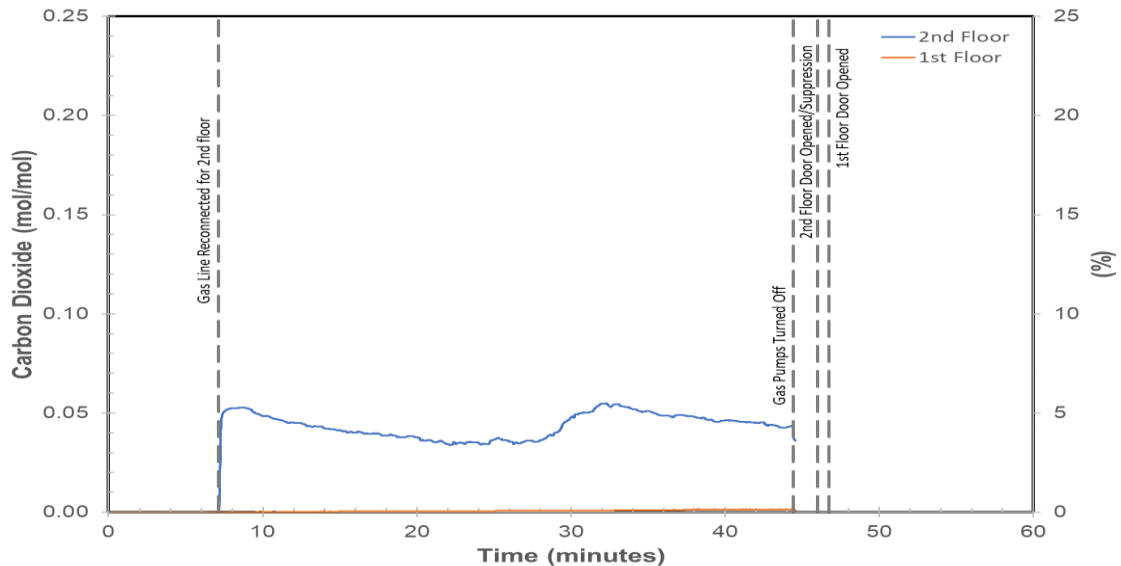


Figure 885. Carbon Dioxide Concentration(s)

The following table provides a description of the video(s) taken during this experiment.

Table 42. Video Log

Description	Start Time	Duration (s)	Filename
Stairs Looking down	10:29:46	2964	360086_20230308_102939_1A.mov
Chair	10:29:53	2969	360086_20230308_102947_2A.mov
Stairs looking up	10:30:00	2974	360086_20230308_102954_3A.mov
Wide View 2nd	10:30:08	2977	360086_20230308_103001_4A.mov
Ignition	10:30:15	2981	360086_20230308_103009_5A.mov
Smoke Detector 1st floor	10:30:23	2985	360086_20230308_103016_6A.mov
Wide View 1st	10:30:30	2989	360086_20230308_103024_7A.mov
HD outside view	10:30:38	2992	360086_20230308_103031_8A.mov
Data Chart	10:30:50	2992	360086_20230308_103044_17A.mov
Custom - Master Sped Up 60X			360086_1313199.MOV
Master			360086_1313200.MOV

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture's filename as well as any description and elapsed test time associated with the picture.



Figure 886. Pre test 25 minutes, 360086_1305120



Figure 887. Pre test 25 minutes, 360086_1305121



Figure 888. Pre test 24 minutes, 360086_1305122

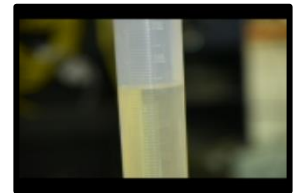


Figure 889. Pre test 24 minutes, 360086_1305123



Figure 890. Pre test 24 minutes, 360086_1305124



Figure 891. Pre test 24 minutes, 360086_1305125

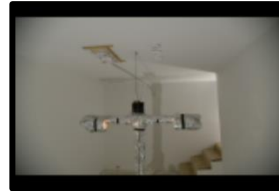


Figure 892. Pre test 24 minutes, 360086_1305126



Figure 893. Pre test 24 minutes, 360086_1305127



Figure 894. Pre test 24 minutes, 360086_1305128



Figure 895. Pre test 24 minutes, 360086_1305129



Figure 896. Pre test 24 minutes, 360086_1305130



Figure 897. Pre test 23 minutes, 360086_1305131



Figure 898. Pre test 23 minutes, 360086_1305132



Figure 899. Pre test 23 minutes, 360086_1305133

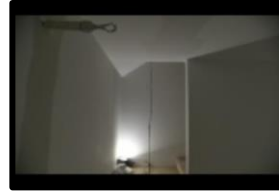


Figure 900. Pre test 23 minutes, 360086_1305134

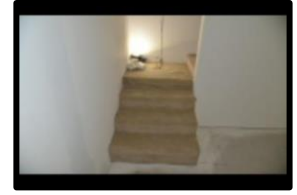


Figure 901. Pre test 23 minutes, 360086_1305135

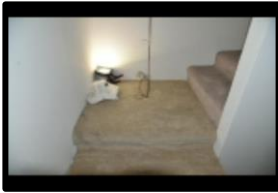


Figure 902. Pre test 23 minutes, 360086_1305136



Figure 903. Pre test 23 minutes, 360086_1305137

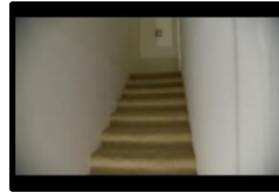


Figure 904. Pre test 23 minutes, 360086_1305138

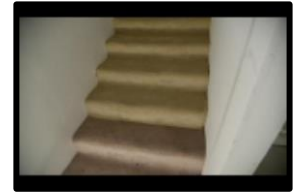


Figure 905. Pre test 23 minutes, 360086_1305139

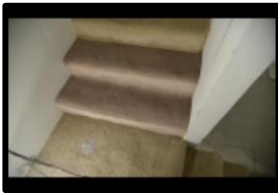


Figure 906. Pre test 23 minutes, 360086_1305140

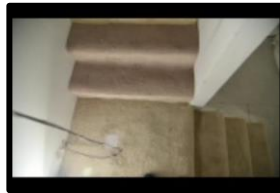


Figure 907. Pre test 23 minutes, 360086_1305141

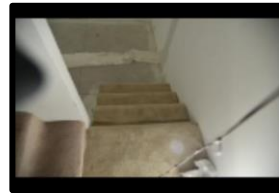


Figure 908. Pre test 23 minutes, 360086_1305142

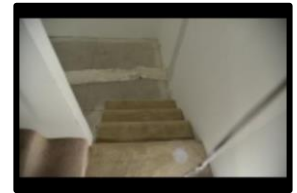


Figure 909. Pre test 23 minutes, 360086_1305143

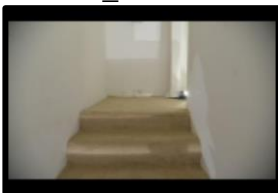


Figure 910. Pre test 22 minutes, 360086_1305144

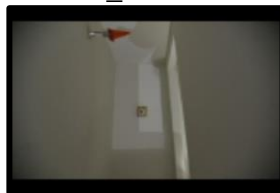


Figure 911. Pre test 22 minutes, 360086_1305145

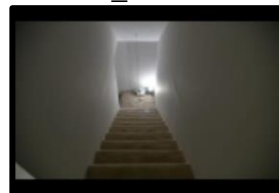


Figure 912. Pre test 22 minutes, 360086_1305146

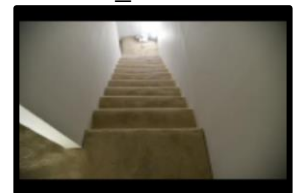


Figure 913. Pre test 22 minutes, 360086_1305147



Figure 914. Pre test 22 minutes, 360086_1305148

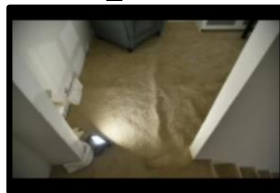


Figure 915. Pre test 22 minutes, 360086_1305149



Figure 916. Pre test 22 minutes, 360086_1305150

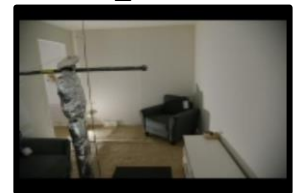


Figure 917. Pre test 21 minutes, 360086_1305151

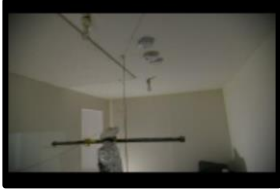


Figure 918. Pre test 21 minutes, 360086_1305152

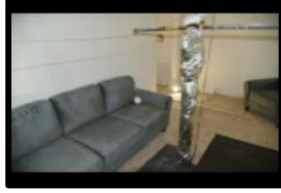


Figure 919. Pre test 21 minutes, 360086_1305153



Figure 920. Pre test 21 minutes, 360086_1305154



Figure 921. Pre test 21 minutes, 360086_1305155



Figure 922. Pre test 21 minutes, 360086_1305156



Figure 923. Pre test 21 minutes, 360086_1305157



Figure 924. Pre test 21 minutes, 360086_1305158



Figure 925. Pre test 21 minutes, 360086_1305159

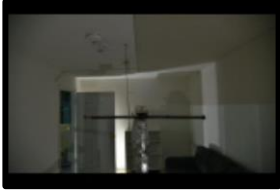


Figure 926. Pre test 21 minutes, 360086_1305160



Figure 927. Pre test 21 minutes, 360086_1305161

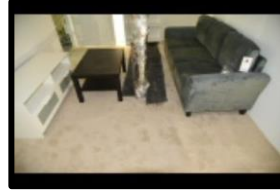


Figure 928. Pre test 21 minutes, 360086_1305162

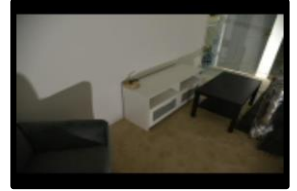


Figure 929. Pre test 21 minutes, 360086_1305163

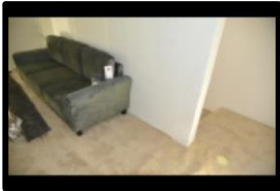


Figure 930. Pre test 21 minutes, 360086_1305164



Figure 931. Pre test 21 minutes, 360086_1305165



Figure 932. Pre test 21 minutes, 360086_1305166

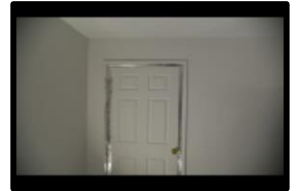


Figure 933. Pre test 19 minutes, 360086_1305167



Figure 934. Pre test 19 minutes, 360086_1305168



Figure 935. Pre test 19 minutes, 360086_1305169



Figure 936. Pre test 19 minutes, 360086_1305170



Figure 937. Pre test 19 minutes, 360086_1305171



Figure 938. Pre test 19 minutes, 360086_1305172



Figure 939. Pre test 19 minutes, 360086_1305173



Figure 940. Pre test 19 minutes, 360086_1305174

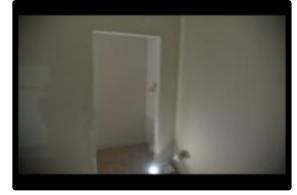


Figure 941. Pre test 19 minutes, 360086_1305175

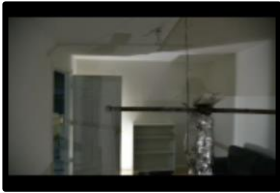


Figure 942. Pre test 19 minutes, 360086_1305176



Figure 943. Pre test 19 minutes, 360086_1305177



Figure 944. Pre test 18 minutes, 360086_1305178



Figure 945. Pre test 18 minutes, 360086_1305179



Figure 946. Pre test 18 minutes, 360086_1305180



Figure 947. Pre test 18 minutes, 360086_1305181



Figure 948. Pre test 18 minutes, 360086_1305182

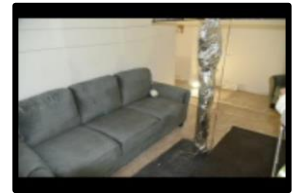


Figure 949. Pre test 12 seconds, 360086_1305183

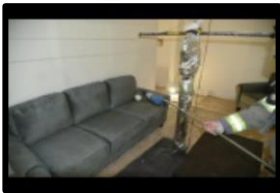


Figure 950. Pre test 2 seconds, 360086_1305184



Figure 951. Pre test 2 seconds, 360086_1305185



Figure 952. 0 seconds, 360086_1305186



Figure 953. 0 seconds, 360086_1305187



Figure 954. 2 seconds, 360086_1305188



Figure 955. 4 seconds, 360086_1305189



Figure 956. 6 seconds, 360086_1305190



Figure 957. 48 seconds, 360086_1305191



Figure 958. 50 seconds, 360086_1305192



Figure 959. 1164 seconds, 360086_1305193



Figure 960. 1172 seconds, 360086_1305194



Figure 961. 1178 seconds, 360086_1305195



Figure 962. 1780 seconds, 360086_1305196



Figure 963. 1786 seconds, 360086_1305197



Figure 964. Post test 1:27 hr:min, 360086_1305199



Figure 965. Post test 1:27 hr:min, 360086_1305200



Figure 966. Post test 1:27 hr:min, 360086_1305201

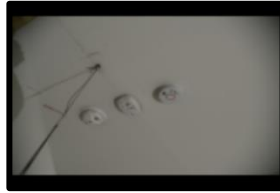


Figure 967. Post test 1:27 hr:min, 360086_1305202

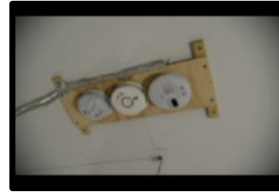


Figure 968. Post test 1:27 hr:min, 360086_1305203



Figure 969. Post test 1:27 hr:min, 360086_1305204



Figure 970. Post test 1:27 hr:min, 360086_1305205



Figure 971. Post test 1:27 hr:min, 360086_1305206



Figure 972. Post test 1:27 hr:min, 360086_1305207



Figure 973. Post test 1:28 hr:min, 360086_1305208



Figure 974. Post test 1:28 hr:min, 360086_1305209



Figure 975. Post test 1:28 hr:min, 360086_1305210



Figure 976. Post test 1:28 hr:min, 360086_1305211



Figure 977. Post test 1:28 hr:min, 360086_1305212



Figure 978. Post test 1:28 hr:min, 360086_1305213



Figure 979. Post test 1:28 hr:min, 360086_1305214



Figure 980. Post test 1:28 hr:min, 360086_1305215



Figure 981. Post test 1:28 hr:min, 360086_1305216



Figure 982. Post test 1:28 hr:min, 360086_1305217



Figure 983. Post test 1:28 hr:min, 360086_1305218



Figure 984. Post test 1:28 hr:min, 360086_1305219



Figure 985. Post test 1:28 hr:min, 360086_1305220



Figure 986. Post test 1:28 hr:min, 360086_1305221



Figure 987. Post test 1:29 hr:min, 360086_1305222



Figure 988. Post test 1:29 hr:min, 360086_1305223



Figure 989. Post test 1:29 hr:min, 360086_1305224



Figure 990. Post test 1:29 hr:min, 360086_1305225



Figure 991. Post test 1:29 hr:min, 360086_1305226



Figure 992. Post test 1:29 hr:min, 360086_1305227



Figure 993. Post test 1:29 hr:min, 360086_1305228



Figure 994. Post test 1:29 hr:min, 360086_1305229



Figure 995. Post test 1:29 hr:min, 360086_1305230



Figure 996. Post test 1:29 hr:min, 360086_1305231



Figure 997. Post test 2:30 hr:min, 360086_1305232



Figure 998. Post test
2:30 hr:min,
360086_1305233



Figure 999. Post test
2:30 hr:min,
360086_1305234



Figure 1000. Post test
2:30 hr:min,
360086_1305235



Figure 1001. Post test
2:30 hr:min,
360086_1305236



Figure 1002. Post test
2:30 hr:min,
360086_1305237



Figure 1003. Post test
2:30 hr:min,
360086_1305238



Figure 1004. Post test
2:30 hr:min,
360086_1305239



Figure 1005. Post test
2:30 hr:min,
360086_1305240



Figure 1006. Post test
2:30 hr:min,
360086_1305241



Figure 1007. Post test
2:31 hr:min,
360086_1305242



Figure 1008. Post test
2:31 hr:min,
360086_1305243



Figure 1009. Post test
2:31 hr:min,
360086_1305244



Figure 1010. Post test
2:31 hr:min,
360086_1305245

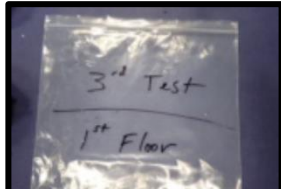


Figure 1011.
360086_1307347



Figure 1012.
360086_1307348



Figure 1013.
360086_1307349



Figure 1014.
360086_1307350



Figure 1015.
360086_1307351



Figure 1016.
360086_1307352



Figure 1017.
360086_1307353



Figure 1018.
360086_1307354



Figure 1019.
360086_1307355



Figure 1020.
360086_1307356

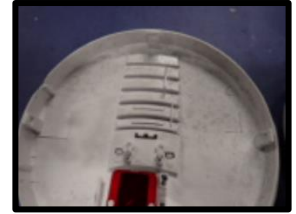


Figure 1021.
360086_1307357



Figure 1022.
360086_1307358



Figure 1023.
360086_1307359



Figure 1024.
360086_1307360



Figure 1025.
360086_1307361



Figure 1026.
360086_1307362



Figure 1027.
360086_1307363



Figure 1028.
360086_1307364



Figure 1029.
360086_1307365



Figure 1030.
360086_1307366

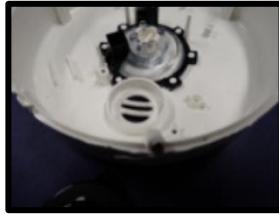


Figure 1031.
360086_1307367



Figure 1032.
360086_1307368



Figure 1033.
360086_1307369



Figure 1034.
360086_1307370



Figure 1035.
360086_1307371



Figure 1036.
360086_1307372



Figure 1037.
360086_1307373



Figure 1038.
360086_1307374



Figure 1039.
360086_1307375



Figure 1040.
360086_1307376

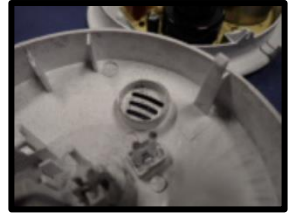


Figure 1041.
360086_1307377



Figure 1042.
360086_1307378



Figure 1043.
360086_1307379



Figure 1044.
360086_1307380

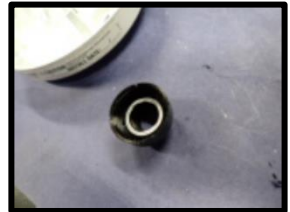


Figure 1045.
360086_1307381



Figure 1046.
360086_1307382



Figure 1047.
360086_1307383



Figure 1048.
360086_1307384



Figure 1049.
360086_1307385

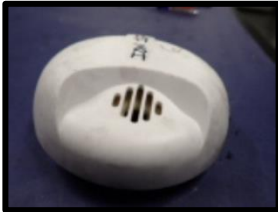


Figure 1050.
360086_1307386



Figure 1051.
360086_1307387



Figure 1052.
360086_1307388



Figure 1053.
360086_1307389



Figure 1054.
360086_1307390



Figure 1055.
360086_1307391

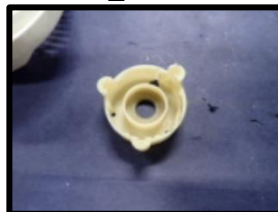


Figure 1056.
360086_1307392



Figure 1057.
360086_1307393



Figure 1058.
360086_1307394



Figure 1059.
360086_1307395



Figure 1060.
360086_1307396



Figure 1061.
360086_1307397

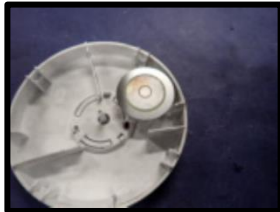


Figure 1062.
360086_1307398



Figure 1063.
360086_1307399



Figure 1064.
360086_1307400



Figure 1065.
360086_1307401



Figure 1066.
360086_1307402

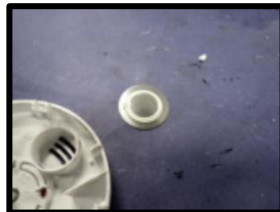


Figure 1067.
360086_1307403



Figure 1068.
360086_1307404



Figure 1069.
360086_1307405



Figure 1070.
360086_1307406



Figure 1071.
360086_1307407



Figure 1072.
360086_1307408



Figure 1073.
360086_1307409



Figure 1074.
360086_1307410



Figure 1075.
360086_1307411



Figure 1076.
360086_1307412



Figure 1077.
360086_1307413



Figure 1078.
360086_1307414



Figure 1079.
360086_1307415



Figure 1080.
360086_1307416



Figure 1081.
360086_1307417



Figure 1082.
360086_1307418

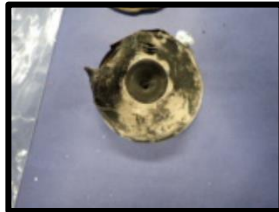


Figure 1083.
360086_1307419



Figure 1084.
360086_1307420



Figure 1085.
360086_1307421



Figure 1086.
360086_1307422



Figure 1087.
360086_1307423

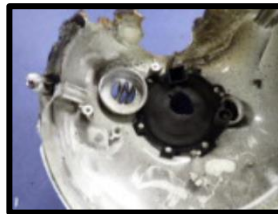


Figure 1088.
360086_1307424



Figure 1089.
360086_1307425

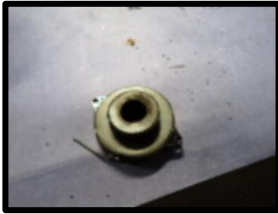


Figure 1090.
360086_1307426



Figure 1091.
360086_1307427

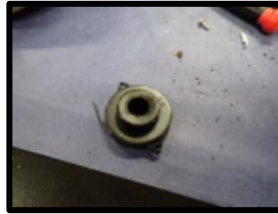


Figure 1092.
360086_1307428

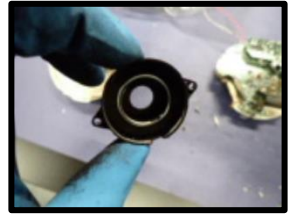


Figure 1093.
360086_1307429

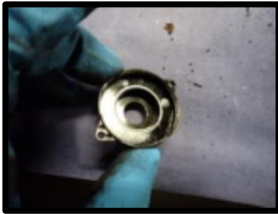


Figure 1094.
360086_1307430



Figure 1095.
360086_1307431

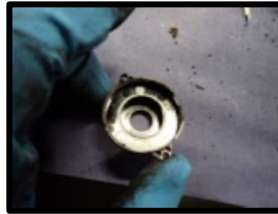


Figure 1096.
360086_1307432



Figure 1097.
360086_1308188



Figure 1098.
360086_1308189



Figure 1099.
360086_1308190



Figure 1100.
360086_1308191



Figure 1101.
360086_1308192



Figure 1102.
360086_1308193



Figure 1103.
360086_1308194



Figure 1104.
360086_1308195



Figure 1105.
360086_1308196

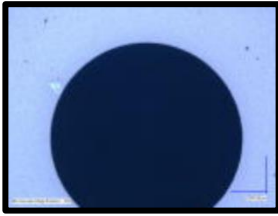


Figure 1106.
360086_1308197

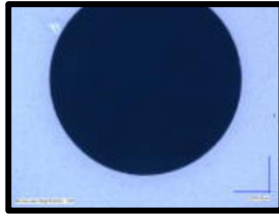


Figure 1107.
360086_1308198

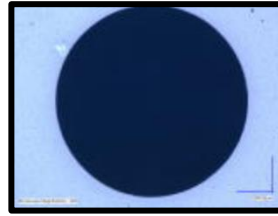


Figure 1108.
360086_1308199

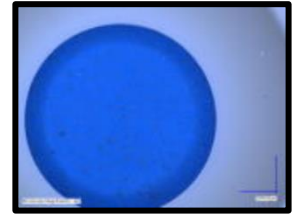


Figure 1109.
360086_1308200



Figure 1110.
360086_1308201



Figure 1111.
360086_1308202

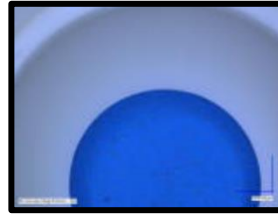


Figure 1112.
360086_1308203



Figure 1113.
360086_1308204



Figure 1114.
360086_1308205

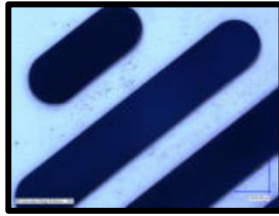


Figure 1115.
360086_1308206



Figure 1116.
360086_1308207



Figure 1117.
360086_1308208



Figure 1118.
360086_1308209



Figure 1119.
360086_1308210



Figure 1120.
360086_1308211



Figure 1121.
360086_1308212



Figure 1122.
360086_1308213



Figure 1123.
360086_1308214



Figure 1124.
360086_1308215

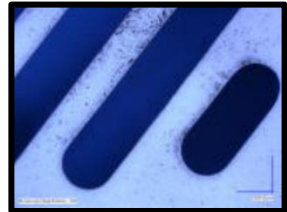


Figure 1125.
360086_1308216



Figure 1126.
360086_1308217



Figure 1127.
360086_1308218



Figure 1128.
360086_1308219

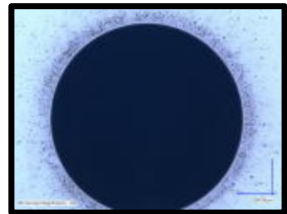


Figure 1129.
360086_1308220

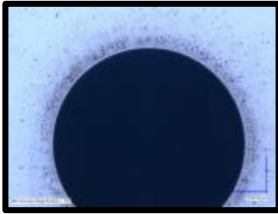


Figure 1130.
360086_1308221

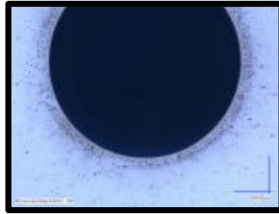


Figure 1131.
360086_1308222

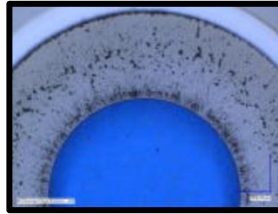


Figure 1132.
360086_1308223

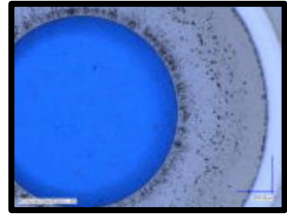


Figure 1133.
360086_1308224

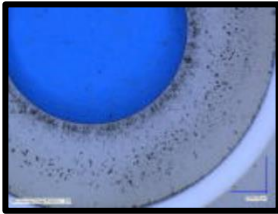


Figure 1134.
360086_1308225

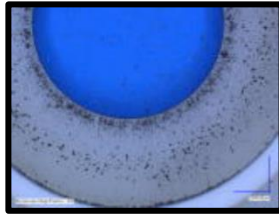


Figure 1135.
360086_1308226



Figure 1136.
360086_1308227

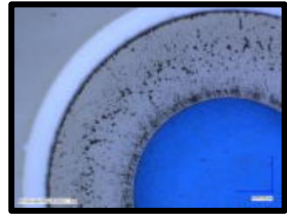


Figure 1137.
360086_1308228



Figure 1138.
360086_1308229



Figure 1139.
360086_1308230

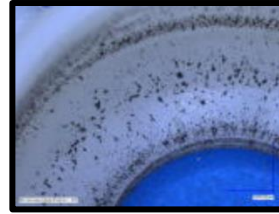


Figure 1140.
360086_1308231

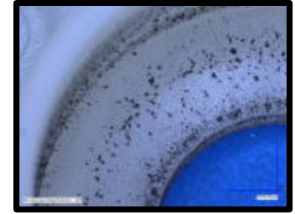


Figure 1141.
360086_1308232

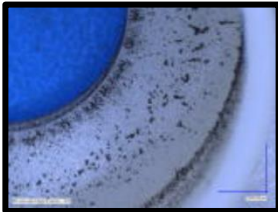


Figure 1142.
360086_1308233

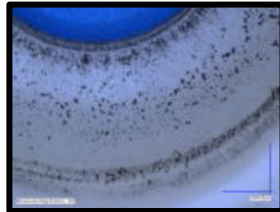


Figure 1143.
360086_1308234

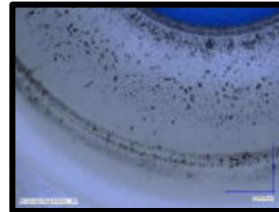


Figure 1144.
360086_1308235

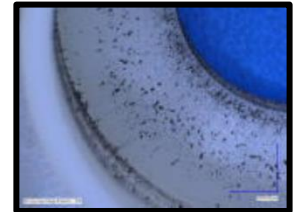


Figure 1145.
360086_1308236

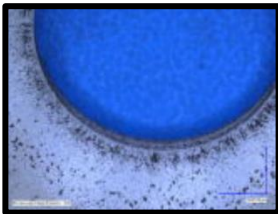


Figure 1146.
360086_1308237

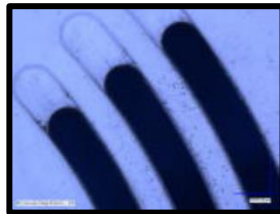


Figure 1147.
360086_1308238



Figure 1148.
360086_1308239

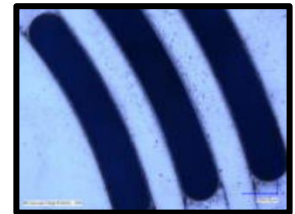


Figure 1149.
360086_1308240

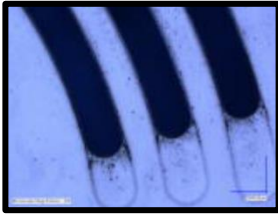


Figure 1150.
360086_1308241

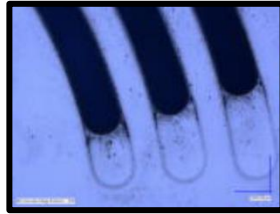


Figure 1151.
360086_1308242

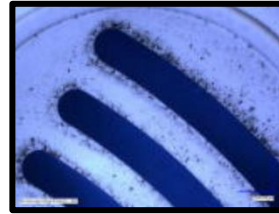


Figure 1152.
360086_1308243

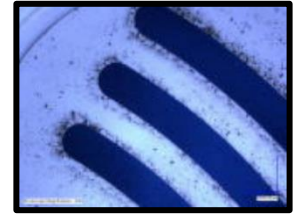


Figure 1153.
360086_1308244

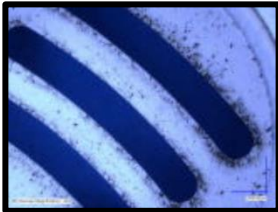


Figure 1154.
360086_1308245

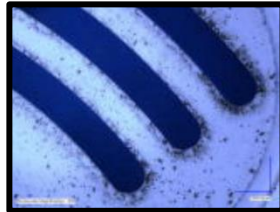


Figure 1155.
360086_1308246



Figure 1156.
360086_1308247

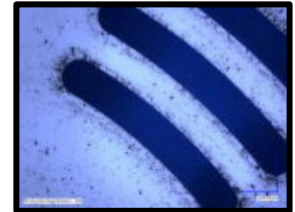


Figure 1157.
360086_1308248



Figure 1158.
360086_1308249

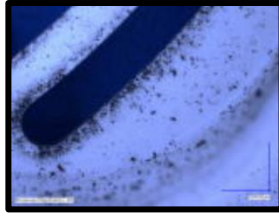


Figure 1159.
360086_1308250

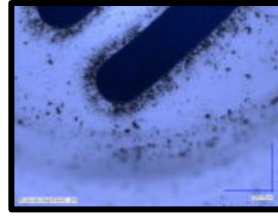


Figure 1160.
360086_1308251

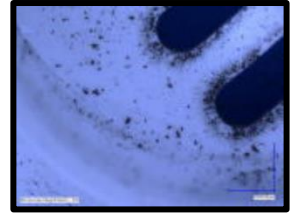


Figure 1161.
360086_1308252

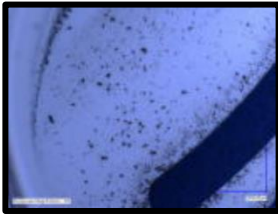


Figure 1162.
360086_1308253

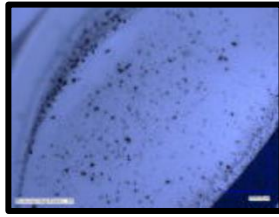


Figure 1163.
360086_1308254

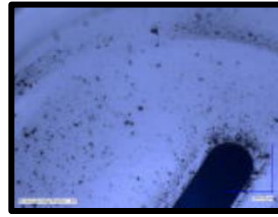


Figure 1164.
360086_1308255

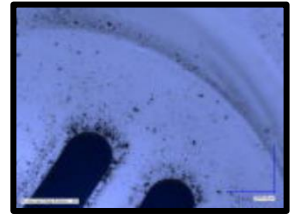


Figure 1165.
360086_1308256

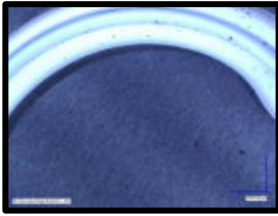


Figure 1166.
360086_1308257

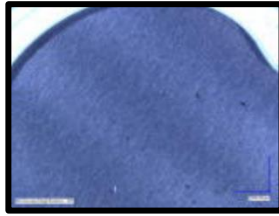


Figure 1167.
360086_1308258

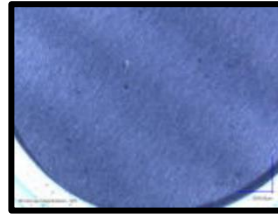


Figure 1168.
360086_1308259

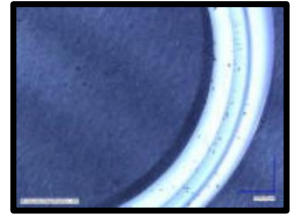


Figure 1169.
360086_1308260

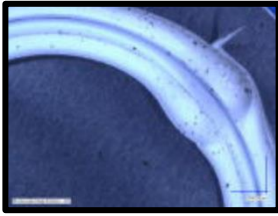


Figure 1170.
360086_1308261

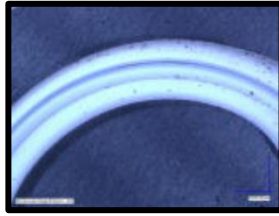


Figure 1171.
360086_1308262

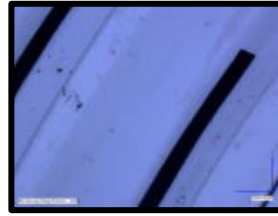


Figure 1172.
360086_1308263

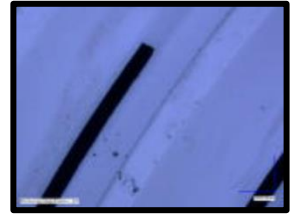


Figure 1173.
360086_1308264

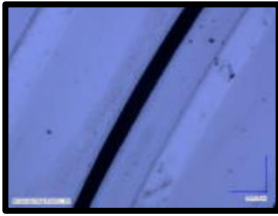


Figure 1174.
360086_1308265

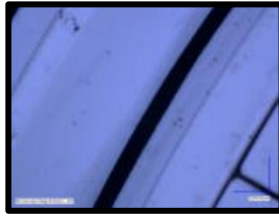


Figure 1175.
360086_1308266

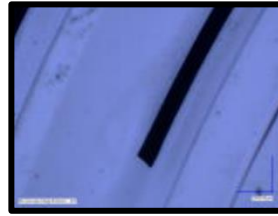


Figure 1176.
360086_1308267

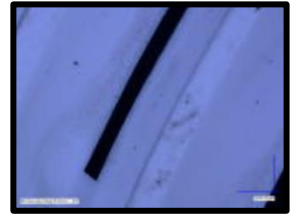


Figure 1177.
360086_1308268



Figure 1178.
360086_1308269



Figure 1179.
360086_1308270



Figure 1180.
360086_1308271



Figure 1181.
360086_1308272

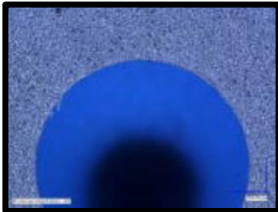


Figure 1182.
360086_1308273

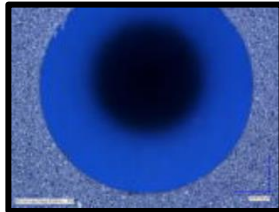


Figure 1183.
360086_1308274

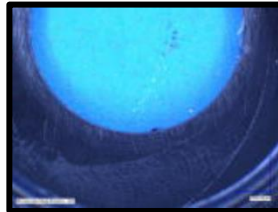


Figure 1184.
360086_1308275

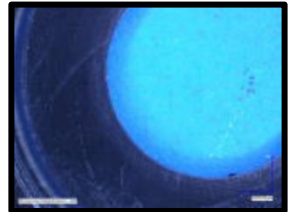


Figure 1185.
360086_1308276

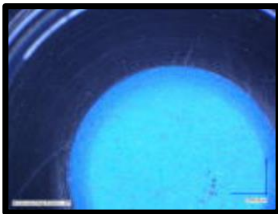


Figure 1186.
360086_1308277

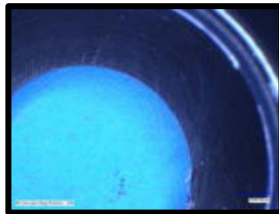


Figure 1187.
360086_1308278

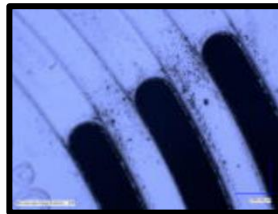


Figure 1188.
360086_1308279

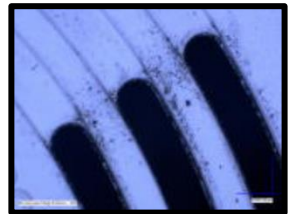


Figure 1189.
360086_1308280

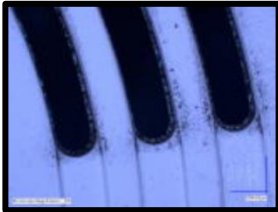


Figure 1190.
360086_1308281

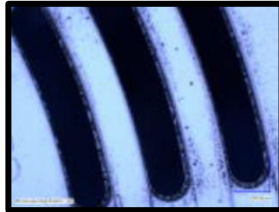


Figure 1191.
360086_1308282

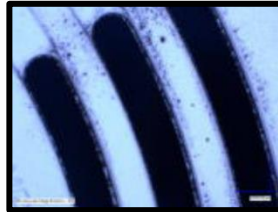


Figure 1192.
360086_1308283



Figure 1193.
360086_1308284

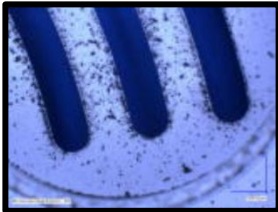


Figure 1194.
360086_1308285



Figure 1195.
360086_1308286

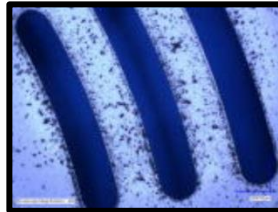


Figure 1196.
360086_1308287



Figure 1197.
360086_1308288

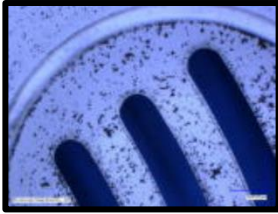


Figure 1198.
360086_1308289



Figure 1199.
360086_1308290

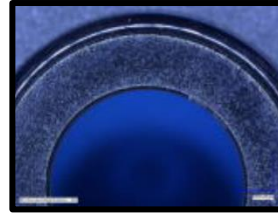


Figure 1200.
360086_1308291

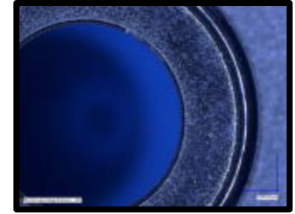


Figure 1201.
360086_1308292

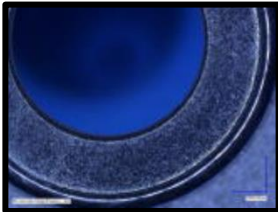


Figure 1202.
360086_1308293

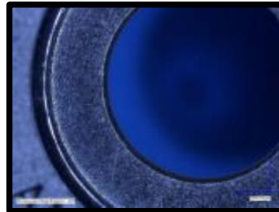


Figure 1203.
360086_1308294

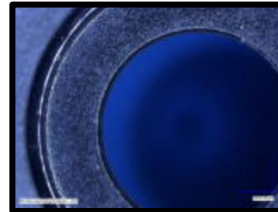


Figure 1204.
360086_1308295

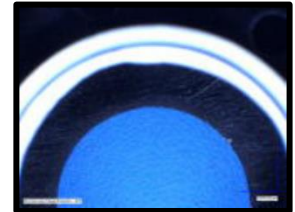


Figure 1205.
360086_1308296

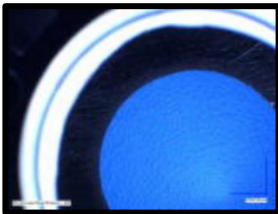


Figure 1206.
360086_1308297

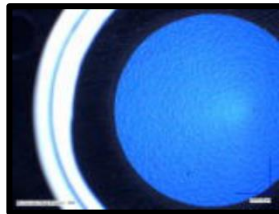


Figure 1207.
360086_1308298

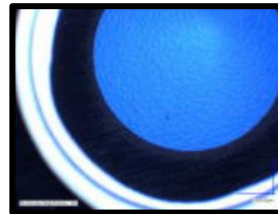


Figure 1208.
360086_1308299

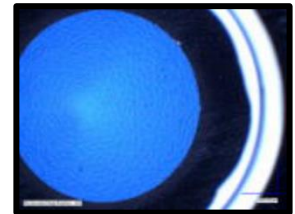


Figure 1209.
360086_1308300

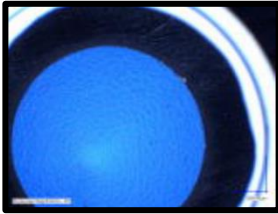


Figure 1210.
360086_1308301

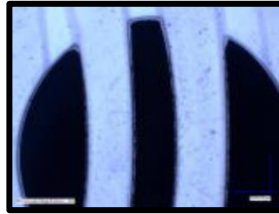


Figure 1211.
360086_1308302

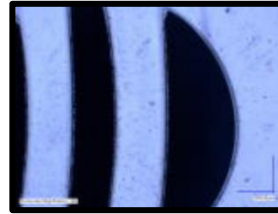


Figure 1212.
360086_1308303

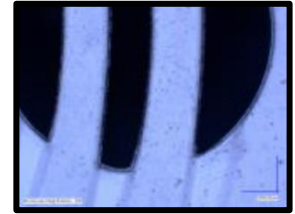


Figure 1213.
360086_1308304



Figure 1214.
360086_1308305

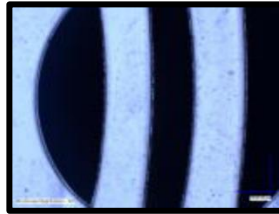


Figure 1215.
360086_1308306

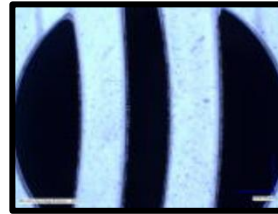


Figure 1216.
360086_1308307

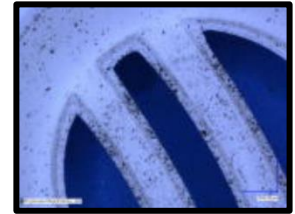


Figure 1217.
360086_1308308



Figure 1218.
360086_1308309



Figure 1219.
360086_1308310



Figure 1220.
360086_1308311



Figure 1221.
360086_1308312



Figure 1222.
360086_1308313



Figure 1223.
360086_1308314

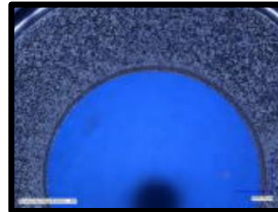


Figure 1224.
360086_1308315

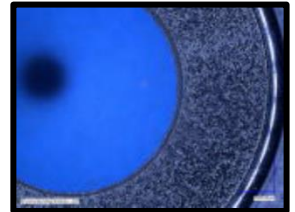


Figure 1225.
360086_1308316

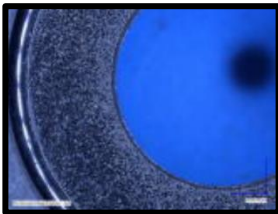


Figure 1226.
360086_1308317

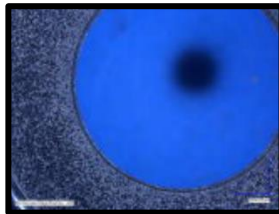


Figure 1227.
360086_1308318

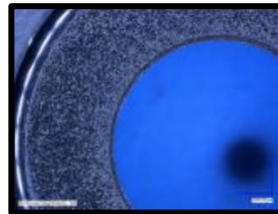


Figure 1228.
360086_1308319

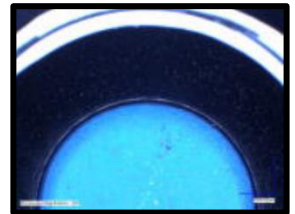


Figure 1229.
360086_1308320

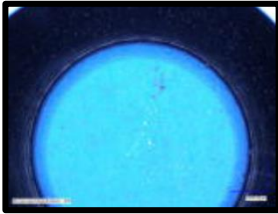


Figure 1230.
360086_1308321

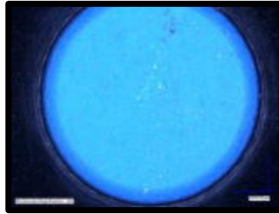


Figure 1231.
360086_1308322

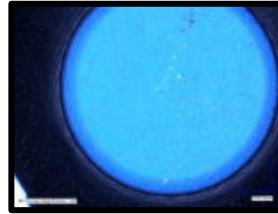


Figure 1232.
360086_1308323

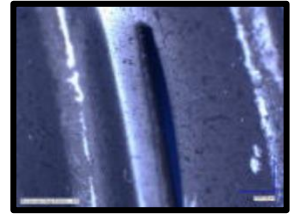


Figure 1233.
360086_1308324

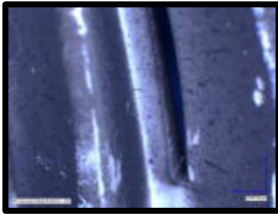


Figure 1234.
360086_1308325



Figure 1235.
360086_1308326

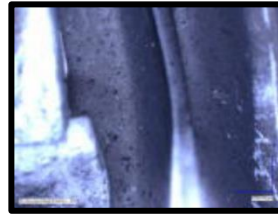


Figure 1236.
360086_1308327

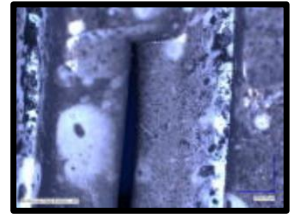


Figure 1237.
360086_1308328

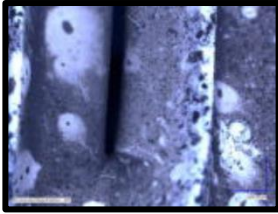


Figure 1238.
360086_1308329

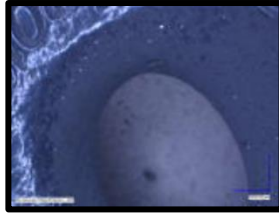


Figure 1239.
360086_1308330

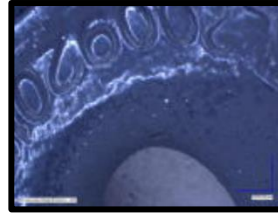


Figure 1240.
360086_1308331

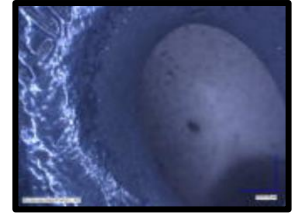


Figure 1241.
360086_1308332

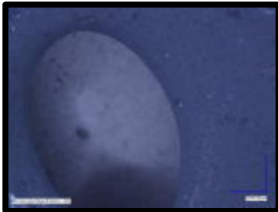


Figure 1242.
360086_1308333

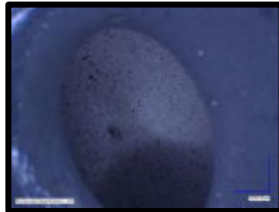


Figure 1243.
360086_1308334

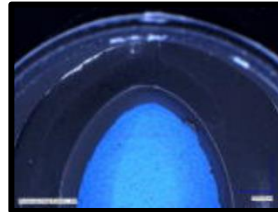


Figure 1244.
360086_1308335

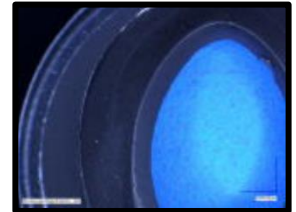


Figure 1245.
360086_1308336

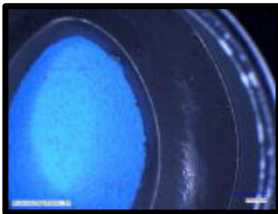


Figure 1246.
360086_1308337

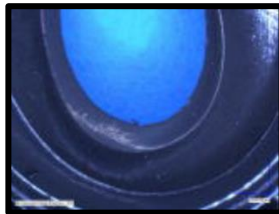


Figure 1247.
360086_1308338

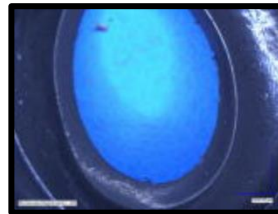


Figure 1248.
360086_1308339

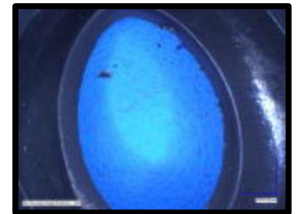


Figure 1249.
360086_1308340

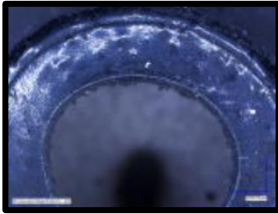


Figure 1250.
360086_1308341

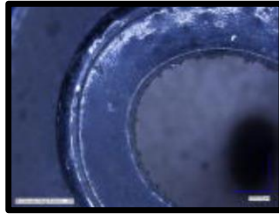


Figure 1251.
360086_1308342

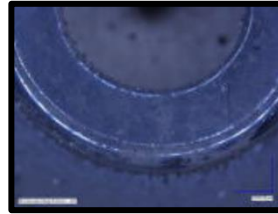


Figure 1252.
360086_1308343

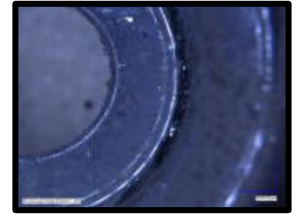


Figure 1253.
360086_1308344

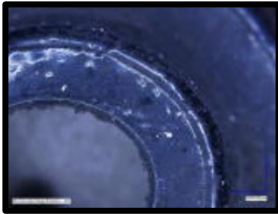


Figure 1254.
360086_1308345

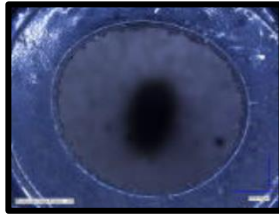


Figure 1255.
360086_1308346

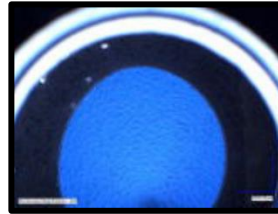


Figure 1256.
360086_1308347

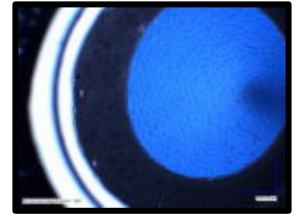


Figure 1257.
360086_1308348

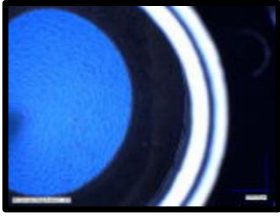


Figure 1258.
360086_1308349

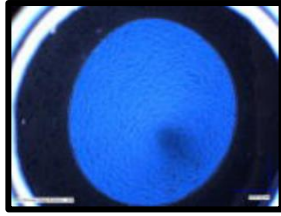


Figure 1259.
360086_1308350



Figure 1260.
360086_1308351

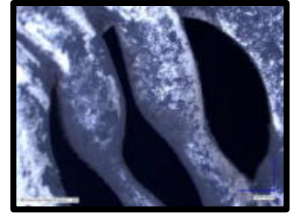


Figure 1261.
360086_1308352

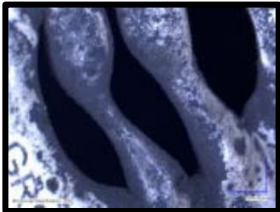


Figure 1262.
360086_1308353

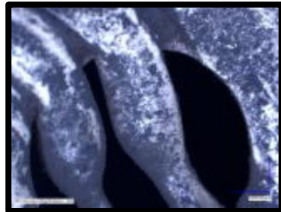


Figure 1263.
360086_1308354

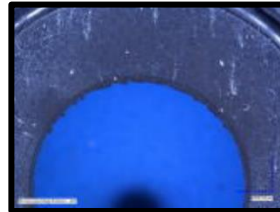


Figure 1264.
360086_1308355

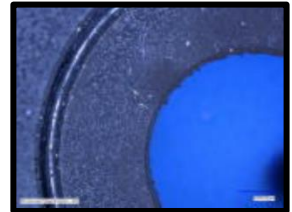


Figure 1265.
360086_1308356

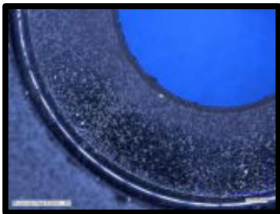


Figure 1266.
360086_1308357

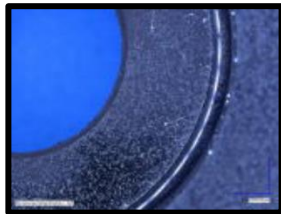


Figure 1267.
360086_1308358

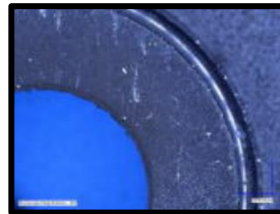


Figure 1268.
360086_1308359

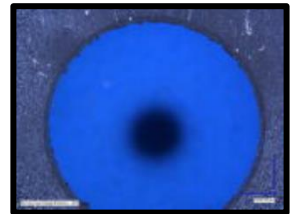


Figure 1269.
360086_1308360

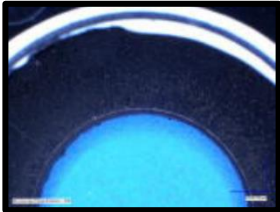


Figure 1270.
360086_1308361

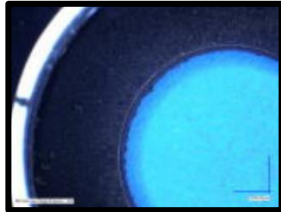


Figure 1271.
360086_1308362

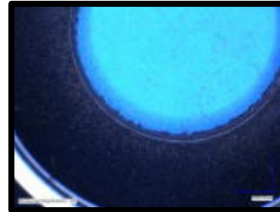


Figure 1272.
360086_1308363

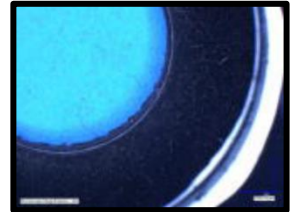


Figure 1273.
360086_1308364

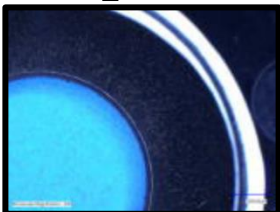


Figure 1274.
360086_1308365

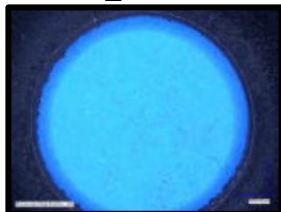


Figure 1275.
360086_1308366

Results for Test 4 (ID 360089)

The following table lists selected events that occurred during the experiment.

Table 43. Experiment Events

Description	Time (s)
2 nd Floor Heat Flux Gauge Covered	232
Gas Pump Off for 2nd floor	445
Suppression	844

The following table provides a summary of the temperature results. The “Initial” column provides the measured temperature at the beginning of the test. The maximum temperature recorded during the test is provided in the “Max” column. The remaining columns provide the calculated maximum average temperatures over pre-determined time spans.

Table 44. Temperature Value Result Summary

Description	Initial (C)	Max (C)	30 second max average (C)	1 minute max average (C)	5 minute max average (C)	10 minute max average (C)
Landing 0'	10.2	66.8	59.4	52.9	35.4	26.6
Landing 1'	10.0	64.0	41.2	36.8	25.2	19.7
Landing 2'	10.0	70.9	58.0	50.6	32.2	24.9
Landing 3'	9.9	76.0	70.4	62.7	40.6	31.6
Landing 4'	9.9	101.6	89.9	79.7	51.9	41.6
Landing 5'	9.9	107.9	95.2	84.2	56.9	45.5
Landing 6'	10.1	387.1	355.5	319.7	145.8	99.4
Landing 7'	10.3	411.8	391.1	365.7	253.0	198.6
1st Floor 0'	10.5	14.6	14.6	14.6	14.5	13.5
1st Floor 1'	10.0	13.9	13.8	13.7	13.6	13.0
1st Floor 2'	10.3	14.8	14.7	14.7	14.5	14.2
1st Floor 3'	10.1	15.9	15.7	15.6	15.0	14.5
1st Floor 4'	10.0	20.8	20.1	19.9	18.6	17.4
1st Floor 5'	9.9	27.6	27.0	26.6	23.6	21.7
1st Floor 6'	9.9	41.4	39.4	38.1	31.8	27.2
1st Floor 7'	10.0	49.3	45.9	45.4	37.9	31.7
1st Floor 8'	10.1	58.3	54.4	52.8	42.9	36.1
2nd Floor 0'	9.4	872.7	868.0	865.5	800.9	618.1
2nd Floor 1'	10.1	945.8	940.6	935.0	910.1	811.8
2nd Floor 2'	9.7	960.7	935.8	928.2	897.3	833.5
2nd Floor 3'	9.7	971.3	935.0	930.6	903.8	851.1
2nd Floor 4'	9.8	958.5	951.2	947.5	917.0	868.3
2nd Floor 5'	9.9	949.4	942.2	937.6	910.7	866.8
2nd Floor 6'	10.1	954.5	951.1	948.6	921.0	891.3
2nd Floor 7'	10.3	961.7	957.8	956.4	922.2	891.4
2nd Floor 8'	10.7	946.3	942.5	940.2	911.2	882.5
Tenability 1st Floor 5'	10.1	23.9	23.6	23.4	22.0	20.6
Tenability 2nd Floor 5'	10.3	1042.9	1016.6	1007.6	965.8	934.7

The following chart(s) present a time-dependent representation of the instantaneous temperatures measured during the experiment.

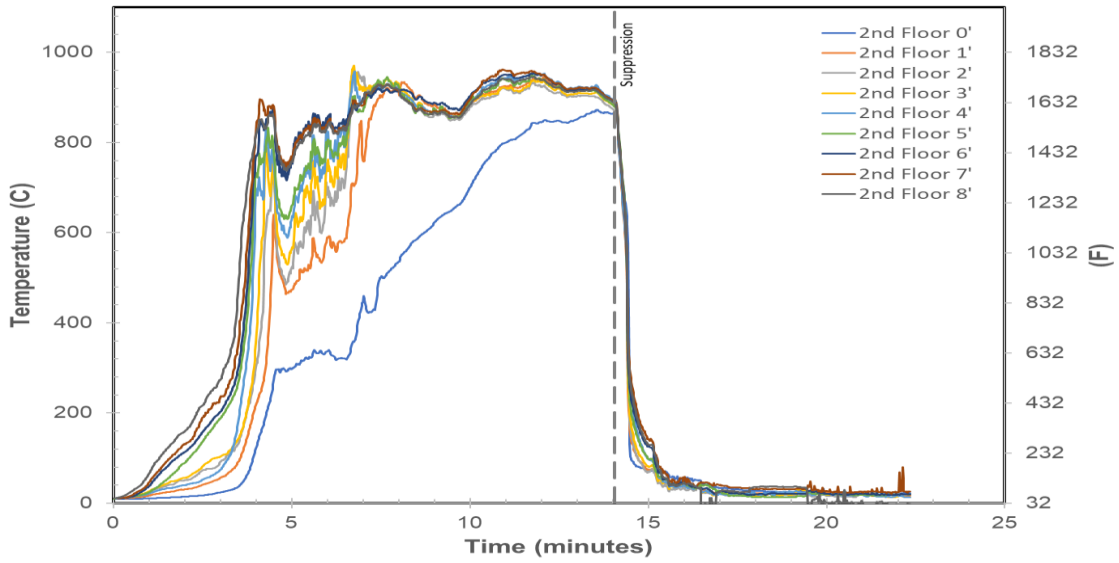


Figure 1276. Temperature – 2nd Floor

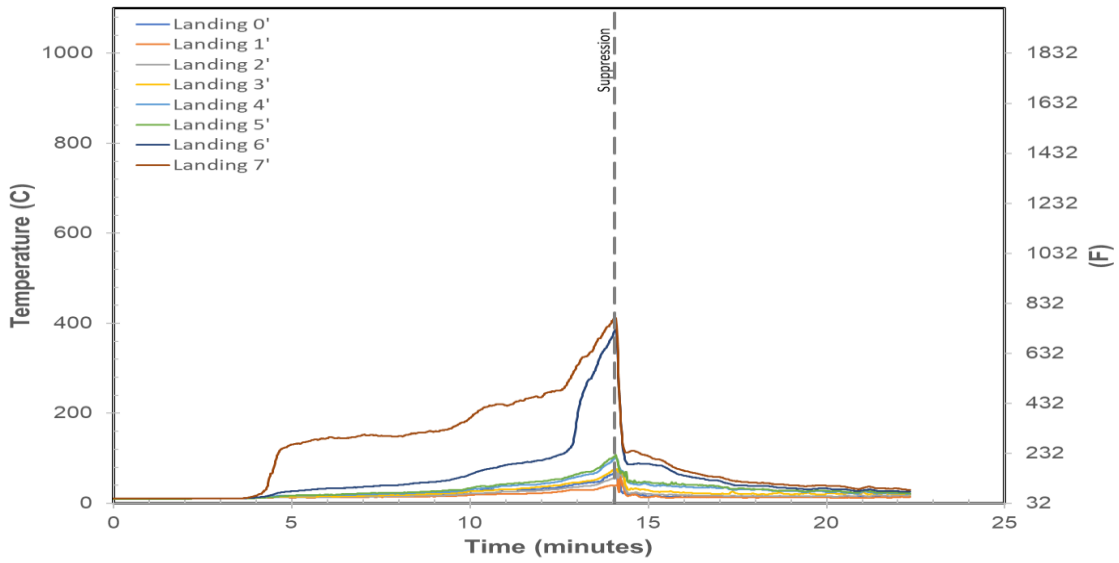


Figure 1277. Temperature – Landing

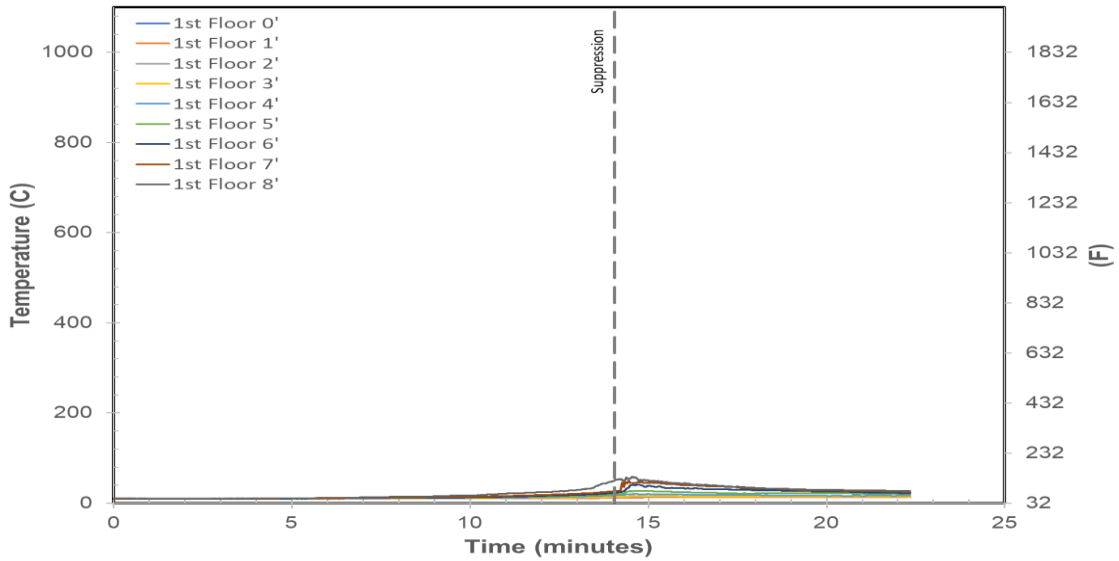


Figure 1278. Temperature – 1st Floor

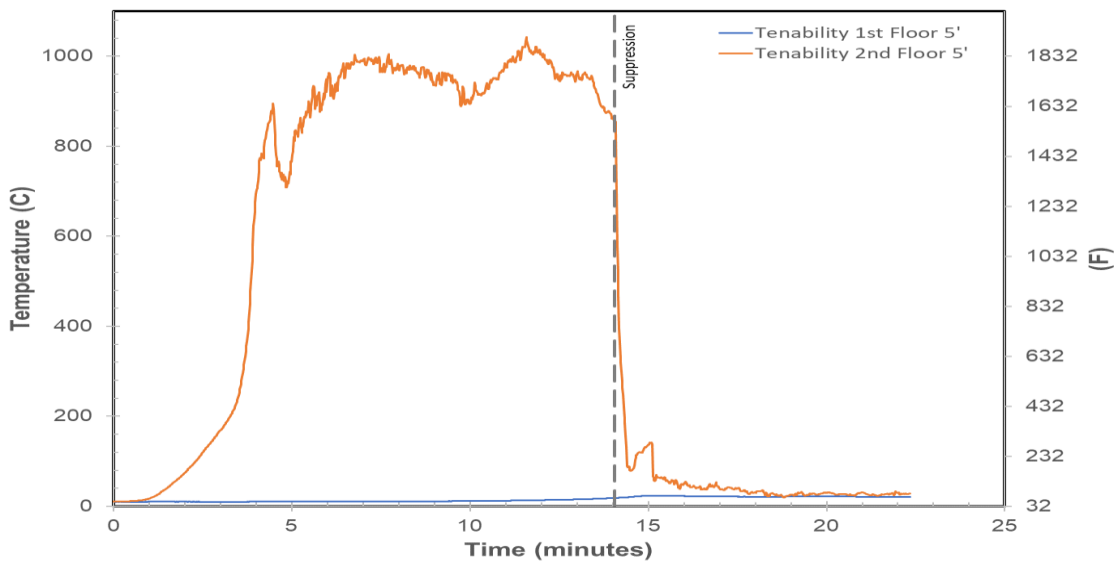


Figure 1279. Temperature - Tenability

The following table shows which heat flux transducers(s) were taken out of service during the experiment(s). The “Description” column typically describes the location of the heat flux transducer. If the heat flux measurement has to be discontinued during a test, the “Out of Service Time” and “Out of Service Reason” columns report the test time and reason why the heat flux measurement was removed, respectively.

Table 45. Out of Service Times

Description	Serial number	Out of service time (s)	Out of service reason
2nd Floor Total	1227941T	228	OverRange
2nd Floor Rad	1227941R	232	Gauge covered to limit heat exposure

The following table provides a summary of the heat flux results. The “Description” column typically describes the location of the heat flux transducer. The time at which the heat flux first changes by a pre-determined amount is provided in the “Time of Initial Change” column. The pre-determined amount of change in heat flux is provided in the “Initial Change Amount” column. The maximum heat flux recorded during the test is provided in the “Maximum” column. The “Maximum Average” columns are calculated over pre-determined time spans. A “SC” indicates that the values did not change sufficiently for this value to be calculated.

Table 46. Heat Flux Result Summary

Description	Time of Initial Change (s)	Initial Change Value (kW/m ²)	Maximum (kW/m ²)	10 Second Maximum Average (kW/m ²)	30 Second Maximum Average (kW/m ²)	1 Minute Maximum Average (kW/m ²)	5 Minute Maximum Average (kW/m ²)	10 Minute Maximum Average (kW/m ²)
1st Floor Total	SC	1	0.2	0.2	0.2	0.2	0.2	0.1
1st Floor Rad	SC	1	0.1	0.1	0.1	0.1	0.1	0.1
2nd Floor Total	121	1	32.3	24.4	15.3	10.0	2.4	1.2
2nd Floor Rad	197	1	10.0	8.7	5.0	3.0	0.7	0.3

The following chart(s) shows a time dependent representation of the baseline corrected instantaneous heat flux measured during the experiment.

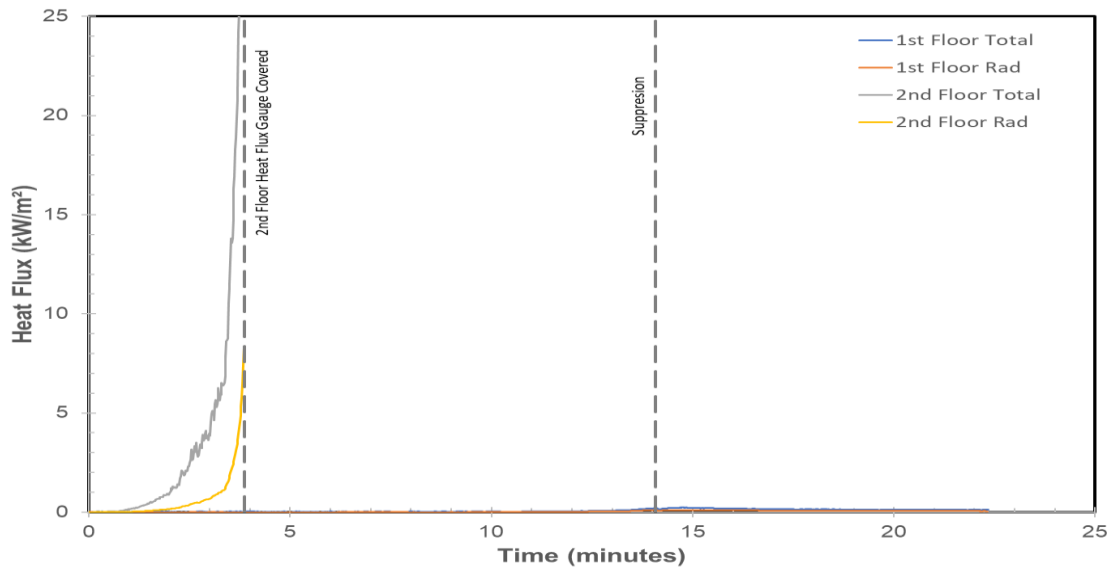


Figure 1280. Heat Flux

The following table provides a summary of the optical density.

Table 47. Optical Density Results Summary

Description	Average Optical Density (1/m)	Maximum Optical Density (1/m)
1st Floor ODM	0.33	1.16

The following chart provides a time dependent representation of the optical density measured during the experiment.

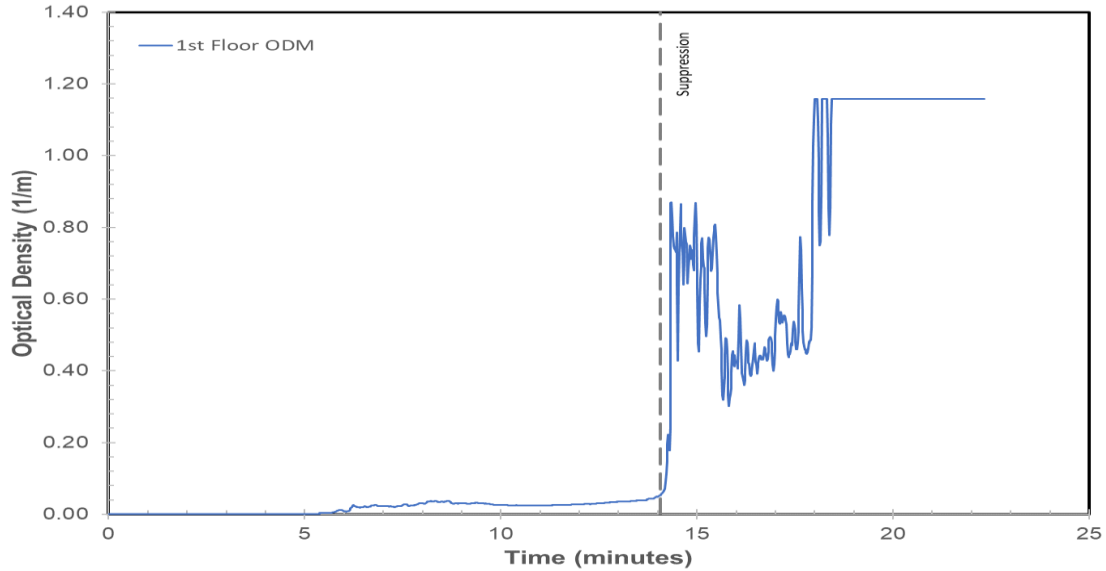


Figure 1281. Optical Density

The following chart shows the obscuration during the experiment.

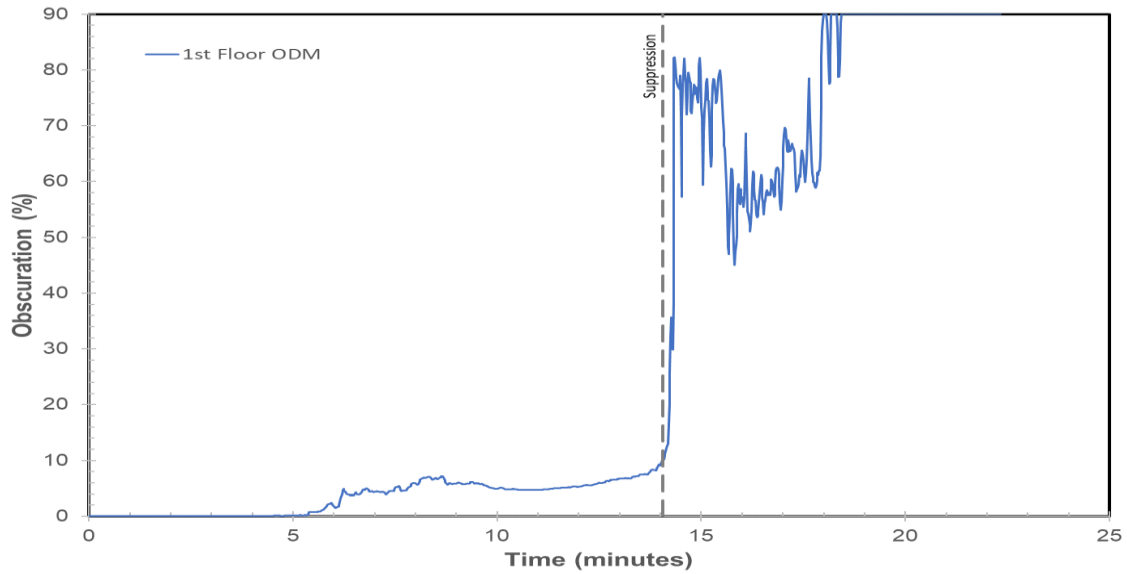


Figure 1282. Obscuration

The following table shows which oxygen analyzer(s) were taken out of service during the experiment.

Table 48. Out of Service

Description	Time out of service time (s)	Out of service reason
2nd Floor	445	Pump Turned Off

The following table provides a summary of the oxygen measurement results.

Table 49. Oxygen Measurement Results

Description	Full Scale Range (%)	Minimum Value (%)	Average (%)
2nd Floor	25	0.875	11.14699
1st Floor	25	19.94375	20.51214

The following chart presents the oxygen concentration(s) measured during the test.

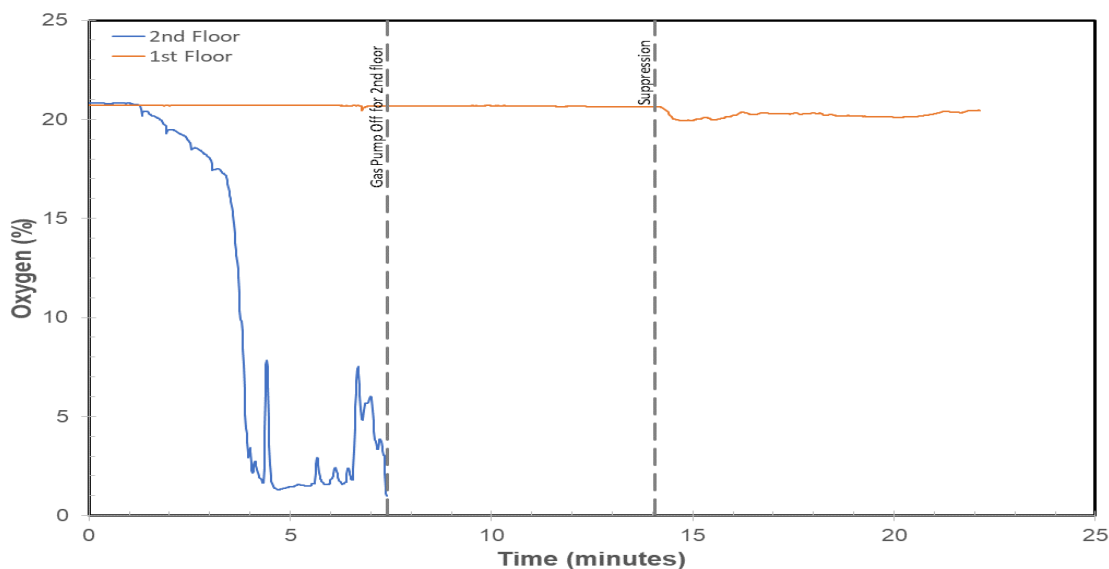


Figure 1283. Oxygen Concentration

The following table shows which CO/CO2 gas analyzer(s) were taken out of service (OOS) during the experiment.

Table 50. Out of Service

Description	CO- Time OOS (s)	CO- Reason OOS	CO2- Time OOS (s)	CO2- Reason OOS
2nd Floor	445	Pump Turned Off	445	Pump Turned Off

The following table provides a summary of the carbon monoxide gas measurement results.

Table 51. CO Measurement Results

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
2nd Floor	0.05	0.0435	0.0093

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
1st Floor	0.05	0.0001	-0.0001

The following table provides a summary of the carbon dioxide gas measurement results.

Table 52. CO₂ Measurement Results

Description	Full Scale Range (mol/mol)	Maximum Value (mol/mol)	Average (mol/mol)
2nd Floor	0.25	0.1494	0.0755
1st Floor	0.25	0.0068	0.0014

The following chart shows the carbon monoxide concentration(s) measured during the experiment.

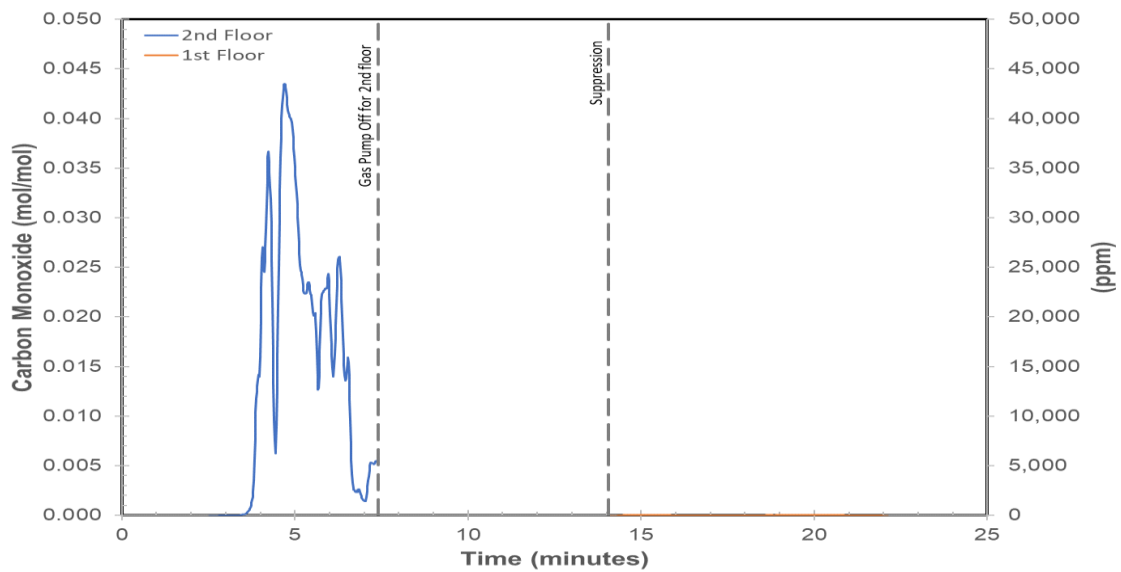


Figure 1284. Carbon Monoxide Concentration(s)

The following chart shows the carbon dioxide concentration(s) measured during the experiment.

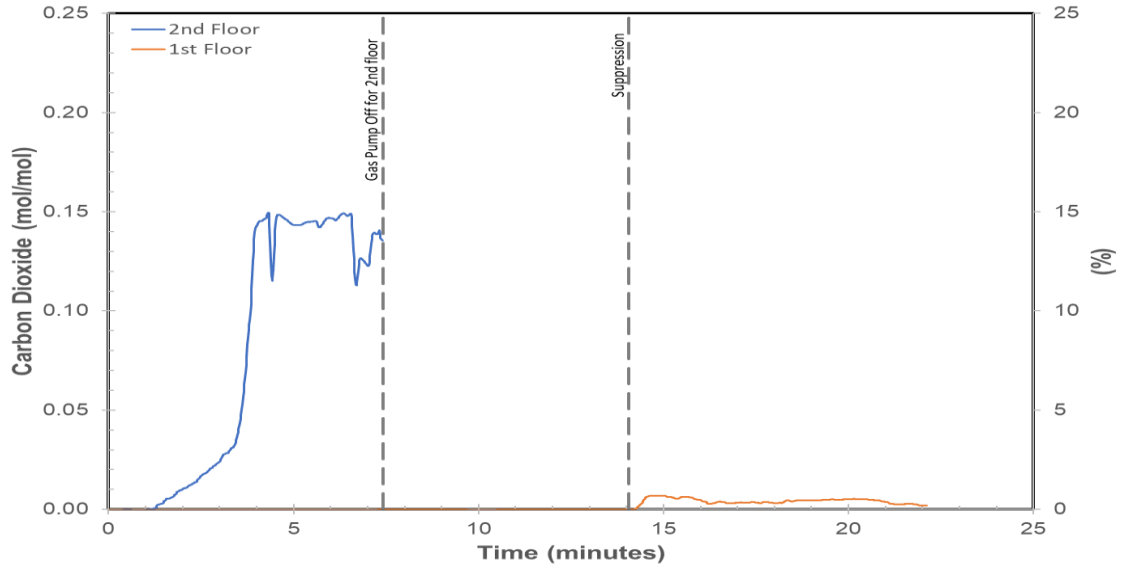


Figure 1285. Carbon Dioxide Concentration(s)

The following table provides a description of the video(s) taken during this experiment.

Table 53. Video Log

Description	Start Time	Duration (s)	Filename
Stairs Looking down	09:48:46	1438	360089_20230309_094839_1A.mov
Chair	09:48:54	1441	360089_20230309_094847_2A.mov
Stairs looking up	09:49:01	1445	360089_20230309_094854_3A.mov
Wide View 2nd	09:49:08	1449	360089_20230309_094902_4A.mov
Ignition	09:49:16	1452	360089_20230309_094909_5A.mov
Smoke Detector 1st floor	09:49:23	1457	360089_20230309_094917_6A.mov
Wide View 1st	09:49:31	1461	360089_20230309_094924_7A.mov
HD outside view	09:49:39	1464	360089_20230309_094932_8A.mov
Data Chart	09:49:51	1464	360089_20230309_094944_17A.mov
Master			360089_1313197.MOV
Custom - Master Sped Up 60X			360089_1313198.MOV

The following figures show all of the still photographs uploaded into the FireTOSS system. The caption below each figure provides the picture's filename as well as any description and elapsed test time associated with the picture.

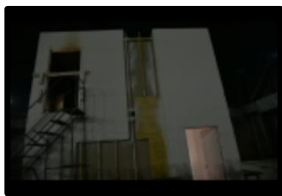


Figure 1286. Pre test 27 minutes, 360089_1305397



Figure 1287. Pre test 27 minutes, 360089_1305398



Figure 1288. Pre test 27 minutes, 360089_1305399

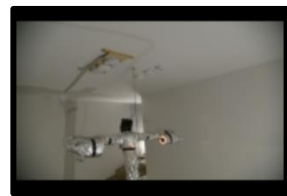


Figure 1289. Pre test 27 minutes, 360089_1305400



Figure 1290. Pre test 27 minutes, 360089_1305401



Figure 1291. Pre test 27 minutes, 360089_1305402



Figure 1292. Pre test 27 minutes, 360089_1305403

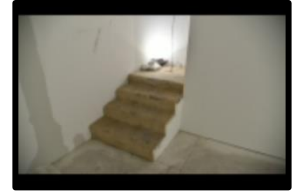


Figure 1293. Pre test 27 minutes, 360089_1305404



Figure 1294. Pre test 27 minutes, 360089_1305405



Figure 1295. Pre test 27 minutes, 360089_1305406



Figure 1296. Pre test 27 minutes, 360089_1305407



Figure 1297. Pre test 27 minutes, 360089_1305408



Figure 1298. Pre test 27 minutes, 360089_1305409



Figure 1299. Pre test 26 minutes, 360089_1305410



Figure 1300. Pre test 26 minutes, 360089_1305411



Figure 1301. Pre test 26 minutes, 360089_1305412



Figure 1302. Pre test 26 minutes, 360089_1305413



Figure 1303. Pre test 26 minutes, 360089_1305414



Figure 1304. Pre test 26 minutes, 360089_1305415



Figure 1305. Pre test 26 minutes, 360089_1305416



Figure 1306. Pre test 26 minutes, 360089_1305417



Figure 1307. Pre test 26 minutes, 360089_1305418



Figure 1308. Pre test 26 minutes, 360089_1305419



Figure 1309. Pre test 26 minutes, 360089_1305420



Figure 1310. Pre test 26 minutes, 360089_1305421



Figure 1311. Pre test 26 minutes, 360089_1305422



Figure 1312. Pre test 26 minutes, 360089_1305423



Figure 1313. Pre test 26 minutes, 360089_1305424



Figure 1314. Pre test 26 minutes, 360089_1305425



Figure 1315. Pre test 26 minutes, 360089_1305426



Figure 1316. Pre test 25 minutes, 360089_1305427



Figure 1317. Pre test 25 minutes, 360089_1305428



Figure 1318. Pre test 25 minutes, 360089_1305429



Figure 1319. Pre test 24 minutes, 360089_1305430



Figure 1320. Pre test 18 minutes, 360089_1305431



Figure 1321. Pre test 18 minutes, 360089_1305432

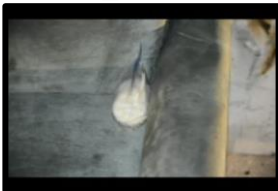


Figure 1322. Pre test 18 minutes, 360089_1305433

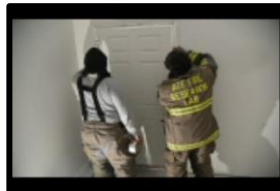


Figure 1323. Pre test 17 minutes, 360089_1305434



Figure 1324. Pre test 16 minutes, 360089_1305435



Figure 1325. Pre test 16 minutes, 360089_1305436



Figure 1326. Pre test 16 minutes, 360089_1305437



Figure 1327. Pre test 16 minutes, 360089_1305438



Figure 1328. Pre test 14 minutes, 360089_1305439



Figure 1329. Pre test 14 minutes, 360089_1305440



Figure 1330. Pre test 14 minutes, 360089_1305441



Figure 1331. Pre test 14 minutes, 360089_1305442

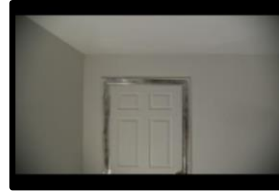


Figure 1332. Pre test 12 minutes, 360089_1305443



Figure 1333. Pre test 12 minutes, 360089_1305444



Figure 1334. Pre test 12 minutes, 360089_1305445



Figure 1335. Pre test 12 minutes, 360089_1305446



Figure 1336. Pre test 12 minutes, 360089_1305447



Figure 1337. Pre test 11 minutes, 360089_1305448



Figure 1338. Pre test 11 minutes, 360089_1305449



Figure 1339. Pre test 11 minutes, 360089_1305450



Figure 1340. Pre test 11 minutes, 360089_1305451



Figure 1341. Pre test 61 seconds, 360089_1305452



Figure 1342. Pre test 57 seconds, 360089_1305453



Figure 1343. Pre test 1 seconds, 360089_1305454

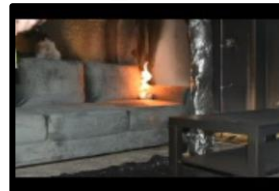


Figure 1344. 1 seconds, 360089_1305455



Figure 1345. 27 seconds, 360089_1305456



Figure 1346. 29 seconds, 360089_1305457



Figure 1347. 71 seconds, 360089_1305458



Figure 1348. 93 seconds, 360089_1305459



Figure 1349. 97 seconds, 360089_1305460



Figure 1350. 105 seconds, 360089_1305461



Figure 1351. 117 seconds, 360089_1305462



Figure 1352. 121 seconds, 360089_1305463



Figure 1353. 159 seconds, 360089_1305464



Figure 1354. 167 seconds, 360089_1305465



Figure 1355. 169 seconds, 360089_1305466



Figure 1356. 175 seconds, 360089_1305467



Figure 1357. 185 seconds, 360089_1305468



Figure 1358. 193 seconds, 360089_1305469



Figure 1359. 199 seconds, 360089_1305470



Figure 1360. 211 seconds, 360089_1305471



Figure 1361. 211 seconds, 360089_1305472



Figure 1362. 215 seconds, 360089_1305473



Figure 1363. 217 seconds, 360089_1305474



Figure 1364. 281 seconds, 360089_1305475



Figure 1365. 285 seconds, 360089_1305476



Figure 1366. 293 seconds, 360089_1305477



Figure 1367. 303 seconds, 360089_1305478



Figure 1368. 303 seconds, 360089_1305479



Figure 1369. 311 seconds, 360089_1305480



Figure 1390. 655 seconds,
360089_1305501



Figure 1391. 663 seconds,
360089_1305502



Figure 1392. 671 seconds,
360089_1305503



Figure 1393. 677 seconds,
360089_1305504



Figure 1394. 699 seconds,
360089_1305505



Figure 1395. 701 seconds,
360089_1305506



Figure 1396. 733 seconds,
360089_1305507



Figure 1397. 737 seconds,
360089_1305508



Figure 1398. 747 seconds,
360089_1305509



Figure 1399. 751 seconds,
360089_1305510



Figure 1400. 805 seconds,
360089_1305511



Figure 1401. 811 seconds,
360089_1305512



Figure 1402. 817 seconds,
360089_1305513



Figure 1403. 831 seconds,
360089_1305514



Figure 1404. 833 seconds,
360089_1305515



Figure 1405. 841 seconds,
360089_1305516



Figure 1406. 843 seconds,
360089_1305517



Figure 1407. 845 seconds,
360089_1305518



Figure 1408. 847 seconds,
360089_1305519



Figure 1409. 847 seconds,
360089_1305520



Figure 1410. 849 seconds, 360089_1305521



Figure 1411. 849 seconds, 360089_1305522



Figure 1412. 851 seconds, 360089_1305523



Figure 1413. 853 seconds, 360089_1305524



Figure 1414. 855 seconds, 360089_1305525



Figure 1415. 883 seconds, 360089_1305526



Figure 1416. 887 seconds, 360089_1305527



Figure 1417. 901 seconds, 360089_1305528



Figure 1418. 903 seconds, 360089_1305529



Figure 1419. 907 seconds, 360089_1305530



Figure 1420. 921 seconds, 360089_1305531



Figure 1421. 923 seconds, 360089_1305532



Figure 1422. 927 seconds, 360089_1305533



Figure 1423. 929 seconds, 360089_1305534



Figure 1424. 931 seconds, 360089_1305535



Figure 1425. 939 seconds, 360089_1305536

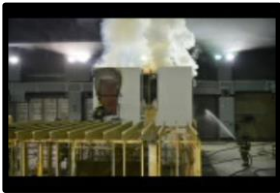


Figure 1426. 945 seconds, 360089_1305537

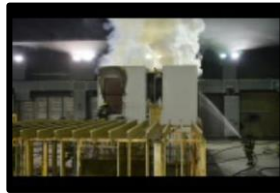


Figure 1427. 945 seconds, 360089_1305538



Figure 1428. 949 seconds, 360089_1305539

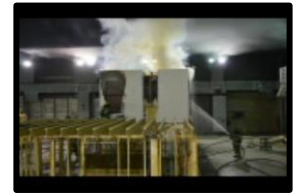


Figure 1429. 951 seconds, 360089_1305540



Figure 1430. 957 seconds, 360089_1305541



Figure 1431. 963 seconds, 360089_1305542



Figure 1432. 981 seconds, 360089_1305543



Figure 1433. 981 seconds, 360089_1305544



Figure 1434. 999 seconds, 360089_1305545



Figure 1435. 1003 seconds, 360089_1305546



Figure 1436. 1005 seconds, 360089_1305547



Figure 1437. 1009 seconds, 360089_1305548



Figure 1438. 1013 seconds, 360089_1305549



Figure 1439. 1043 seconds, 360089_1305550



Figure 1440. 1049 seconds, 360089_1305551



Figure 1441. 1055 seconds, 360089_1305552



Figure 1442. 1065 seconds, 360089_1305553



Figure 1443. 1125 seconds, 360089_1305554



Figure 1444. 1127 seconds, 360089_1305555



Figure 1445. 1157 seconds, 360089_1305556



Figure 1446. 1159 seconds, 360089_1305557



Figure 1447. 1161 seconds, 360089_1305558



Figure 1448. 1163 seconds, 360089_1305559



Figure 1449. 1169 seconds, 360089_1305560



Figure 1450. 1171 seconds, 360089_1305561



Figure 1451. 1201 seconds, 360089_1305562



Figure 1452. 1205 seconds, 360089_1305563



Figure 1453. 1207 seconds, 360089_1305564



Figure 1454. 1247 seconds, 360089_1305565



Figure 1455. 1251 seconds, 360089_1305566



Figure 1456. 1251 seconds, 360089_1305567



Figure 1457. 1255 seconds, 360089_1305568



Figure 1458. Post test 0 minutes, 360089_1305569



Figure 1459. Post test 0 minutes, 360089_1305570



Figure 1460. Post test 0 minutes, 360089_1305571



Figure 1461. Post test 0 minutes, 360089_1305572



Figure 1462. Post test 0 minutes, 360089_1305573



Figure 1463. Post test 0 minutes, 360089_1305574



Figure 1464. Post test 0 minutes, 360089_1305575



Figure 1465. Post test 1 minutes, 360089_1305576



Figure 1466. Post test 1 minutes, 360089_1305577



Figure 1467. Post test 19 minutes, 360089_1306822



Figure 1468. Post test 19 minutes, 360089_1306823



Figure 1469. Post test 19 minutes, 360089_1306824



Figure 1470. Post test 20 minutes, 360089_1306825



Figure 1471. Post test 20 minutes, 360089_1306826



Figure 1472. Post test 20 minutes, 360089_1306827



Figure 1473. Post test 20 minutes, 360089_1306828

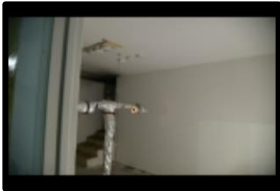


Figure 1474. Post test 22 minutes, 360089_1306829



Figure 1475. Post test 22 minutes, 360089_1306830



Figure 1476. Post test 22 minutes, 360089_1306831



Figure 1477. Post test 22 minutes, 360089_1306832



Figure 1478. Post test 22 minutes, 360089_1306833



Figure 1479. Post test 22 minutes, 360089_1306834



Figure 1480. Post test 22 minutes, 360089_1306835



Figure 1481. Post test 23 minutes, 360089_1306836



Figure 1482. Post test 23 minutes, 360089_1306837



Figure 1483. Post test 23 minutes, 360089_1306838



Figure 1484. Post test 23 minutes, 360089_1306839



Figure 1485. Post test 23 minutes, 360089_1306840



Figure 1486. Post test 23 minutes, 360089_1306841



Figure 1487. Post test 23 minutes, 360089_1306842



Figure 1488. Post test 23 minutes, 360089_1306843



Figure 1489. Post test 23 minutes, 360089_1306844



Figure 1490. Post test 23 minutes, 360089_1306845



Figure 1491. Post test 23 minutes, 360089_1306846



Figure 1492. Post test 23 minutes, 360089_1306847



Figure 1493. Post test 23 minutes, 360089_1306848



Figure 1494. Post test 23 minutes, 360089_1306849



Figure 1495. Post test 23 minutes, 360089_1306850



Figure 1496. Post test 23 minutes, 360089_1306851



Figure 1497. Post test 25 minutes, 360089_1306852



Figure 1498. Post test 25 minutes, 360089_1306853

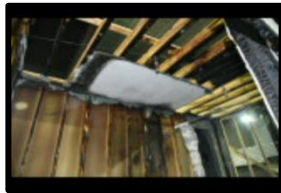


Figure 1499. Post test 25 minutes, 360089_1306854



Figure 1500. Post test 25 minutes, 360089_1306855



Figure 1501. Post test 25 minutes, 360089_1306856



Figure 1502. Post test 25 minutes, 360089_1306857



Figure 1503. Post test 25 minutes, 360089_1306858



Figure 1504. Post test 25 minutes, 360089_1306859



Figure 1505. Post test 25 minutes, 360089_1306860



Figure 1506. Post test 25 minutes, 360089_1306861



Figure 1507. Post test 25 minutes, 360089_1306862



Figure 1508. Post test 25 minutes, 360089_1306863



Figure 1509. Post test 25 minutes, 360089_1306864



Figure 1510. Post test 25 minutes, 360089_1306865



Figure 1511. Post test 25 minutes, 360089_1306866



Figure 1512. Post test 26 minutes, 360089_1306867



Figure 1513. Post test 26 minutes, 360089_1306868



Figure 1514. Post test 26 minutes, 360089_1306869



Figure 1515. Post test 26 minutes, 360089_1306870



Figure 1516. Post test 26 minutes, 360089_1306871



Figure 1517. Post test 26 minutes, 360089_1306872



Figure 1518. Post test 26 minutes, 360089_1306873



Figure 1519. Post test 26 minutes, 360089_1306874



Figure 1520. Post test 26 minutes, 360089_1306875



Figure 1521. Post test 26 minutes, 360089_1306876



Figure 1522. Post test 26 minutes, 360089_1306877



Figure 1523. Post test 27 minutes, 360089_1306878



Figure 1524. Post test 27 minutes, 360089_1306879



Figure 1525. Post test 27 minutes, 360089_1306880



Figure 1526. Post test 27 minutes, 360089_1306881



Figure 1527. Post test 27 minutes, 360089_1306882



Figure 1528. Post test 27 minutes, 360089_1306883



Figure 1529. Post test 27 minutes, 360089_1306884



Figure 1530. Post test 28 minutes, 360089_1306885



Figure 1531. Post test 28 minutes, 360089_1306886



Figure 1532. Post test 28 minutes, 360089_1306887



Figure 1533. Post test 28 minutes, 360089_1306888



Figure 1534. Post test 28 minutes, 360089_1306889



Figure 1535. Post test 28 minutes, 360089_1306890



Figure 1536. Post test 29 minutes, 360089_1306891



Figure 1537. Post test 29 minutes, 360089_1306892



Figure 1538. Post test 29 minutes, 360089_1306893



Figure 1539. 360089_1307433



Figure 1540. 360089_1307434



Figure 1541. 360089_1307435



Figure 1542. 360089_1307436



Figure 1543. 360089_1307437



Figure 1544. 360089_1307438



Figure 1545. 360089_1307439



Figure 1546. 360089_1307440



Figure 1547. 360089_1307441



Figure 1548. 360089_1307442



Figure 1549. 360089_1307443



Figure 1550.
360089_1307444



Figure 1551.
360089_1307445

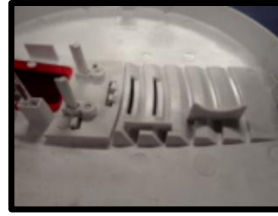


Figure 1552.
360089_1307446



Figure 1553.
360089_1307447

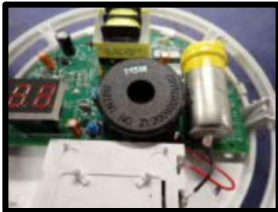


Figure 1554.
360089_1307448



Figure 1555.
360089_1307449



Figure 1556.
360089_1307450



Figure 1557.
360089_1307451



Figure 1558.
360089_1307452



Figure 1559.
360089_1307453

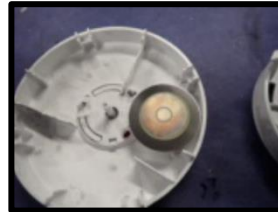


Figure 1560.
360089_1307454



Figure 1561.
360089_1307455

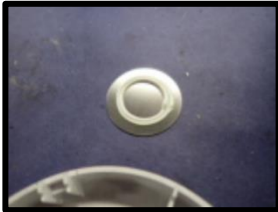


Figure 1562.
360089_1307456

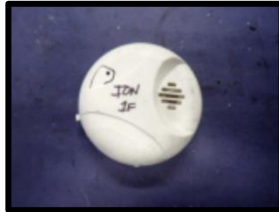


Figure 1563.
360089_1307457



Figure 1564.
360089_1307458



Figure 1565.
360089_1307459



Figure 1566.
360089_1307460



Figure 1567.
360089_1307461



Figure 1568.
360089_1307462



Figure 1569.
360089_1307463



Figure 1570.
360089_1307464



Figure 1571.
360089_1307465

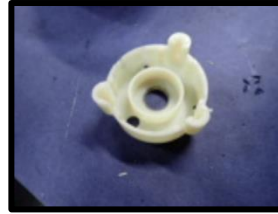


Figure 1572.
360089_1307466



Figure 1573.
360089_1307467

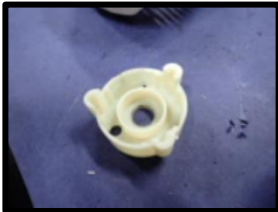


Figure 1574.
360089_1307468



Figure 1575.
360089_1307469



Figure 1576.
360089_1307470



Figure 1577.
360089_1307471



Figure 1578.
360089_1307472



Figure 1579.
360089_1307473



Figure 1580.
360089_1307474



Figure 1581.
360089_1307475



Figure 1582.
360089_1307476

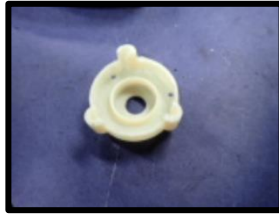


Figure 1583.
360089_1307477



Figure 1584.
360089_1307478



Figure 1585.
360089_1308367



Figure 1586.
360089_1308368



Figure 1587.
360089_1308369



Figure 1588.
360089_1308370

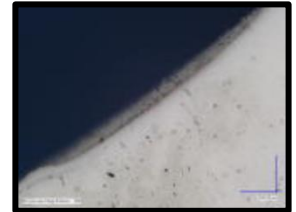


Figure 1589.
360089_1308371



Figure 1590.
360089_1308372



Figure 1591.
360089_1308373



Figure 1592.
360089_1308374



Figure 1593.
360089_1308375



Figure 1594.
360089_1308376



Figure 1595.
360089_1308377



Figure 1596.
360089_1308378

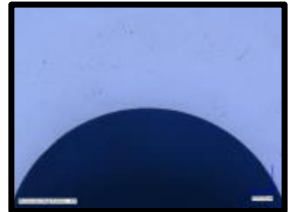


Figure 1597.
360089_1308379

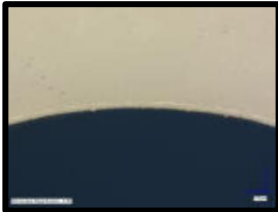


Figure 1598.
360089_1308380



Figure 1599.
360089_1308381

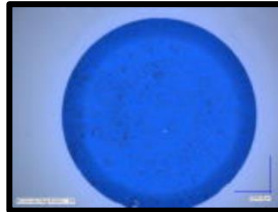


Figure 1600.
360089_1308382



Figure 1601.
360089_1308383

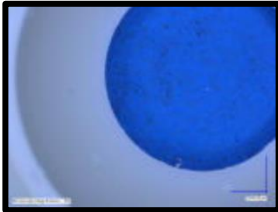


Figure 1602.
360089_1308384

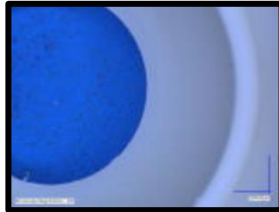


Figure 1603.
360089_1308385

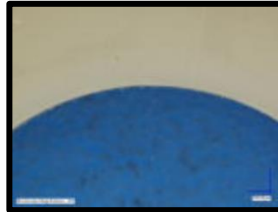


Figure 1604.
360089_1308386

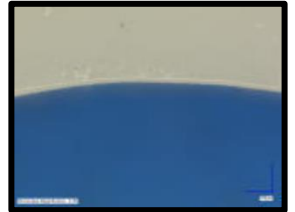


Figure 1605.
360089_1308387



Figure 1606.
360089_1308388



Figure 1607.
360089_1308389



Figure 1608.
360089_1308390



Figure 1609.
360089_1308391



Figure 1610.
360089_1308392



Figure 1611.
360089_1308393



Figure 1612.
360089_1308394



Figure 1613.
360089_1308395



Figure 1614.
360089_1308396



Figure 1615.
360089_1308397



Figure 1616.
360089_1308398



Figure 1617.
360089_1308399



Figure 1618.
360089_1308400



Figure 1619.
360089_1308401

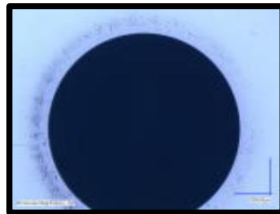


Figure 1620.
360089_1308402



Figure 1621.
360089_1308403



Figure 1622.
360089_1308404



Figure 1623.
360089_1308405

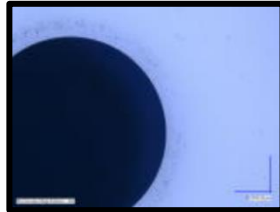


Figure 1624.
360089_1308406

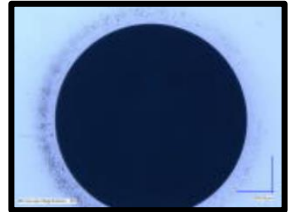


Figure 1625.
360089_1308407

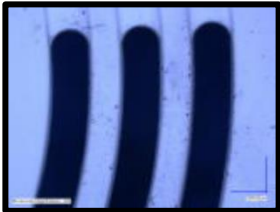


Figure 1626.
360089_1308408

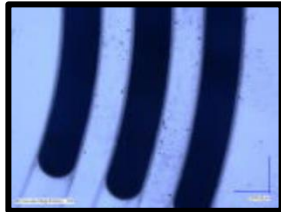


Figure 1627.
360089_1308409

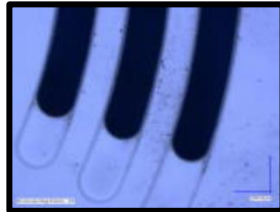


Figure 1628.
360089_1308410

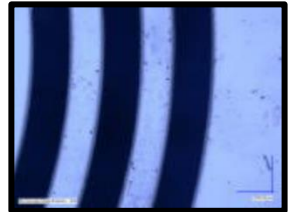


Figure 1629.
360089_1308411



Figure 1630.
360089_1308412



Figure 1631.
360089_1308413



Figure 1632.
360089_1308414



Figure 1633.
360089_1308415

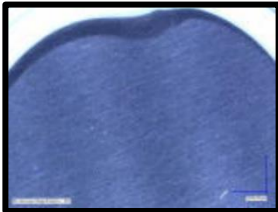


Figure 1634.
360089_1308416

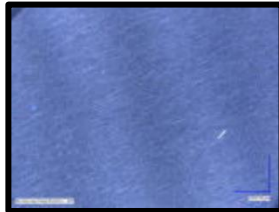


Figure 1635.
360089_1308417

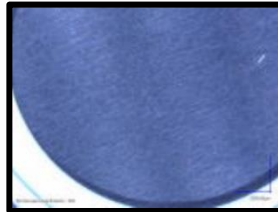


Figure 1636.
360089_1308418

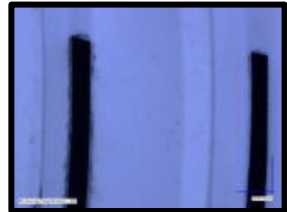


Figure 1637.
360089_1308419

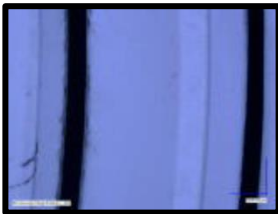


Figure 1638.
360089_1308420



Figure 1639.
360089_1308421



Figure 1640.
360089_1308422



Figure 1641.
360089_1308423



Figure 1642.
360089_1308424



Figure 1643.
360089_1308425



Figure 1644.
360089_1308426



Figure 1645.
360089_1308427

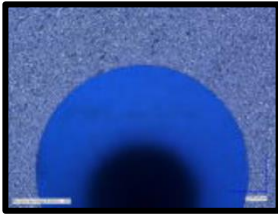


Figure 1646.
360089_1308428

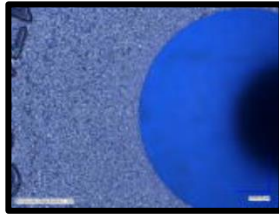


Figure 1647.
360089_1308429

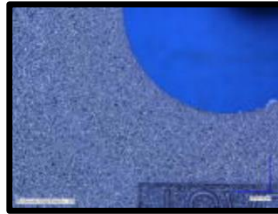


Figure 1648.
360089_1308430

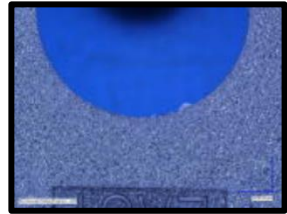


Figure 1649.
360089_1308431

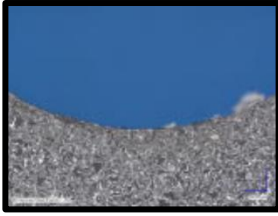


Figure 1650.
360089_1308432



Figure 1651.
360089_1308433

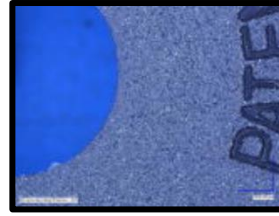


Figure 1652.
360089_1308434



Figure 1653.
360089_1308435

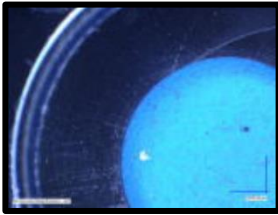


Figure 1654.
360089_1308436

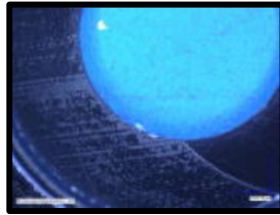


Figure 1655.
360089_1308437

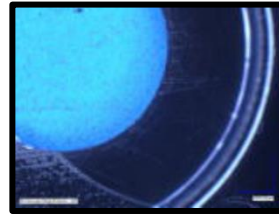


Figure 1656.
360089_1308438

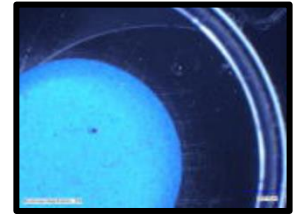


Figure 1657.
360089_1308439

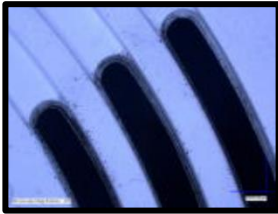


Figure 1658.
360089_1308440

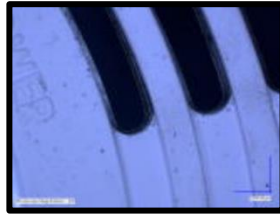


Figure 1659.
360089_1308441

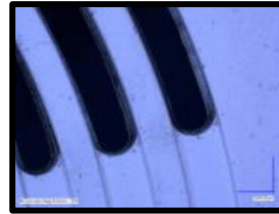


Figure 1660.
360089_1308442

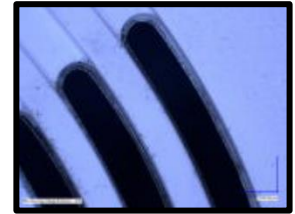


Figure 1661.
360089_1308443

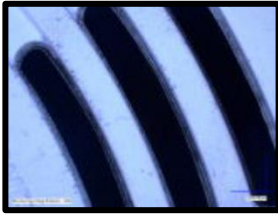


Figure 1662.
360089_1308444



Figure 1663.
360089_1308445

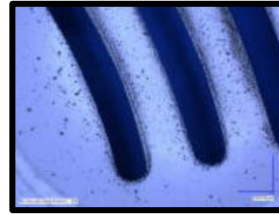


Figure 1664.
360089_1308446

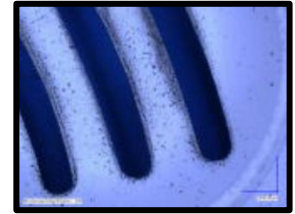


Figure 1665.
360089_1308447

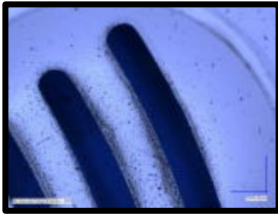


Figure 1666.
360089_1308448

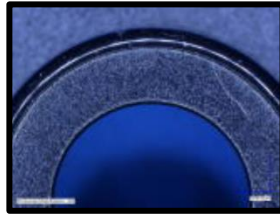


Figure 1667.
360089_1308449

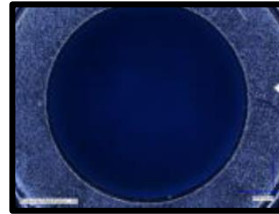


Figure 1668.
360089_1308450

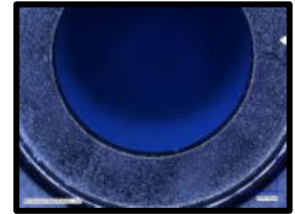


Figure 1669.
360089_1308451

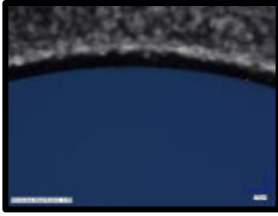


Figure 1670.
360089_1308452



Figure 1671.
360089_1308453

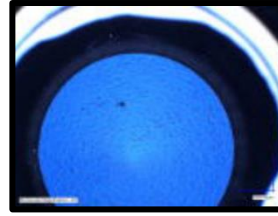


Figure 1672.
360089_1308454



Figure 1673.
360089_1308455



Figure 1674.
360089_1308456

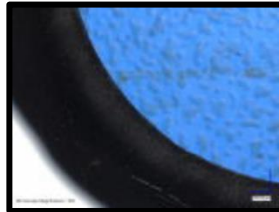


Figure 1675.
360089_1308457

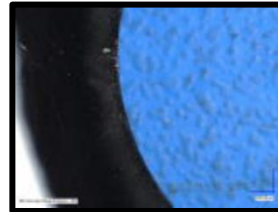


Figure 1676.
360089_1308458

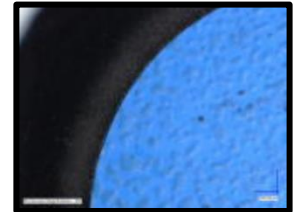


Figure 1677.
360089_1308459

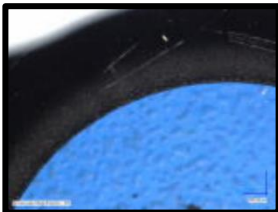


Figure 1678.
360089_1308460

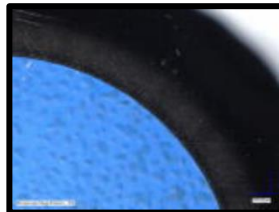


Figure 1679.
360089_1308461

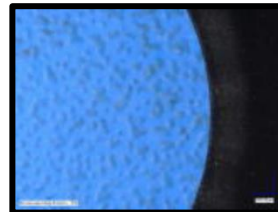


Figure 1680.
360089_1308462

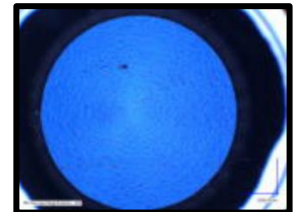


Figure 1681.
360089_1308463



Figure 1682.
360089_1308464



Figure 1683.
360089_1308465



Figure 1684.
360089_1308466



Figure 1685.
360089_1308467



Figure 1686.
360089_1308468



Figure 1687.
360089_1308469



Figure 1688.
360089_1308470

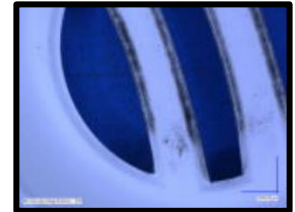


Figure 1689.
360089_1308471



Figure 1690.
360089_1308472



Figure 1691.
360089_1308473



Figure 1692.
360089_1308474

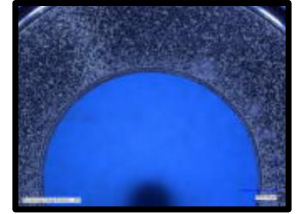


Figure 1693.
360089_1308475

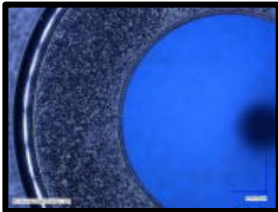


Figure 1694.
360089_1308476

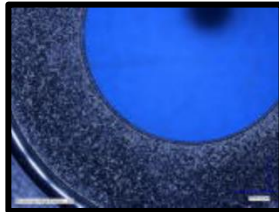


Figure 1695.
360089_1308477

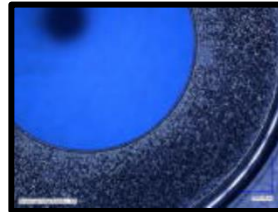


Figure 1696.
360089_1308478

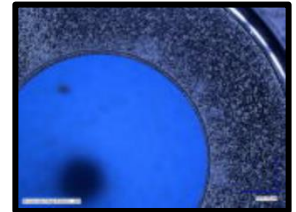


Figure 1697.
360089_1308479

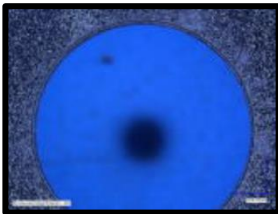


Figure 1698.
360089_1308480

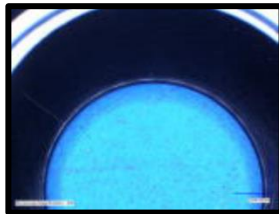


Figure 1699.
360089_1308481

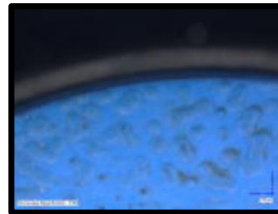


Figure 1700.
360089_1308482

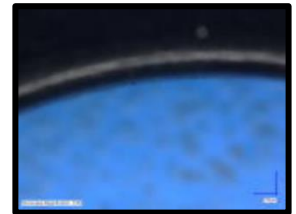


Figure 1701.
360089_1308483

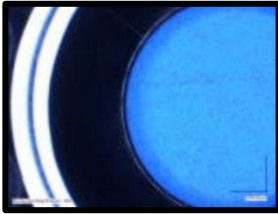


Figure 1702.
360089_1308484

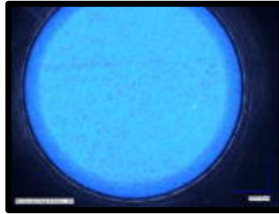


Figure 1703.
360089_1308485

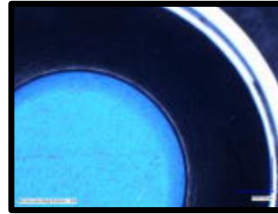


Figure 1704.
360089_1308486

Results Summary

The following table provides a summary of the heat flux results for all experiments conducted during this test series.

Table 54. Multi-Test Heat Flux Summary

Test Number	Experiment ID	Description	Maximum Heat Flux (kW/m ²)	Heat Flux 10 second maximum average (kW/m ²)	Heat Flux 30 second maximum average (kW/m ²)	Heat Flux 1 minute maximum average (kW/m ²)	Heat Flux 5 minute maximum average (kW/m ²)	Heat Flux 10 minute maximum average (kW/m ²)
1	360079	1st Floor Total	0.04	0.03	0.02	0.02	0.01	0.01
		1st Floor Rad	0.01	0.01	0.01	0.01	0.00	0.00
		2nd Floor Total	0.15	0.14	0.13	0.13	0.12	0.12
		2nd Floor Rad	0.03	0.03	0.03	0.03	0.02	0.02
2	360082	1st Floor Total	0.05	0.04	0.04	0.04	0.03	0.03
		1st Floor Rad	0.02	0.02	0.02	0.02	0.01	0.01
		2nd Floor Total	0.06	0.06	0.05	0.05	0.05	0.05
		2nd Floor Rad	0.02	0.02	0.02	0.02	0.01	0.01
3	360086	1st Floor Total	0.04	0.04	0.03	0.02	0.02	0.02
		1st Floor Rad	0.01	0.00	0.00	0.00	0.00	0.00
		2nd Floor Total	6.49	6.08	5.99	5.66	3.71	2.79
		2nd Floor Rad	1.01	0.99	0.97	0.94	0.60	0.43
4	360089	1st Floor Total	0.24	0.23	0.22	0.21	0.17	0.14
		1st Floor Rad	0.11	0.10	0.10	0.10	0.09	0.07
		2nd Floor Total	32.29	24.44	15.29	9.99	2.44	1.21
		2nd Floor Rad	10.00	8.68	5.00	2.99	0.69	0.34

The following table provides a summary of the optical density for all experiments.

Table 55. Multi-Test ODM Results

Test Number	Experiment ID	Description	Average Optical Density (1/m)	Maximum Optical Density (1/m)
1	360079	1st Floor ODM	0.09	0.28
		2nd Floor ODM	0.60	1.12
2	360082	1st Floor ODM	0.00	0.06
		2nd Floor ODM	0.08	0.19
3	360086	1st Floor ODM	0.08	0.17
4	360089	1st Floor ODM	0.33	1.16

The following table provides a summary of activation times for all smoke detectors and CO detectors in all experiments. For the battery powered detectors, the activation times listed were obtained from reviewing the video of the detectors and determining when the red LED started to flash, which indicated the detector was alarming. If an activation time is not listed in the table for a battery power unit, it means either the detector did not alarm, or the activation time could not be determined from the video.

Table 56. Smoke and CO Detector Activation Summary

Test #	Test Description	Floor Location	Detector Type	AC/Battery Power	Activation Time (s)
1	Smolder Combustion 2 nd Floor Door Closed	1 st	Smoke - Ion	AC	
		1 st	Smoke - Photo	AC	5985
		1 st	CO	AC	8859
		1 st	Smoke Ion	Battery	
		1 st	Smoke - Photo	Battery	6583
		1 st	CO	Battery	
		2 nd	Smoke - Ion	AC	4506
		2 nd	Smoke - Photo	AC	4522
		2 nd	CO	AC	2441
		2 nd	Smoke Ion	Battery	
		2 nd	Smoke - Photo	Battery	4506
2 nd	CO	Battery			
2	Smolder Combustion 2 nd Floor Door Open	1 st	Smoke - Ion	AC	
		1 st	Smoke - Photo	AC	
		1 st	CO	AC	
		1 st	Smoke - Ion	Battery	
		1 st	Smoke - Photo	Battery	
		1 st	CO	Battery	
		2 nd	Smoke Ion	AC	3687
		2 nd	Smoke - Photo	AC	3658
		2 nd	CO	AC	1395
		2 nd	Smoke Ion	Battery	
		2 nd	Smoke - Photo	Battery	1896
2 nd	CO	Battery			
3	Flaming Combustion 2 nd Floor Door Closed	1 st	Smoke - Ion	AC	206
		1 st	Smoke - Photo	AC	240
		1 st	CO	AC	
		1 st	Smoke - Ion	Battery	209
		1 st	Smoke - Photo	Battery	1751
		1 st	CO	Battery	
		2 nd	Smoke Ion	AC	17
		2 nd	Smoke - Photo	AC	44
4	Flaming Combustion 2 nd Floor Door Open	1 st	Smoke - Ion	AC	304
		1 st	Smoke - Photo	AC	351
		1 st	CO	AC	879
		1 st	Smoke - Ion	Battery	
		1 st	Smoke - Photo	Battery	615
		1 st	CO	Battery	322
		2 nd	Smoke Ion	AC	18
		2 nd	Smoke - Photo	AC	40
		2 nd	CO	AC	

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1. Laboratory Instruction LI017 – Laboratory Conditions, Bureau of Alcohol, Tobacco, Firearms and Explosives - Fire Research Laboratory, Beltsville, MD.
2. The Temperature Handbook, 2nd edition, Omega Engineering, Stamford, CT, 2000.
3. Laboratory Instruction LI001 - Thermocouple, Bureau of Alcohol, Tobacco, Firearms and Explosives – Fire Research Laboratory, Beltsville, MD.
4. Barnes, A., “Heat Flux Sensors Part 1: Theory,” Sensors, January 1999.
5. Laboratory Instruction LI002 - Heat Flux Transducer, Bureau of Alcohol, Tobacco, Firearms and Explosives - Fire Research Laboratory, Beltsville, MD.
6. Laboratory Instruction LI016 – Point Source Gas Analysis, Bureau of Alcohol, Tobacco, Firearms and Explosives – Fire Research Laboratory, Beltsville, MD.
7. Laboratory Instruction LI003 - Digital Cameras, Bureau of Alcohol, Tobacco, Firearms and Explosives - Fire Research Laboratory, Beltsville, MD