U. S. Department of Justice

Fire Research Laboratory
BUREAU OF ALCOHOL, TOBACCO, FIREARMS AND EXPLOSIVES
6000 Ammendale Road
Beltsville, MD 20705-1250

Laboratory Report

ISO/IEC 17025
Accredited Forensic Testing Laboratory

Title	Heat Release Rates of Gasoline Spill Fires on a Concrete Slab		
Test Type	NFPA 289		
Lab Number	20F0024-3	**Author**	Jason Ouellette
Test dates	8/31/20, 9/1/20, 9/4/20	**No. Tests**	16

Introduction

Sixteen (16) tests were conducted to evaluate the Heat Release Rate (HRR) of gasoline spill fires. Various volumes of gasoline were spilled onto a concrete pad using a stationary pipe system. The spilled gasoline was then ignited, and the resulting fires were allowed to evolve unperturbed until total flame extinction occurred. Measurements of the fire's HRR were made using a Fire Products Collector (FPC). The tests were conducted in the Medium Burn Room (MBR) of the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Fire Research Laboratory (FRL), located in Beltsville, MD.

Contents

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

All tests were conducted under the FRL's 4 MW FPC. The setup consisted of three main components: concrete pad; protective barrier; fuel delivery system. Annotated images showing the setup from the obverse and reverse views are presented in Figure 1 and Figure 2, respectively.

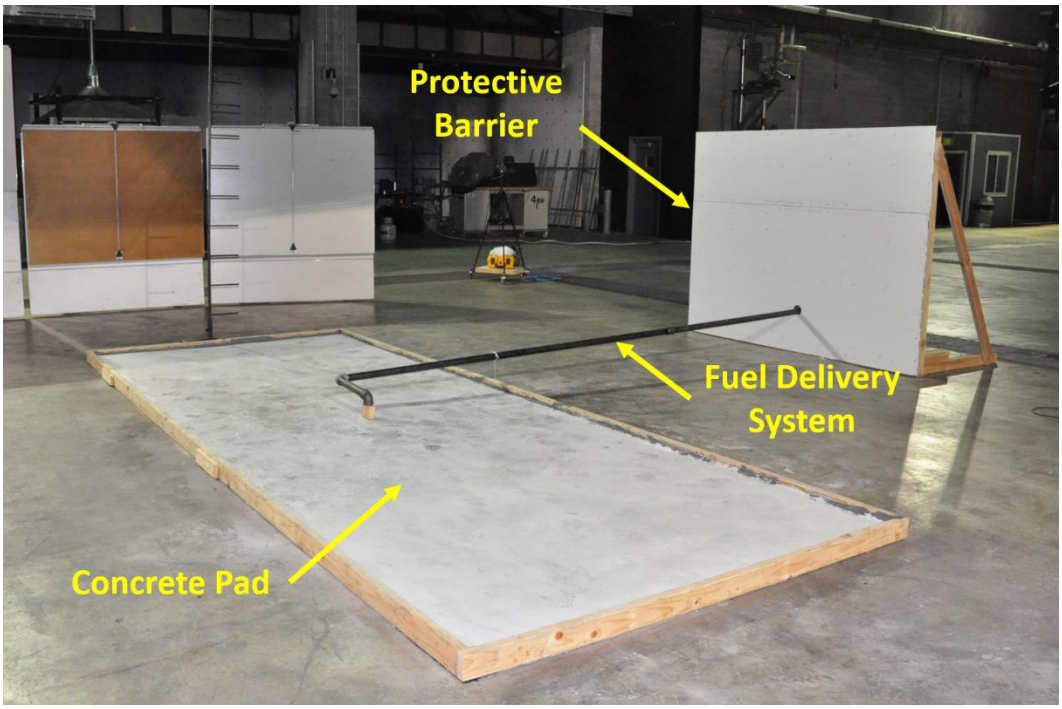


Figure 1. Obverse view of the experiment setup (cropped and annotated from 326951_1120852.jpg).

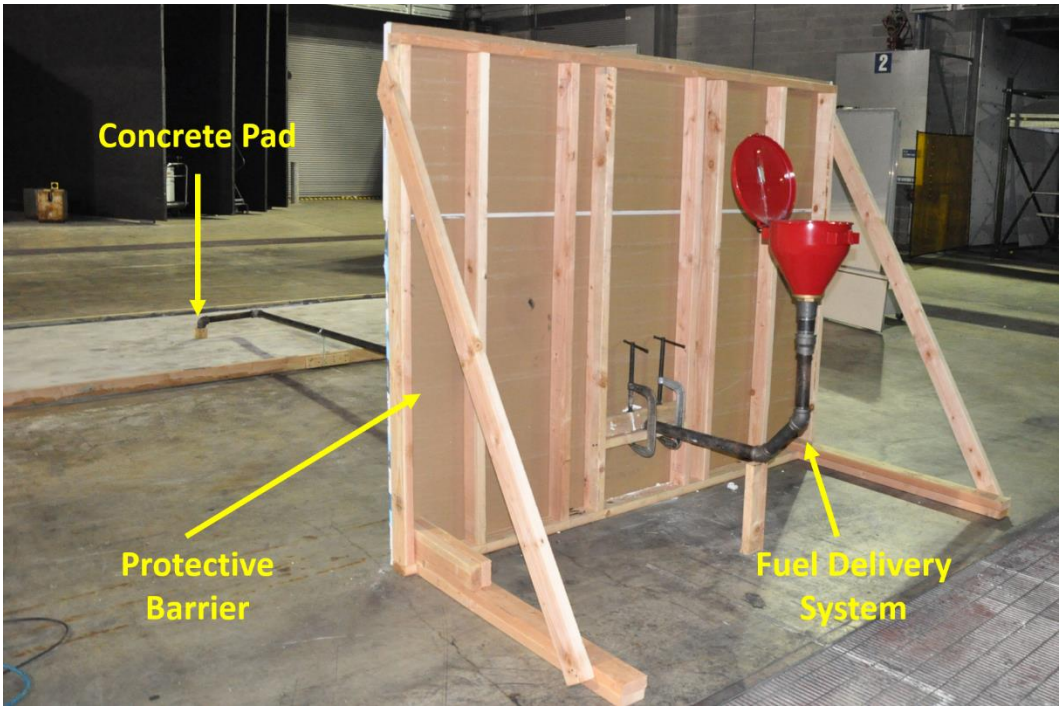


Figure 2. Reverse view of the experiment setup (cropped and annotated from 326951_1120854.jpg).

Concrete Pad

A concrete pad was poured for this test series. The concrete used was Quikrete® High Strength Concrete Mix. The pad was 549 cm long × 213 cm wide × 5 cm deep (216 in × 84 in × 2 in). The pad was framed using dimensional 2 × 4 lumber, and the gaps between the framing and the concrete were filled with 3M® Fire Block sealant. A schematic showing the overall dimensions of the pad is presented in Figure 3. A portion of the pad's framing has been removed in Figure 3 to clearly indicate the depth of the concrete pad. An image of the fire sealant placed in the gap between the concrete pad and the framing is shown in Figure 4.

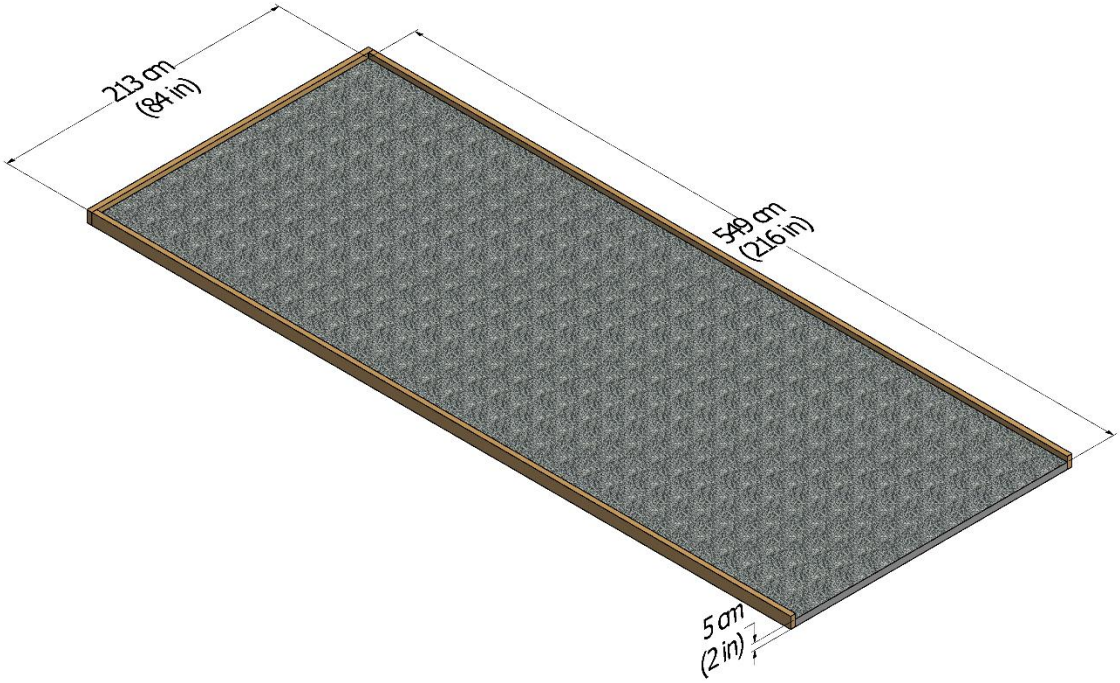


Figure 3. Overall dimensions of the concrete pad.

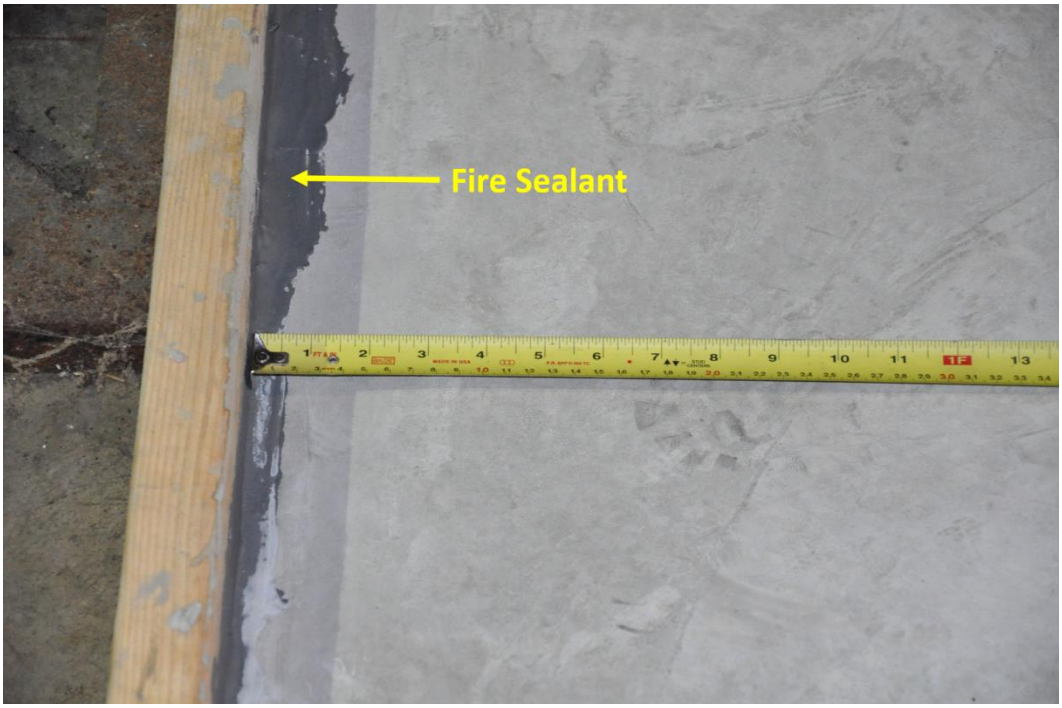


Figure 4. Fire sealant placed in gap between concrete pad and framing (annotated from 326951_1120843.jpg).

Protective Barrier

A protective barrier was constructed to shield personnel during the test. The barrier was framed using dimensional lumber and lined with one (1) sheet of 0.5 inch thick Gypsum Wall Board (GWB). The barrier was 244 cm wide × 185 cm high (96 in × 73 in), and placed 305 cm (120 in) from the edge of the concrete pad. A schematic showing the barrier's dimensions and placement is presented in Figure 5.

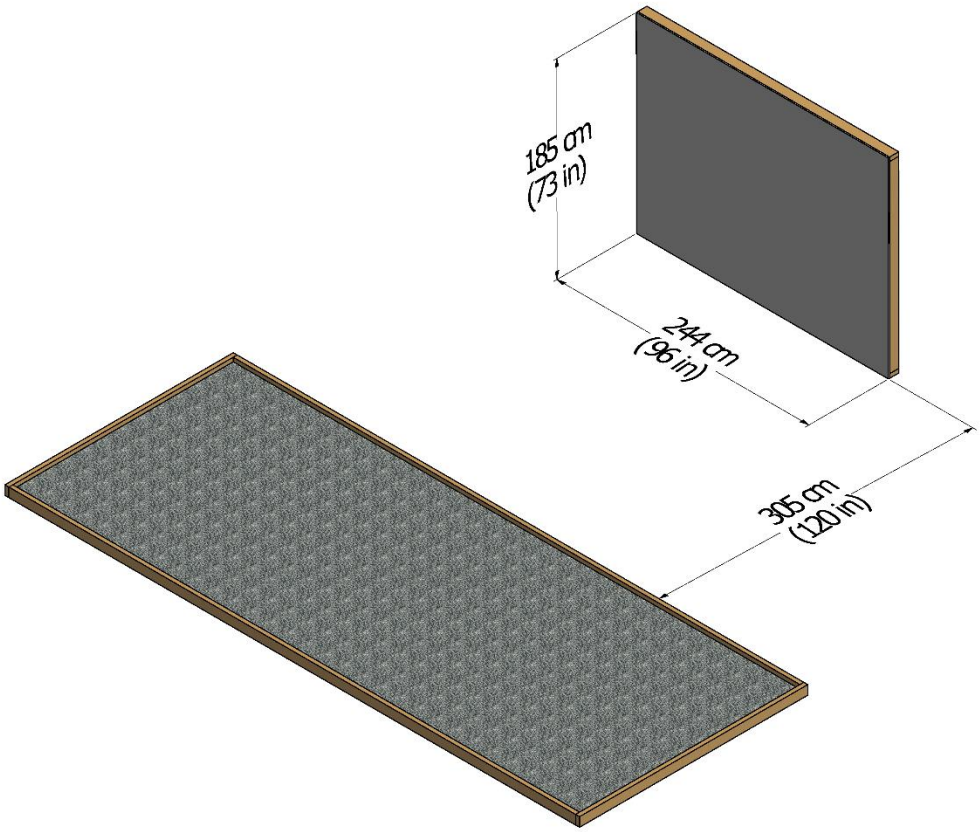


Figure 5. Dimensions of protective barrier and placement relative to pad.

Fuel Delivery System

The fuel delivery system was constructed from 1.5 in nominal diameter black iron pipe. Fuel was dispensed into a safety drum funnel at one end, and discharged from the pipe onto the pad at the other end. The drum was manufactured by Justrite® Manufacturing Company, Product # 08207. The funnel had a 9.5 L (2.5 Gallon) capacity, with a top diameter of 27 cm (10.75 in), and a height of 25 cm (10 in). Schematics showing the dimensions and placement of the fuel delivery system from the side and top views are presented in Figure 6 and Figure 7, respectively.

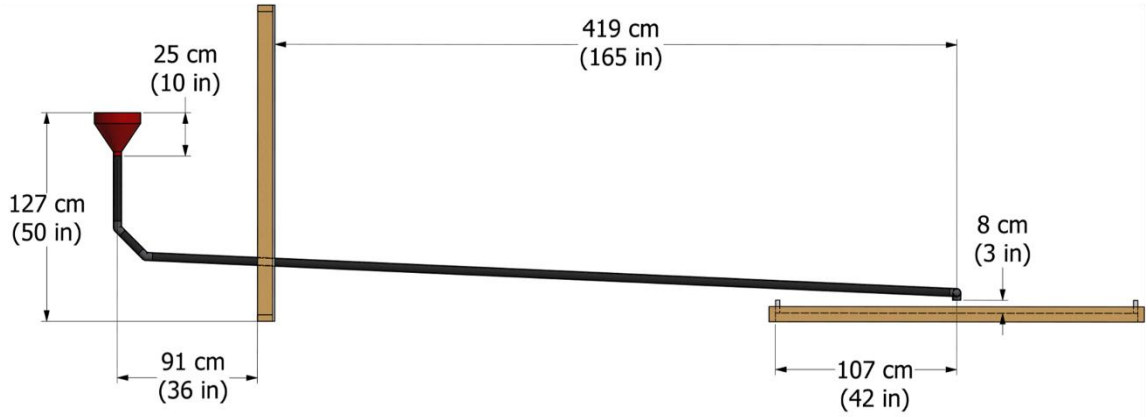


Figure 6. Side view of fuel delivery system.

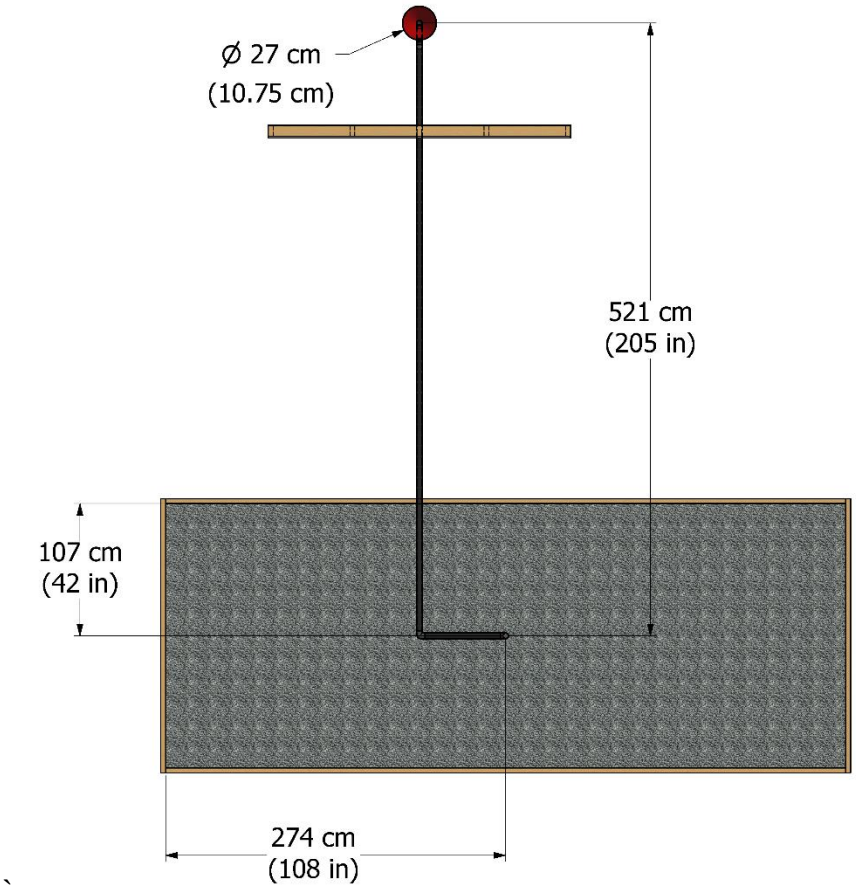


Figure 7. Top view of fuel delivery system.

Flame Height Indicators

Two (2) flame height indicators were placed at various locations around the pad for each test. The overall height of each indicator was 3 m (118 in), with rails spaced every 0.25 m (10 in). A typical placement of the flame height indicators, along with their dimensions, is shown in Figure 8.

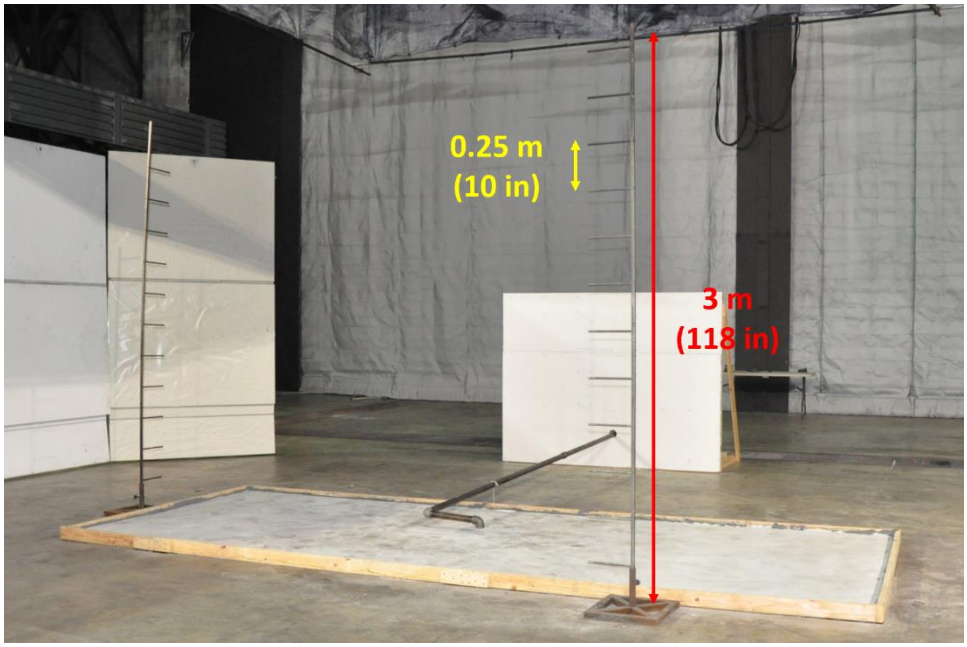


Figure 8. Typical placement and dimensions of flame height indicators (cropped and annotated from 326951_1120882.jpg).

Gasoline Details

The liquid fuel used for this test series was typical 87 Octane, unleaded gasoline. A stock quantity of fuel was stored in an 18.9 L (5 gallon) containers. Prior to each test, a prescribed quantity of fuel was poured from the containers into measuring pitchers. An example of a stock container and fuel being poured into a measuring pitcher are presented in Figure 9 and Figure 10, respectively.

Figure 9. Stock container of gasoline (326955_1121063.jpg)

Figure 10. Gasoline being poured from stock container into measuring pitcher (cropped from 326954_1120990.jpg).

Experiment Details

Eleven (11) tests were conducted to measure the HRR from gasoline spill fires of various sizes on a concrete pad. The tests conducted are summarized in Table 1. Several of the tests conducted deviated from normal FRL laboratory procedures, and those tests are indicated by footnote.

Table 1. Test Matrix.

Test #	Experiment ID	Spill Volume	
		(L)	(Gallons)
1	326951	1.9	0.5
2	326953	3.8	1.0
3	326954	5.7	1.5
4	326955	7.6	2.0
5	326956	9.5	2.5
6	326957	11.4	3.0
7†	326958	13.2	3.5
8	326960	13.2	3.5
9††	326961	15.1	4.0
10††	326962	17.0	4.5
11††	326963	18.9	5.0
12††	326964	0.95	0.25
13	326973	0.95	0.25
14	326974	15.1	4.0
15	326975	17.0	4.5
16	326976	18.9	5.0

† *Corner vents in MBR were kept open.*

†† *FPC Pressure transducer baseline values from previous day were used.*

General Test Procedures

Each test began by dispensing a prescribed volume of gasoline into measuring pitchers. The contents of the pitchers were then poured into the barrel funnel of the fuel delivery system, which allowed the gasoline to be discharged onto the concrete pad. Once all fuel had drained onto the pad, the spill was ignited with a torch. The resulting fire was allowed to evolve unperturbed until total flame extinction of the spill fire occurred. At the conclusion of each test, the surface of the pad was cooled using a fan for at least thirty (30) minutes. Images of the gasoline being poured into the barrel funnel and discharging onto the pad are shown in Figure 11 and Figure 12, respectively. Images of the torch being applied to the spilled gasoline and the resulting fire are shown in Figure 13 and Figure 14, respectively. An image of a fan being used to cool the pad post-test is shown in Figure 15.

Figure 11. Gasoline being poured into barrel funnel of fuel delivery system (326975_1121770.jpg).

Figure 12. Fuel being discharged from delivery system onto pad (326975_1121775.jpg).

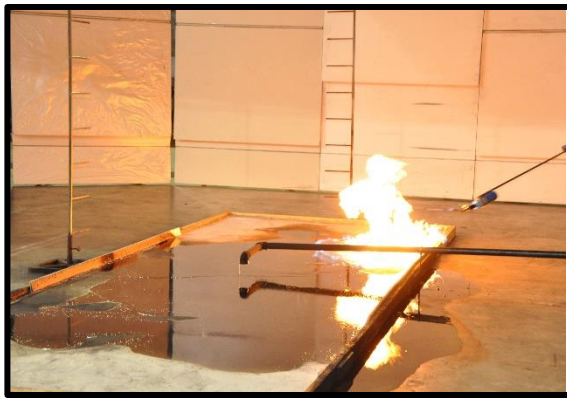


Figure 13. Application of torch to gasoline spill (326975_1121789.jpg).

Figure 14. Resulting fire from application of torch to gasoline spill (326975_1121790. Jpg).

Figure 15. Fan being used to cool surface of the pad post-test (326975_1121815

Scenario Descriptions

Tests # 1 – 3 (Experiment ID's 326951, 326953, 326954)

Tests # 1 – 3 proceeded according to the General Test Procedures without deviation.

Test # 4 (Experiment ID 326955)

For Test # 4, 3M® Cold Weather Foil Tape was placed over a section of the gap between the concrete pad and the frame. An image of the foil tape being placed is shown in Figure 16. The location and extent of the foil tape's placement is shown in Figure 17. The test was conducted according the General Test Procedures without deviation.

Figure 16. Foil tape being placed over gap between the pad and framing for Test # 4 (326955_1121074.jpg).

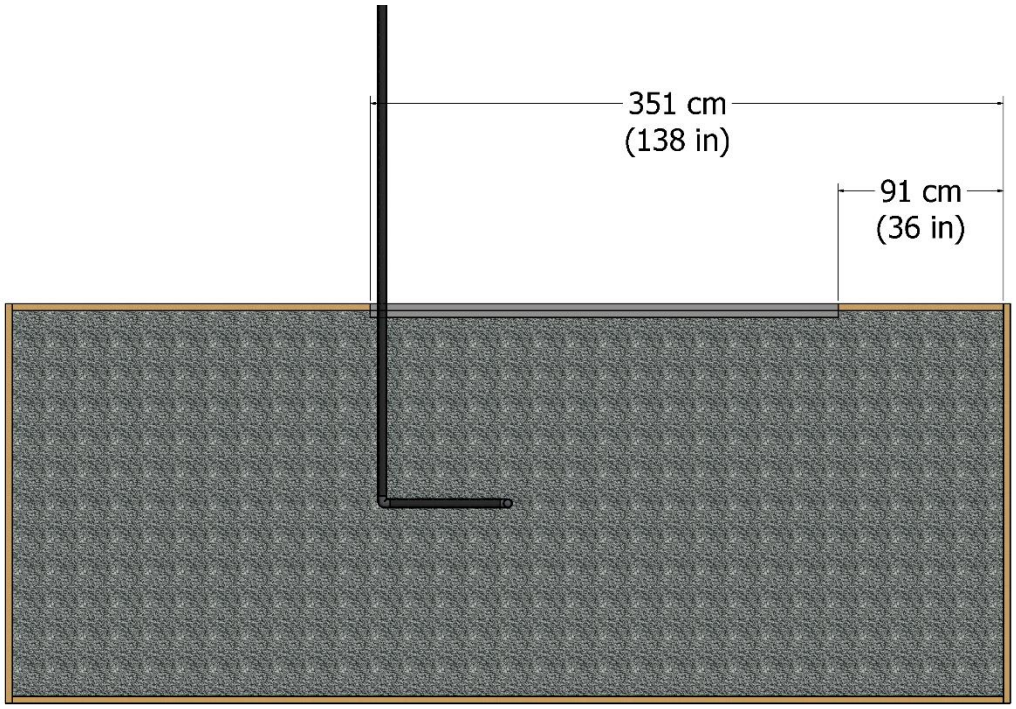


Figure 17. Location and extent of foil tape placement for Test # 4.

Tests # 5 – 8 (Experiment ID's 326956, 326957, 326958, 326960)

Strips of GWB were placed over two (2) sections of the gap between the pad and framing. Each strip of GWB was 244 cm long × 8 cm high × 1 cm thick (96 in × 3 in × 0.5 in). An image of the GWB strips is shown in Figure 18. The approximate locations and extents of the GWB strips are shown in Figure 19. The tests were conducted according the General Test Procedures without deviation. For Test # 7, the corner vents of the MBR were left open during the test, which attenuated the amount of fire products collected by the 4 MW Hood.

Figure 18. Strips of GWB placed at edge of pad (cropped and annotated from 326961_1121405. jpg).

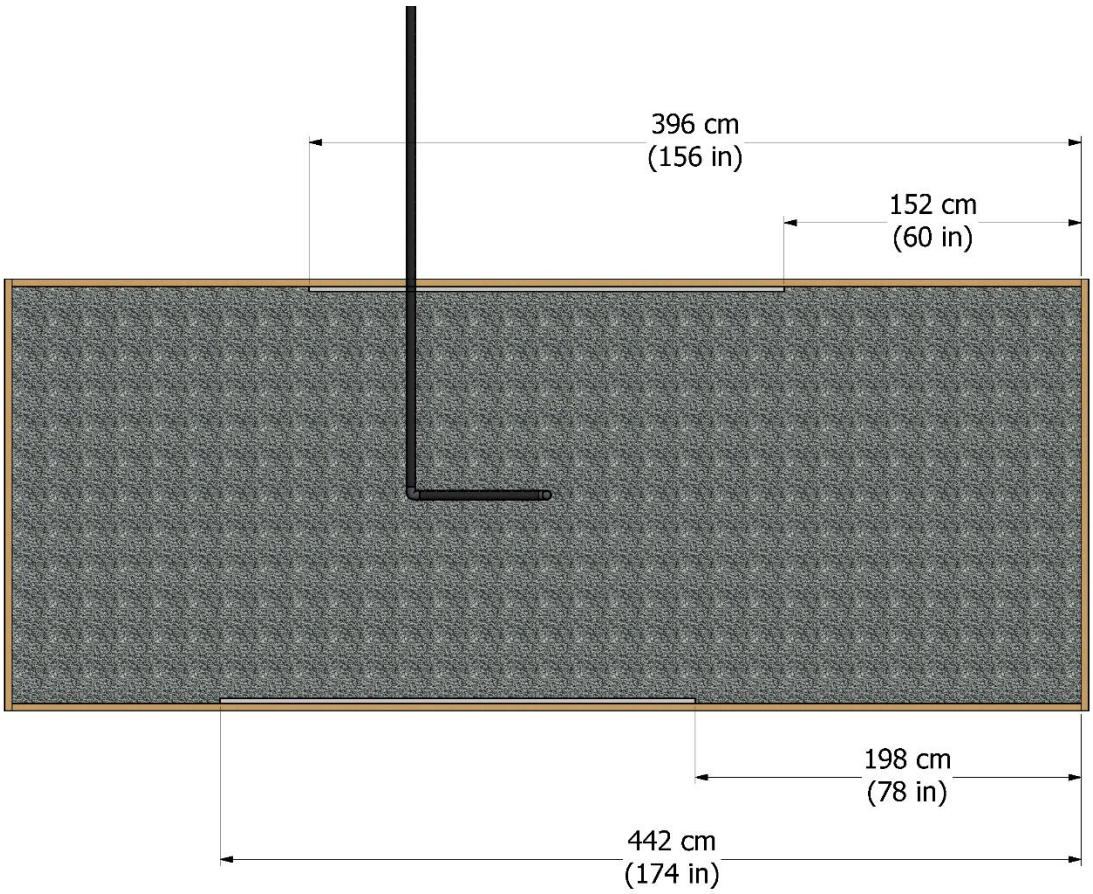


Figure 19. Location and extent of GWB strips placed on edge of pad.

Tests # 9 – 12 (Experiment ID's 326961, 326962, 326963, 326964)

The setup for Tests # 9 – 12 was identical to that shown in Figure 18 and Figure 19, and the tests were conducted according the General Test Procedures without deviation. For these tests, an FPC pressure transducer baseline was not performed on the day of testing (9/01/2020). Instead, pressure transducer baseline values from 8/31/2020 were used. These values were measured to be 2.32 Pa and 2.85 Pa for Pressure Transducers # 1 and # 2, respectively. Pressure transducer baseline values were reevaluated again 9/04/2020, and found to be 2.77 Pa and 3.56 Pa for Pressure Transducers # 1 and # 2, respectively. It is reasonable to assume that the pressure transducer baseline values on the day of these tests are consistent with those measured on 8/31/2020 and 9/04/2020.

Tests # 13 – 16 (Experiment ID's 326973, 326974, 326975, 326976)

The setup for Tests # 13 – 16 was identical to that shown in Figure 18 and Figure 19, and the tests were conducted according the General Test Procedures without deviation.

Instrumentation

Heat release rate data was collected and digital video was recorded during each test. The HRR data was collected using a 4 MW Fire Products Collector (FPC); the digital video was recorded using three (3) High Definition (HD) cameras and one (1) Forward Looking Infrared (FLIR) camera. The placement of the pad under the FPC and the approximate locations of each camera are shown in Figure 20.

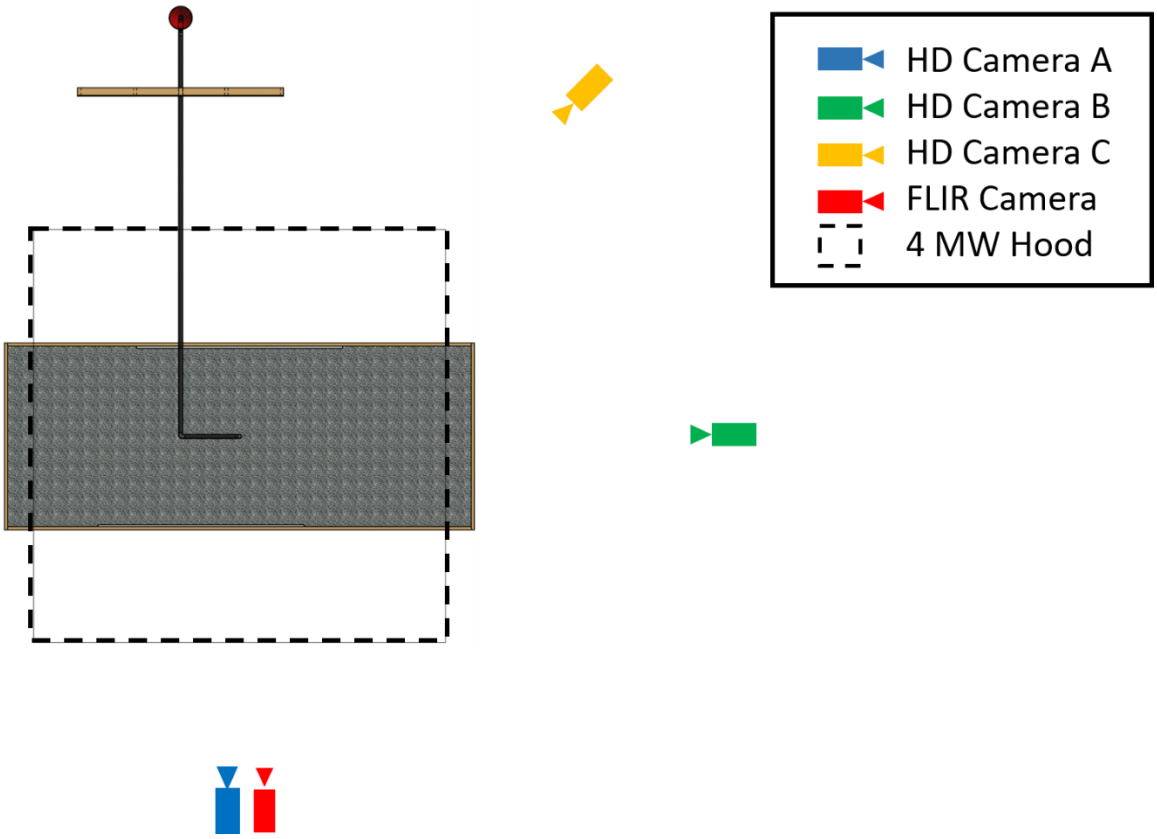


Figure 20. Experimental setup under FPC and placement of cameras.

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 2. Lab Conditions Description

Test Number	Experiment ID	Description	Manufacturer	Model	Bar Code
1	326951	Vaisala MBR	Vaisala	PTU301	99001074
2	326953	Vaisala MBR	Vaisala	PTU301	99001074
3	326954	Vaisala MBR	Vaisala	PTU301	99001074
4	326955	Vaisala MBR	Vaisala	PTU301	99001074
5	326956	Vaisala MBR	Vaisala	PTU301	99001074
6	326957	Vaisala MBR	Vaisala	PTU301	99001074
7	326958	Vaisala MBR	Vaisala	PTU301	99001074
8	326960	Vaisala MBR	Vaisala	PTU301	99001074
9	326961	Vaisala MBR	Vaisala	PTU301	99001074
10	326962	Vaisala MBR	Vaisala	PTU301	99001074
11	326963	Vaisala MBR	Vaisala	PTU301	99001074
12	326964	Vaisala MBR	Vaisala	PTU301	99001074
13	326973	Vaisala MBR	Vaisala	PTU301	99001074
14	326974	Vaisala MBR	Vaisala	PTU301	99001074
15	326975	Vaisala MBR	Vaisala	PTU301	99001074
16	326976	Vaisala MBR	Vaisala	PTU301	99001074

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. RH shows the initial relative humidity.

Table 3. Ambient Laboratory Initial Condition Summary

Test Number	Experiment ID	Description	Temperature (C)	Pressure (kPa)	Initial RH (%)
1	326951	Vaisala MBR	26	101	60
2	326953	Vaisala MBR	26	101	60
3	326954	Vaisala MBR	26	101	61
4	326955	Vaisala MBR	26	101	62
5	326956	Vaisala MBR	26	101	59
6	326957	Vaisala MBR	26	101	58
7	326958	Vaisala MBR	26	101	62
8	326960	Vaisala MBR	26	101	63
9	326961	Vaisala MBR	25	101	61
10	326962	Vaisala MBR	25	101	63
11	326963	Vaisala MBR	25	101	65
12	326964	Vaisala MBR	25	101	66
13	326973	Vaisala MBR	26	101	69
14	326974	Vaisala MBR	26	101	70
15	326975	Vaisala MBR	26	101	68
16	326976	Vaisala MBR	26	101	67

Fire Products Collector

A Fire Products Collector (FPC) measures several characteristics of a fire based upon the measured properties of the fire plume. A FPC consists of a collection hood connected to an exhaust duct placed over a fire as shown in Figure 21. The primary fire characteristics calculated from a FPC include heat release rate (HRR), convective heat release rate (CHRR), gas species production, and smoke production. HRR measurements are based on the principle of oxygen consumption calorimetry. CHRR is calculated as the enthalpy rise of gases flowing through the FPC. Gas species production is calculated based on the measured gas concentrations flowing through the FPC. Smoke production is quantified based on optical smoke measurements, which measure the attenuation of light as it passes through the smoke and fire gases in the FPC.

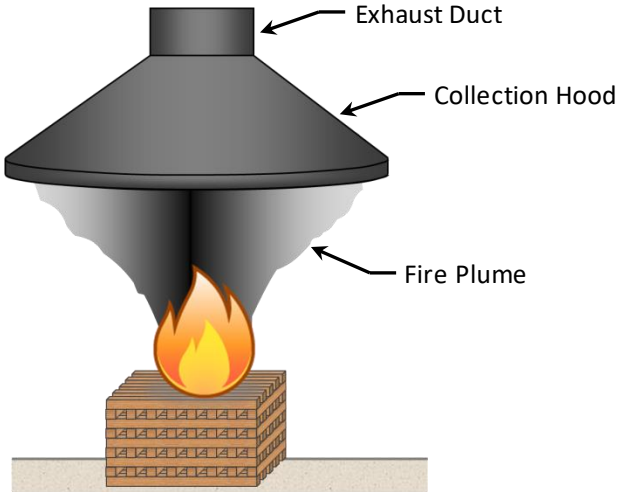


Figure 21. Schematic of a Fire Products Collector

The "Fire Products Collector Description" table identifies which FPC was used in the experiment(s) and summarizes the configuration. Fire Products Collectors were used in accordance with the method defined in FRL Laboratory Instruction "LI011 Fire Products Collectors" [2].

The following table provides a description of the FPC used in the experiment(s). The table includes a description of the FPC, as well as the Calibration factor (C Factor) and E values, which are used to calculate the HRR during an experiment. The C Factor is based on data from a fire with a known HRR. E is the net heat released per unit of oxygen consumed, a property of the fuel being burned.

The maximum HRR used during the C Factor experiment is listed in Table 4. If the HRR measured during an experiment exceeds this maximum HRR, then it may be under predicted, due to smoke spillage from the hood of the FPC.

Table 4. Fire Products Collector Description

Test Number	Experiment ID	Description	C-Factor Experiment ID	Maximum HRR for C-Factor (kW)	C-Factor	E Factor (kJ/kg)
1	326951	4 MW	326931	5000	1.0530	13100.000
2	326953	4 MW	326931	5000	1.0530	13100.000
3	326954	4 MW	326931	5000	1.0530	13100.000
4	326955	4 MW	326931	5000	1.0530	13100.000
5	326956	4 MW	326931	5000	1.0530	13100.000
6	326957	4 MW	326931	5000	1.0530	13100.000
7	326958	4 MW	326931	5000	1.0500	13100.000
8	326960	4 MW	326931	5000	1.0530	13100.000
9	326961	4 MW	326931	5000	1.0530	13100.000
10	326962	4 MW	326931	5000	1.0530	13100.000
11	326963	4 MW	326931	5000	1.0530	13100.000
12	326964	4 MW	326931	5000	1.0530	13100.000
13	326973	4 MW	326931	5000	1.0530	13100.000
14	326974	4 MW	326931	5000	1.0530	13100.000
15	326975	4 MW	326931	5000	1.0530	13100.000
16	326976	4 MW	326931	5000	1.0530	13100.000

Set Up Photos

The following shows photographs of the experiment setup.

Table 5. Setup Photos

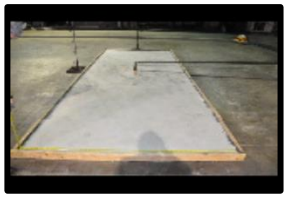


Figure 22.
326951_1120778


Figure 23.
326951_1120779


Figure 24.
326951_1120780


Figure 25.
326951_1120781


Figure 26.
326951_1120782


Figure 27.
326951_1120783


Figure 28.
326951_1120784


Figure 29.
326951_1120785

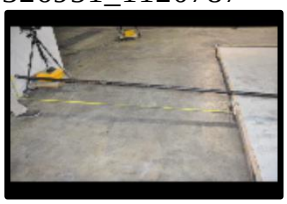

Figure 30.
326951_1120786


Figure 31.
326951_1120787


Figure 32.
326951_1120788


Figure 33.
326951_1120789


Figure 34.
326951_1120790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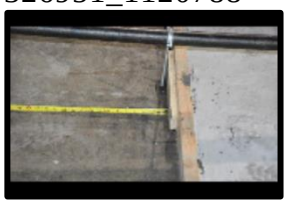
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Figure 37.
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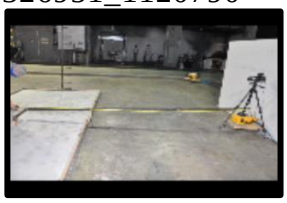
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Figure 39.
326951_1120795


Figure 40.
326951_1120796


Figure 41.
326951_1120797


Figure 42.
326951_1120798


Figure 43.
326951_1120799


Figure 44.
326951_1120800


Figure 45.
326951_1120801


Figure 46.
326951_1120802


Figure 47.
326951_1120803


Figure 48.
326951_1120804


Figure 49.
326951_1120805

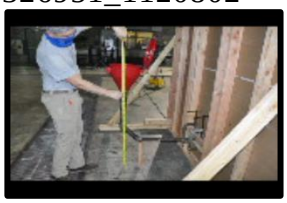
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Figure 51.
326951_1120807


Figure 52.
326951_1120808

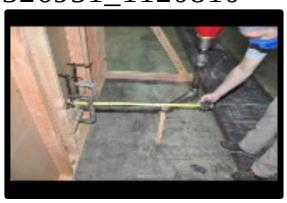

Figure 53.
326951_1120809


Figure 54.
326951_1120810


Figure 55.
326951_1120811


Figure 56.
326951_1120812


Figure 57.
326951_1120813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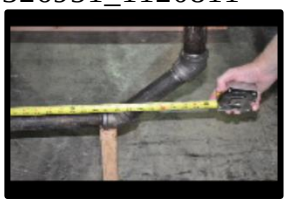
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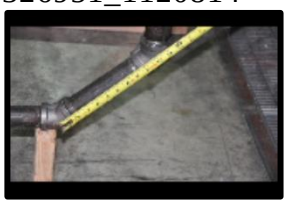
326951_1120815


Figure 60.
326951_1120816


Figure 61.
326951_1120817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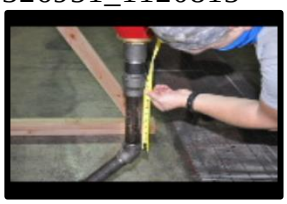
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Figure 64.
326951_1120820

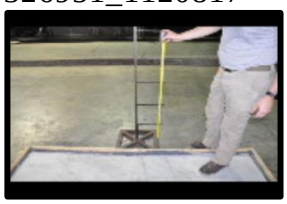
Figure 65.
326951_1120821

Figure 66.
326951_1120822

Figure 67.
326951_1120823

Figure 68.
326951_1120824

Figure 69.
326951_1120825

Figure 70.
326951_1120826

Figure 71.
326951_1120827

Figure 72.
326951_1120828

Figure 73.
326951_1120829

Figure 74.
326951_1120830

Figure 75.
326951_1120831

Figure 76.
326951_1120832

Figure 77.
326951_1120833

Figure 78.
326951_1120834

Figure 79.
326951_1120835

Figure 80.
326951_1120836

Figure 81.
326951_1120837

Figure 82.
326951_1120838

Figure 83.
326951_1120839

Figure 84.
326951_1120840

Figure 85.
326951_1120841

Figure 86.
326951_1120842

Figure 87.
326951_1120843

Figure 88.
326951_1120844

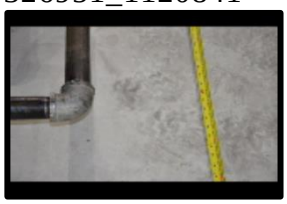

Figure 89.
326951_1120845

Figure 90.
326951_1120846

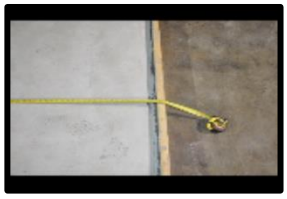

Figure 91.
326951_1120847

Figure 92.
326951_1120848

Figure 93.
326951_1120849

Figure 94.
326951_1120850

Figure 95.
326951_1120851

Figure 96.
326951_1120852

Figure 97.
326951_1120853

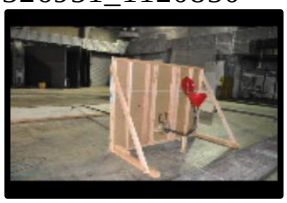

Figure 98.
326951_1120854

Figure 99.
326951_1120855

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” [3].

Results for Test 1 (ID 326951)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

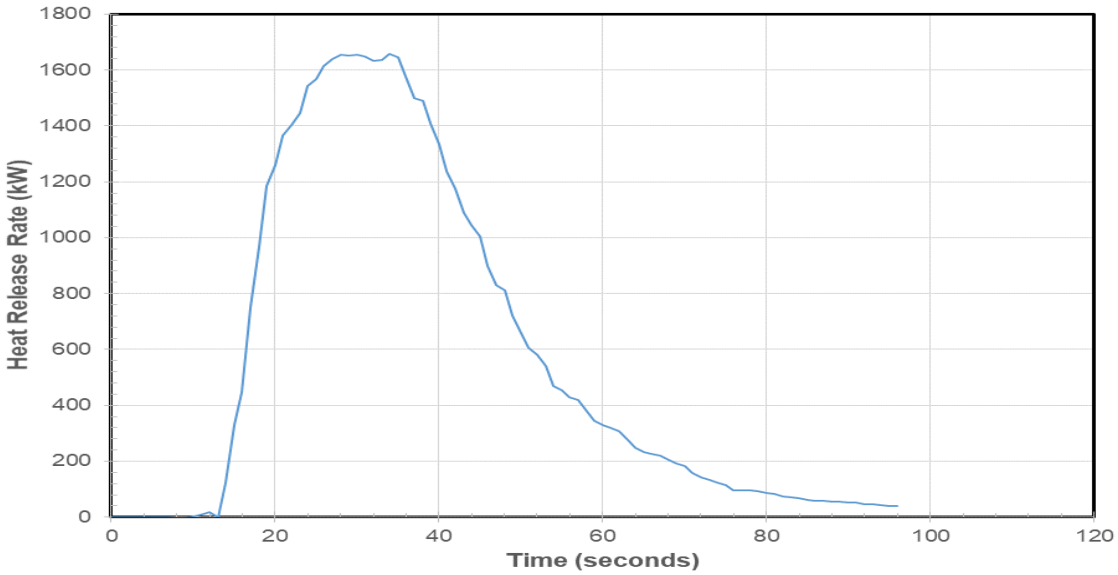

Figure 100. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

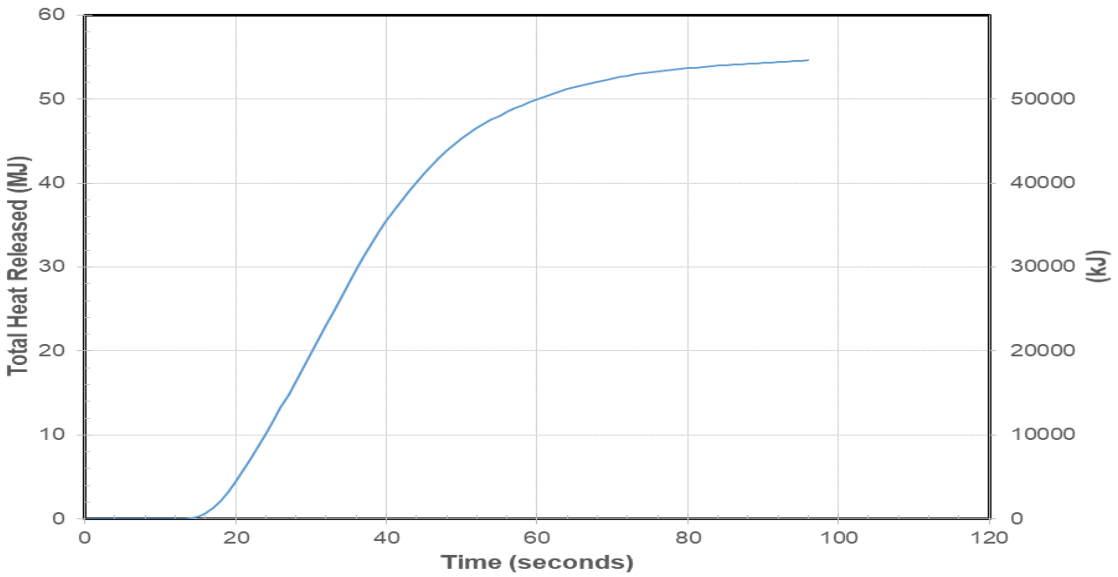

Figure 101. Total Heat Released

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

Table 6. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	09:10:36	216	326951_20200831_091036_1.mov
SIDE VIEW	09:10:38	214	326951_20200831_091038_9.mov
FRONT VIEW	09:10:39	214	326951_20200831_091039_10.mov
CLOSE UP	09:10:39	215	326951_20200831_091039_11.mov
MASTER			326951_1122961.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 102. Pre test 9 minutes, 326951_1120879

Figure 103. Pre test 9 minutes, 326951_1120880

Figure 104. Pre test 9 minutes, 326951_1120881

Figure 105. Pre test 7 minutes, 326951_1120882

Figure 106. Pre test 7 minutes, 326951_1120883

Figure 107. Pre test 6 minutes, 326951_1120884

Figure 108. Pre test 6 minutes, 326951_1120885

Figure 109. Pre test 50 seconds, 326951_1120886

Figure 110. Pre test 49 seconds, 326951_1120887

Figure 111. Pre test 47 seconds, 326951_1120888

Figure 112. Pre test 42 seconds, 326951_1120889

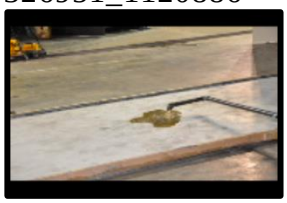

Figure 113. Pre test 37 seconds, 326951_1120890

Figure 114. Pre test 35 seconds, 326951_1120891

Figure 115. Pre test 33 seconds, 326951_1120892

Figure 116. Pre test 30 seconds, 326951_1120893

Figure 117. Pre test 25 seconds, 326951_1120894

Figure 118. Pre test 1 seconds, 326951_1120895

Figure 119. 0 seconds, 326951_1120896

Figure 120. 3 seconds, 326951_1120897

Figure 121. 6 seconds, 326951_1120898

Figure 122. 12 seconds, 326951_1120899

Figure 123. 16 seconds, 326951_1120900

Figure 124. 25 seconds, 326951_1120901

Figure 125. 28 seconds, 326951_1120902

Figure 126. 38 seconds, 326951_1120903

Figure 127. 43 seconds, 326951_1120904

Figure 128. 53 seconds, 326951_1120905

Figure 129. 56 seconds, 326951_1120906

Figure 130. 62 seconds, 326951_1120907

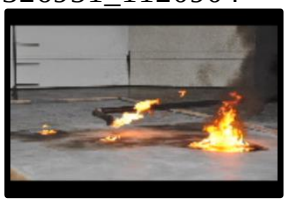

Figure 131. 74 seconds, 326951_1120908

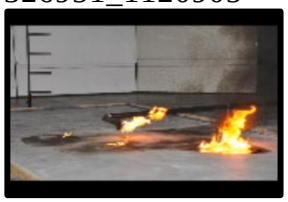

Figure 132. 77 seconds, 326951_1120909

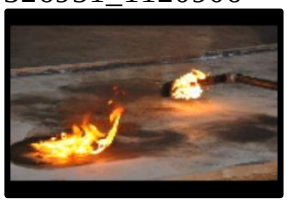

Figure 133. 90 seconds, 326951_1120910

Figure 134. 94 seconds, 326951_1120911

Figure 135. 100 seconds, 326951_1120912

Figure 136. 113 seconds, 326951_1120913

Figure 137. Post test 0 minutes, 326951_1120914

Figure 138. Post test 0 minutes, 326951_1120915

Figure 139. Post test 0 minutes, 326951_1120916

Figure 140. Post test 0 minutes, 326951_1120917

Figure 141. Post test 1 minutes, 326951_1120918

Figure 142. Post test 1 minutes, 326951_1120919

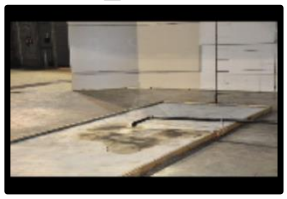

Figure 143. Post test 1 minutes, 326951_1120920

Figure 144. Post test 1 minutes, 326951_1120921

Figure 145. Post test 1 minutes, 326951_1120922

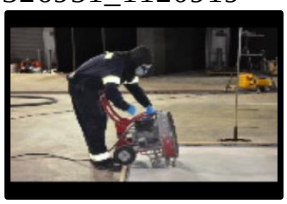

Figure 146. Post test 1 minutes, 326951_1120923

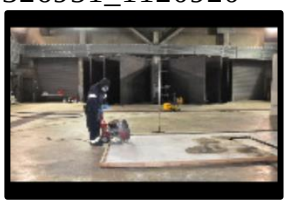

Figure 147. Post test 1 minutes, 326951_1120924

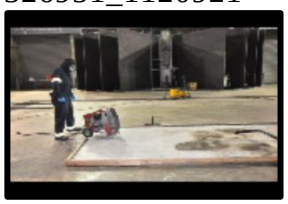

Figure 148. Post test 1 minutes, 326951_1120925

Results for Test 2 (ID 326953)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

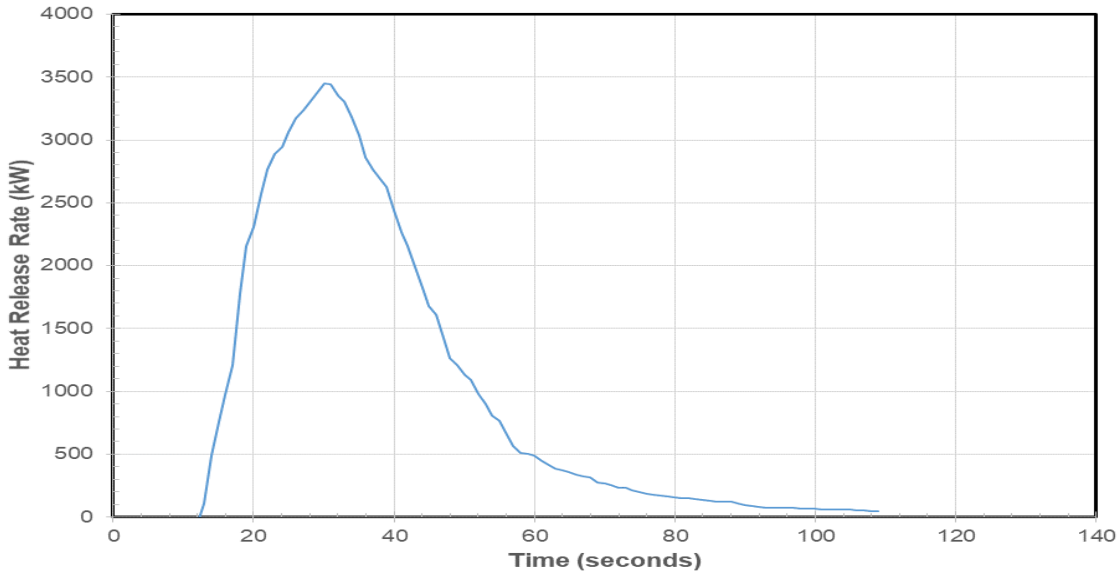

Figure 149. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

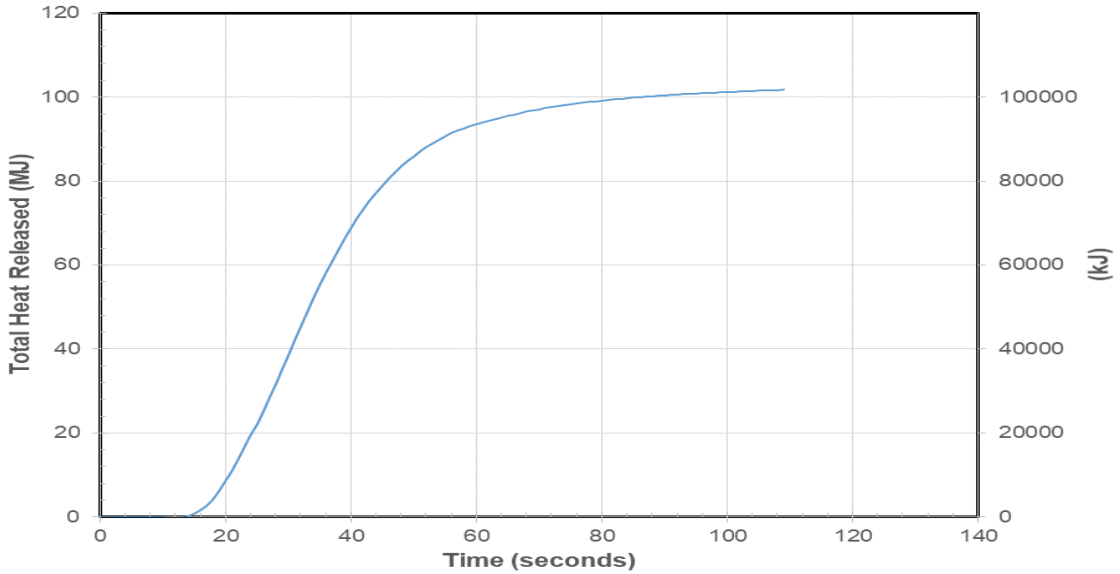

Figure 150. Total Heat Released

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

Table 7. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	09:48:32	220	326953_20200831_094832_1.mov
SIDE VIEW	09:48:33	220	326953_20200831_094833_9.mov
FRONT VIEW	09:48:34	219	326953_20200831_094834_10.mov
CLOSE UP	09:48:35	219	326953_20200831_094835_11.mov
MASTER			326953_1122962.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 151. Pre test 4 minutes, 326953_1120932

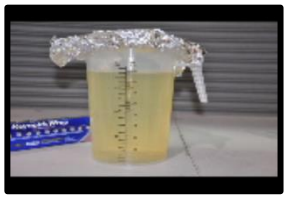

Figure 152. Pre test 4 minutes, 326953_1120933

Figure 153. Pre test 68 seconds, 326953_1120934

Figure 154. Pre test 48 seconds, 326953_1120935

Figure 155. Pre test 46 seconds, 326953_1120936

Figure 156. Pre test 44 seconds, 326953_1120937

Figure 157. Pre test 43 seconds, 326953_1120938

Figure 158. Pre test 41 seconds, 326953_1120939

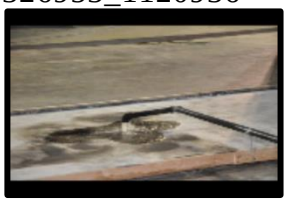

Figure 159. Pre test 38 seconds, 326953_1120940

Figure 160. Pre test 36 seconds, 326953_1120941

Figure 161. Pre test 33 seconds, 326953_1120942

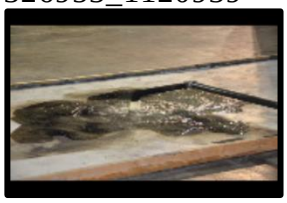

Figure 162. Pre test 32 seconds, 326953_1120943

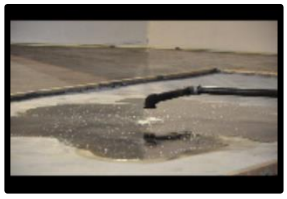

Figure 163. Pre test 25 seconds, 326953_1120944

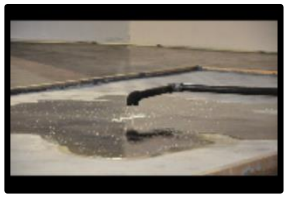

Figure 164. Pre test 24 seconds, 326953_1120945

Figure 165. Pre test 22 seconds, 326953_1120946

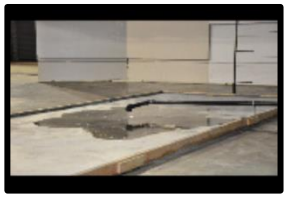

Figure 166. Pre test 19 seconds, 326953_1120947

Figure 167. Pre test 9 seconds, 326953_1120948

Figure 168. Pre test 6 seconds, 326953_1120949

Figure 169. Pre test 5 seconds, 326953_1120950

Figure 170. 0 seconds, 326953_1120951

Figure 171. 1 seconds, 326953_1120952

Figure 172. 2 seconds, 326953_1120953

Figure 173. 18 seconds, 326953_1120954

Figure 174. 27 seconds, 326953_1120955

Figure 175. 31 seconds, 326953_1120956

Figure 176. 43 seconds, 326953_1120957

Figure 177. 46 seconds, 326953_1120958

Figure 178. 57 seconds, 326953_1120959

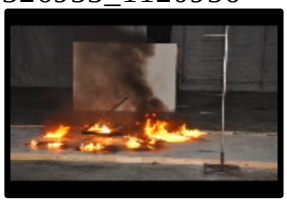

Figure 179. 61 seconds, 326953_1120960

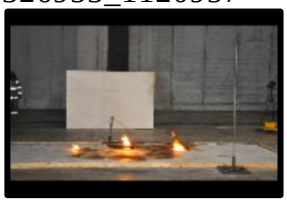

Figure 180. 99 seconds, 326953_1120961

Figure 181. 101 seconds, 326953_1120962

Figure 182. 104 seconds, 326953_1120963

Figure 183. 116 seconds, 326953_1120964

Figure 184. 120 seconds, 326953_1120965

Figure 185. 124 seconds, 326953_1120966

Figure 186. Post test 0 minutes, 326953_1120967

Figure 187. Post test 0 minutes, 326953_1120968

Figure 188. Post test 0 minutes, 326953_1120969

Figure 189. Post test 1 minutes, 326953_1120970

Figure 190. Post test 1 minutes, 326953_1120971

Figure 191. Post test 1 minutes, 326953_1120972

Figure 192. Post test 1 minutes, 326953_1120973

Figure 193. Post test 1 minutes, 326953_1120974

Figure 194. Post test 10 minutes, 326953_1120975

Figure 195. Post test 10 minutes, 326953_1120976

Results for Test 3 (ID 326954)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

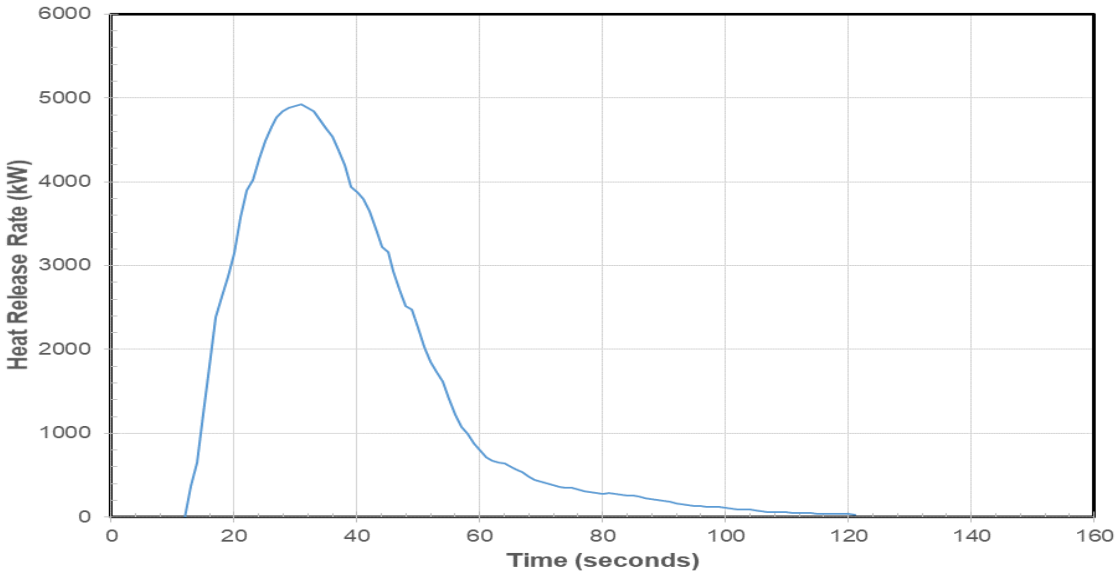

Figure 196. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

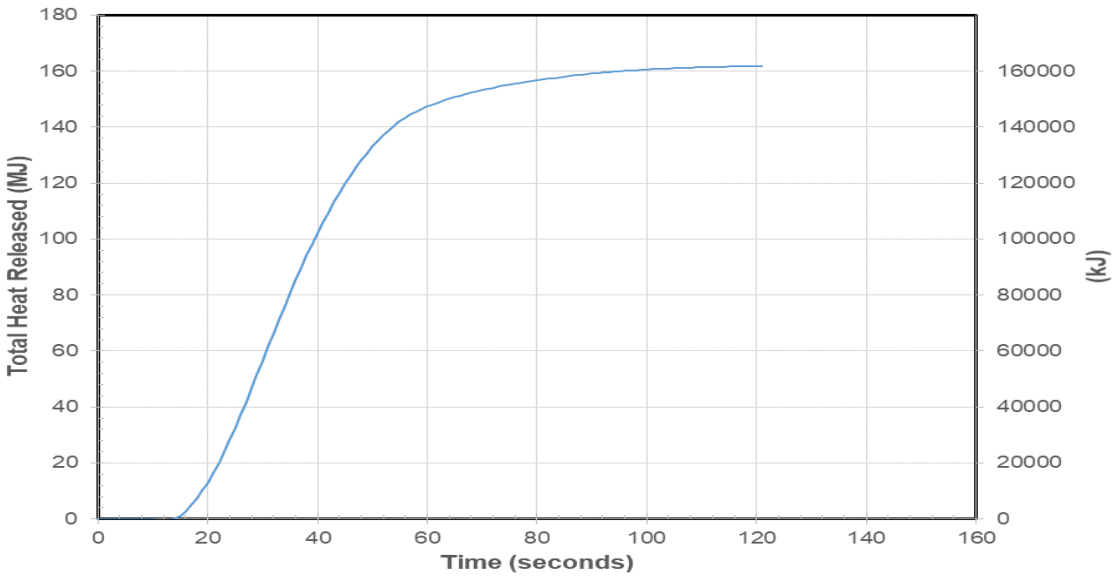

Figure 197. Total Heat Released

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

Table 8. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	10:33:37	211	326954_20200831_103337_1.mov
SIDE VIEW	10:33:39	214	326954_20200831_103339_9.mov
FRONT VIEW	10:33:40	214	326954_20200831_103340_10.mov
CLOSE UP	10:33:40	215	326954_20200831_103340_11.mov
MASTER			326954_1122963.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.

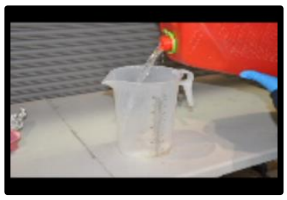

Figure 198. Pre test 26 minutes, 326954_1120986

Figure 199. Pre test 26 minutes, 326954_1120987

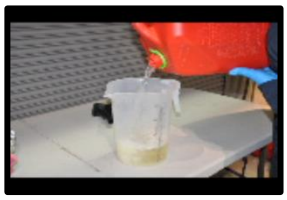

Figure 200. Pre test 26 minutes, 326954_1120988

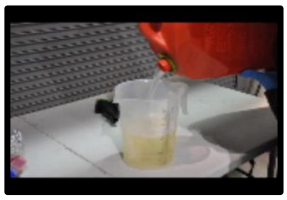

Figure 201. Pre test 26 minutes, 326954_1120989

Figure 202. Pre test 26 minutes, 326954_1120990

Figure 203. Pre test 26 minutes, 326954_1120991

Figure 204. Pre test 25 minutes, 326954_1120992

Figure 205. Pre test 25 minutes, 326954_1120993

Figure 206. Pre test 25 minutes, 326954_1120994

Figure 207. Pre test 25 minutes, 326954_1120995

Figure 208. Pre test 25 minutes, 326954_1120996

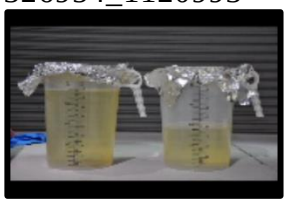

Figure 209. Pre test 23 minutes, 326954_1120997

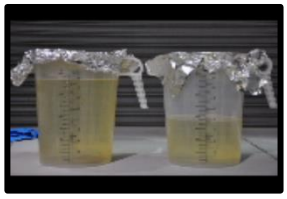

Figure 210. Pre test 23 minutes, 326954_1120998

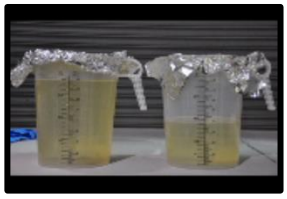

Figure 211. Pre test 22 minutes, 326954_1120999

Figure 212. Pre test 39 seconds, 326954_1121000

Figure 213. Pre test 38 seconds, 326954_1121001

Figure 214. Pre test 36 seconds, 326954_1121002

Figure 215. Pre test 34 seconds, 326954_1121003

Figure 216. Pre test 30 seconds, 326954_1121004

Figure 217. Pre test 28 seconds, 326954_1121005

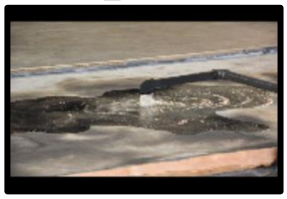

Figure 218. Pre test 26 seconds, 326954_1121006

Figure 219. Pre test 20 seconds, 326954_1121007

Figure 220. Pre test 18 seconds, 326954_1121008

Figure 221. Pre test 17 seconds, 326954_1121009

Figure 222. Pre test 13 seconds, 326954_1121010

Figure 223. Pre test 11 seconds, 326954_1121011

Figure 224. Pre test 8 seconds, 326954_1121012

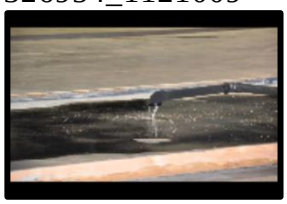

Figure 225. Pre test 6 seconds, 326954_1121013

Figure 226. 0 seconds, 326954_1121014

Figure 227. 1 seconds, 326954_1121015

Figure 228. 2 seconds, 326954_1121016

Figure 229. 4 seconds, 326954_1121017

Figure 230. 6 seconds, 326954_1121018

Figure 231. 8 seconds, 326954_1121019

Figure 232. 16 seconds, 326954_1121020

Figure 233. 20 seconds, 326954_1121021

Figure 234. 26 seconds, 326954_1121022

Figure 235. 27 seconds, 326954_1121023

Figure 236. 34 seconds, 326954_1121024

Figure 237. 41 seconds, 326954_1121025

Figure 238. 44 seconds, 326954_1121026

Figure 239. 51 seconds, 326954_1121027

Figure 240. 57 seconds, 326954_1121028

Figure 241. 70 seconds, 326954_1121029

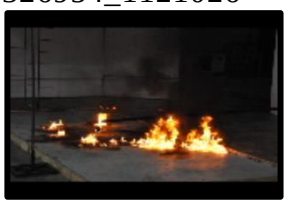

Figure 242. 75 seconds, 326954_1121030

Figure 243. 82 seconds, 326954_1121031

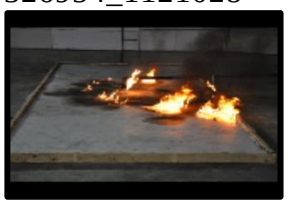

Figure 244. 85 seconds, 326954_1121032

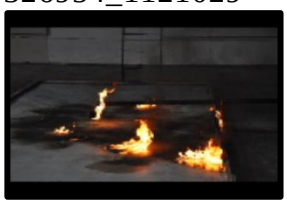

Figure 245. 96 seconds, 326954_1121033

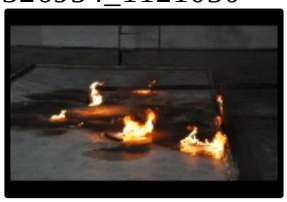

Figure 246. 100 seconds, 326954_1121034

Figure 247. 111 seconds, 326954_1121035

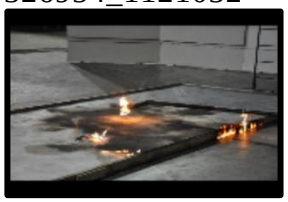

Figure 248. 117 seconds, 326954_1121036

Figure 249. 134 seconds, 326954_1121037

Figure 250. Post test 0 minutes, 326954_1121038

Figure 251. Post test 0 minutes, 326954_1121039

Figure 252. Post test 0 minutes, 326954_1121040

Figure 253. Post test 0 minutes, 326954_1121041

Figure 254. Post test 0 minutes, 326954_1121042

Figure 255. Post test 0 minutes, 326954_1121043

Figure 256. Post test 0 minutes, 326954_1121044

Figure 257. Post test 1 minutes, 326954_1121045

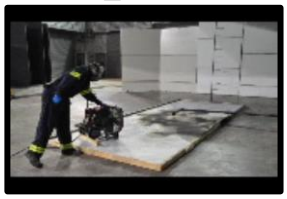

Figure 258. Post test 1 minutes, 326954_1121046

Figure 259. Post test 1 minutes, 326954_1121047

Figure 260. Post test 1 minutes, 326954_1121048

Results for Test 4 (ID 326955)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

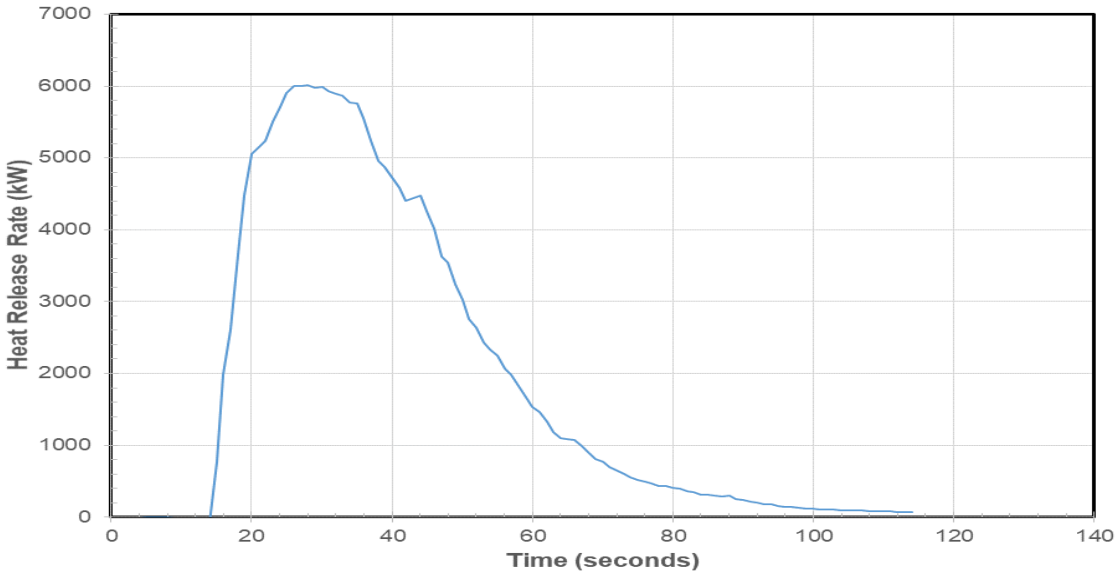

Figure 261. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

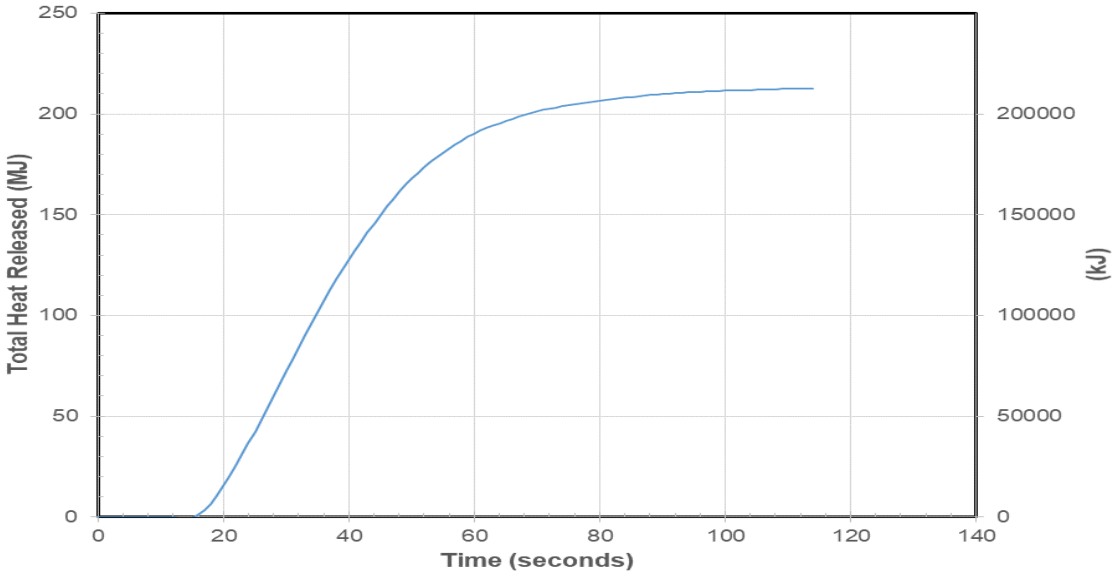

Figure 262. Total Heat Released

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

Table 9. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	11:22:53	205	326955_20200831_112253_1.mov
SIDE VIEW	11:22:55	209	326955_20200831_112255_9.mov
FRONT VIEW	11:22:55	210	326955_20200831_112255_10.mov
CLOSE UP	11:22:56	210	326955_20200831_112256_11.mov
MASTER			326955_1122964.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 263. Pre test 38 minutes, 326955_1121061

Figure 264. Pre test 37 minutes, 326955_1121062

Figure 265. Pre test 37 minutes, 326955_1121063

Figure 266. Pre test 37 minutes, 326955_1121064

Figure 267. Pre test 21 minutes, 326955_1121065

Figure 268. Pre test 21 minutes, 326955_1121066

Figure 269. Pre test 20 minutes, 326955_1121067

Figure 270. Pre test 20 minutes, 326955_1121068

Figure 271. Pre test 20 minutes, 326955_1121069

Figure 272. Pre test 19 minutes, 326955_1121070

Figure 273. Pre test 19 minutes, 326955_1121071

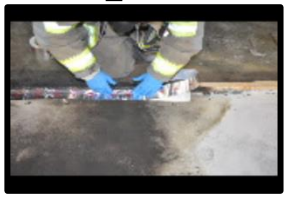

Figure 274. Pre test 18 minutes, 326955_1121072

Figure 275. Pre test 17 minutes, 326955_1121073

Figure 276. Pre test 17 minutes, 326955_1121074

Figure 277. Pre test 16 minutes, 326955_1121075

Figure 278. Pre test 16 minutes, 326955_1121076

Figure 279. Pre test 15 minutes, 326955_1121077

Figure 280. Pre test 14 minutes, 326955_1121078

Figure 281. Pre test 13 minutes, 326955_1121079

Figure 282. Pre test 13 minutes, 326955_1121080

Figure 283. Pre test 13 minutes, 326955_1121081

Figure 284. Pre test 12 minutes, 326955_1121082

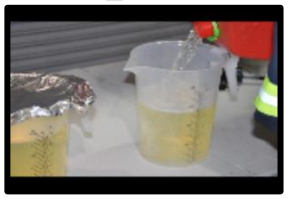

Figure 285. Pre test 11 minutes, 326955_1121083

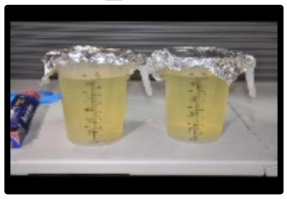

Figure 286. Pre test 11 minutes, 326955_1121084

Figure 287. Pre test 10 minutes, 326955_1121085

Figure 288. Pre test 10 minutes, 326955_1121086

Figure 289. Pre test 9 minutes, 326955_1121087

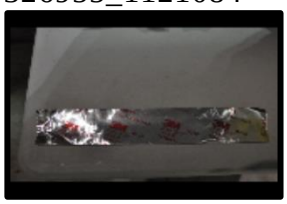

Figure 290. Pre test 9 minutes, 326955_1121088

Figure 291. Pre test 9 minutes, 326955_1121089

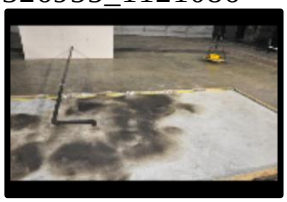

Figure 292. Pre test 4 minutes, 326955_1121090

Figure 293. Pre test 4 minutes, 326955_1121091

Figure 294. Pre test 4 minutes, 326955_1121092

Figure 295. Pre test 4 minutes, 326955_1121093

Figure 296. Pre test 4 minutes, 326955_1121094

Figure 297. Pre test 3 minutes, 326955_1121095

Figure 298. Pre test 3 minutes, 326955_1121096

Figure 299. Pre test 3 minutes, 326955_1121097

Figure 300. Pre test 41 seconds, 326955_1121098

Figure 301. Pre test 39 seconds, 326955_1121099

Figure 302. Pre test 38 seconds, 326955_1121100

Figure 303. Pre test 36 seconds, 326955_1121101

Figure 304. Pre test 32 seconds, 326955_1121102

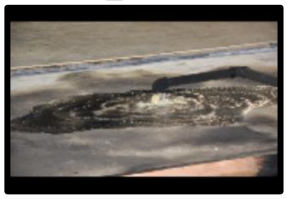

Figure 305. Pre test 31 seconds, 326955_1121103

Figure 306. Pre test 24 seconds, 326955_1121104

Figure 307. Pre test 20 seconds, 326955_1121105

Figure 308. Pre test 17 seconds, 326955_1121106

Figure 309. Pre test 15 seconds, 326955_1121107

Figure 310. Pre test 14 seconds, 326955_1121108

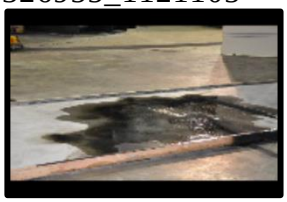

Figure 311. Pre test 11 seconds, 326955_1121109

Figure 312. Pre test 7 seconds, 326955_1121110

Figure 313. 0 seconds, 326955_1121111

Figure 314. 3 seconds, 326955_1121112

Figure 315. 6 seconds, 326955_1121113

Figure 316. 14 seconds, 326955_1121114

Figure 317. 17 seconds, 326955_1121115

Figure 318. 21 seconds, 326955_1121116

Figure 319. 23 seconds, 326955_1121117

Figure 320. 30 seconds, 326955_1121118

Figure 321. 39 seconds, 326955_1121119

Figure 322. 46 seconds, 326955_1121120

Figure 323. 59 seconds, 326955_1121121

Figure 324. 67 seconds, 326955_1121122

Figure 325. 75 seconds, 326955_1121123

Figure 326. 76 seconds, 326955_1121124

Figure 327. 91 seconds, 326955_1121125

Figure 328. 93 seconds, 326955_1121126

Figure 329. 102 seconds, 326955_1121127

Figure 330. 104 seconds, 326955_1121128

Figure 331. 111 seconds, 326955_1121129

Figure 332. 114 seconds, 326955_1121130

Figure 333. 127 seconds, 326955_1121131

Figure 334. 131 seconds, 326955_1121132

Figure 335. Post test 0 minutes, 326955_1121133

Figure 336. Post test 0 minutes, 326955_1121134

Figure 337. Post test 0 minutes, 326955_1121135

Figure 338. Post test 0 minutes, 326955_1121136

Figure 339. Post test 0 minutes, 326955_1121137

Figure 340. Post test 0 minutes, 326955_1121138

Figure 341. Post test 0 minutes, 326955_1121139

Figure 342. Post test 1 minutes, 326955_1121140

Figure 343. Post test 1 minutes, 326955_1121141

Figure 344. Post test 1 minutes, 326955_1121142

Figure 345. Post test 1 minutes, 326955_1121143

Results for Test 5 (ID 326956)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

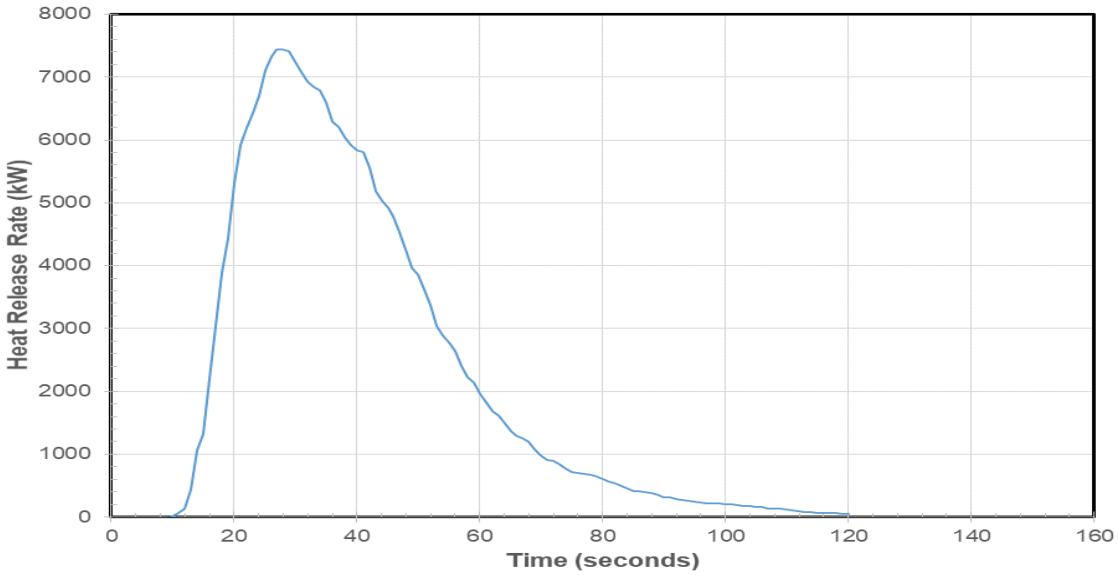

Figure 346. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

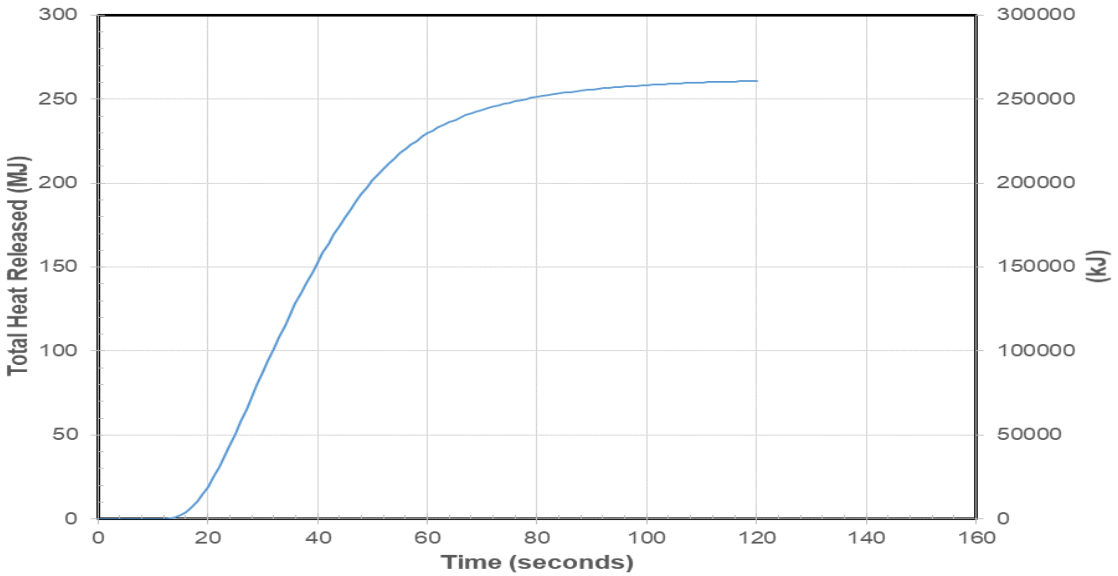

Figure 347. Total Heat Released

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

Table 10. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	01:02:38	235	326956_20200831_130238_1.mov
SIDE VIEW	01:02:40	234	326956_20200831_130240_9.mov
FRONT VIEW	01:02:41	234	326956_20200831_130241_10.mov
CLOSE UP	01:02:41	235	326956_20200831_130241_11.mov
MASTER			326956_1122965.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 348. Pre test 16 minutes, 326956_1121153

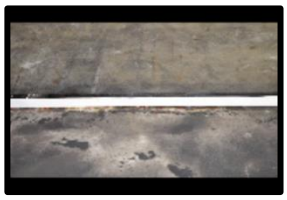

Figure 349. Pre test 16 minutes, 326956_1121154

Figure 350. Pre test 16 minutes, 326956_1121155

Figure 351. Pre test 16 minutes, 326956_1121156

Figure 352. Pre test 15 minutes, 326956_1121157

Figure 353. Pre test 10 minutes, 326956_1121158

Figure 354. Pre test 10 minutes, 326956_1121159

Figure 355. Pre test 10 minutes, 326956_1121160

Figure 356. Pre test 9 minutes, 326956_1121161

Figure 357. Pre test 8 minutes, 326956_1121162

Figure 358. Pre test 8 minutes, 326956_1121163

Figure 359. Pre test 6 minutes, 326956_1121164

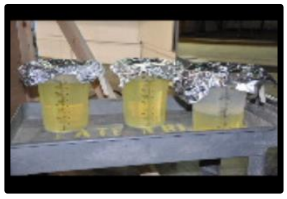

Figure 360. Pre test 6 minutes, 326956_1121165

Figure 361. Pre test 6 minutes, 326956_1121166

Figure 362. Pre test 54 seconds, 326956_1121167

Figure 363. Pre test 53 seconds, 326956_1121168

Figure 364. Pre test 45 seconds, 326956_1121169

Figure 365. Pre test 42 seconds, 326956_1121170

Figure 366. Pre test 39 seconds, 326956_1121171

Figure 367. Pre test 38 seconds, 326956_1121172

Figure 368. Pre test 33 seconds, 326956_1121173

Figure 369. Pre test 31 seconds, 326956_1121174

Figure 370. Pre test 29 seconds, 326956_1121175

Figure 371. Pre test 27 seconds, 326956_1121176

Figure 372. Pre test 21 seconds, 326956_1121177

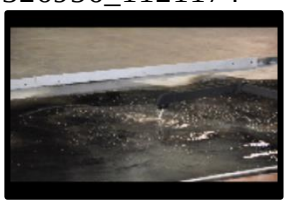

Figure 373. Pre test 18 seconds, 326956_1121178

Figure 374. Pre test 14 seconds, 326956_1121179

Figure 375. Pre test 1 seconds, 326956_1121180

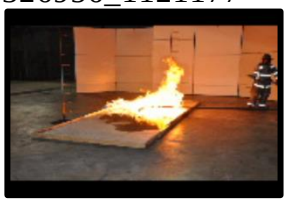

Figure 376. 0 seconds, 326956_1121181

Figure 377. 2 seconds, 326956_1121182

Figure 378. 5 seconds, 326956_1121183

Figure 379. 15 seconds, 326956_1121184

Figure 380. 18 seconds, 326956_1121185

Figure 381. 26 seconds, 326956_1121186

Figure 382. 30 seconds, 326956_1121187

Figure 383. 34 seconds, 326956_1121188

Figure 384. 44 seconds, 326956_1121189

Figure 385. 46 seconds, 326956_1121190

Figure 386. 51 seconds, 326956_1121191

Figure 387. 63 seconds, 326956_1121192

Figure 388. 77 seconds, 326956_1121193

Figure 389. 89 seconds, 326956_1121194

Figure 390. 92 seconds, 326956_1121195

Figure 391. 98 seconds, 326956_1121196

Figure 392. 107 seconds, 326956_1121197

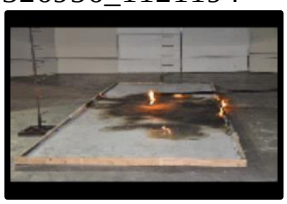

Figure 393. 124 seconds, 326956_1121198

Figure 394. Post test 0 minutes, 326956_1121199

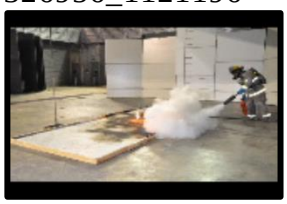

Figure 395. Post test 0 minutes, 326956_1121200

Figure 396. Post test 0 minutes, 326956_1121201

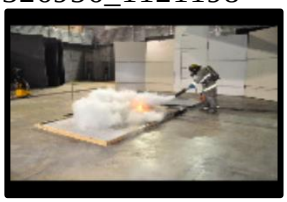

Figure 397. Post test 0 minutes, 326956_1121202

Figure 398. Post test 0 minutes, 326956_1121203

Figure 399. Post test 0 minutes, 326956_1121204

Figure 400. Post test 0 minutes, 326956_1121205

Figure 401. Post test 1 minutes, 326956_1121206

Figure 402. Post test 1 minutes, 326956_1121207

Figure 403. Post test 1 minutes, 326956_1121208

Figure 404. Post test 1 minutes, 326956_1121209

Results for Test 6 (ID 326957)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

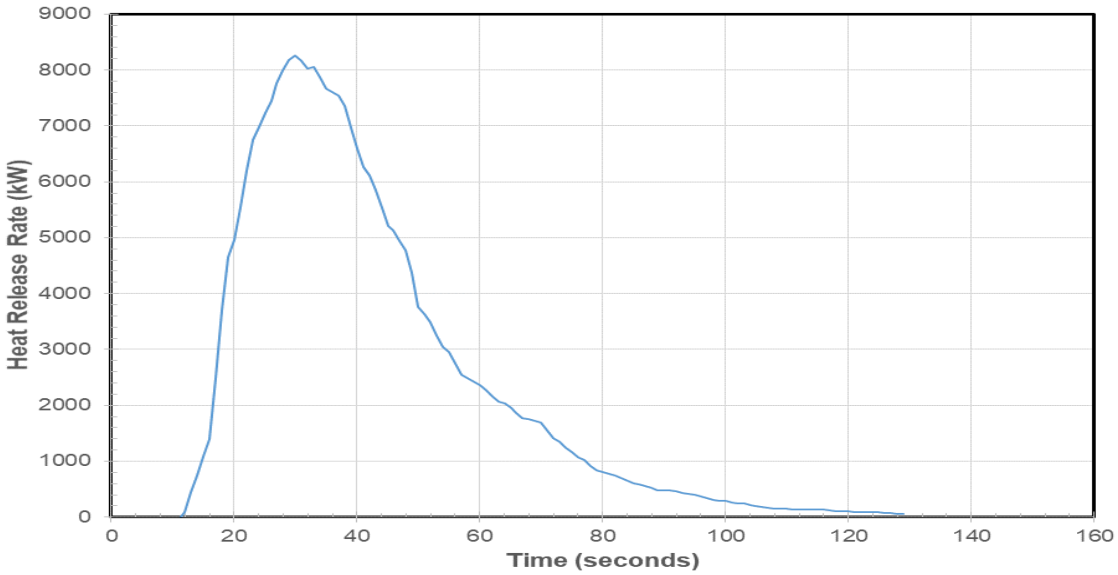

Figure 405. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

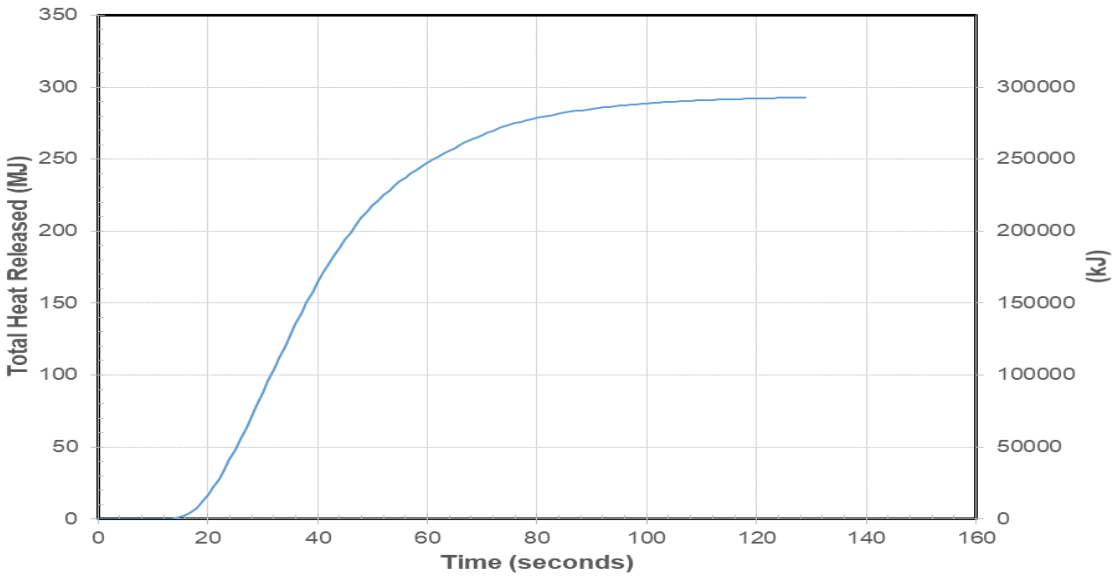

Figure 406. Total Heat Released

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

Table 11. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	01:42:39	245	326957_20200831_134239_1.mov
SIDE VIEW	01:42:40	245	326957_20200831_134240_9.mov
FRONT VIEW	01:42:41	245	326957_20200831_134241_10.mov
CLOSE UP	01:42:42	244	326957_20200831_134242_11.mov
MASTER			326957_1122966.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 407. Pre test 19 minutes, 326957_1121216

Figure 408. Pre test 19 minutes, 326957_1121217

Figure 409. Pre test 18 minutes, 326957_1121218

Figure 410. Pre test 17 minutes, 326957_1121219

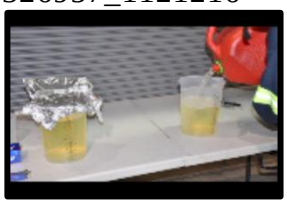

Figure 411. Pre test 16 minutes, 326957_1121220

Figure 412. Pre test 15 minutes, 326957_1121221

Figure 413. Pre test 15 minutes, 326957_1121222

Figure 414. Pre test 15 minutes, 326957_1121223

Figure 415. Pre test 59 seconds, 326957_1121224

Figure 416. Pre test 58 seconds, 326957_1121225

Figure 417. Pre test 56 seconds, 326957_1121226

Figure 418. Pre test 53 seconds, 326957_1121227

Figure 419. Pre test 52 seconds, 326957_1121228

Figure 420. Pre test 50 seconds, 326957_1121229

Figure 421. Pre test 46 seconds, 326957_1121230

Figure 422. Pre test 44 seconds, 326957_1121231

Figure 423. Pre test 42 seconds, 326957_1121232

Figure 424. Pre test 39 seconds, 326957_1121233

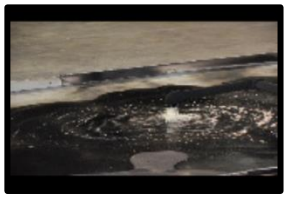

Figure 425. Pre test 37 seconds, 326957_1121234

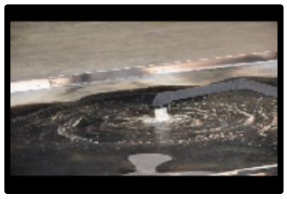

Figure 426. Pre test 35 seconds, 326957_1121235

Figure 427. Pre test 27 seconds, 326957_1121236

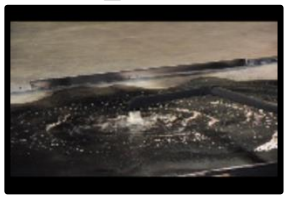

Figure 428. Pre test 25 seconds, 326957_1121237

Figure 429. Pre test 22 seconds, 326957_1121238

Figure 430. Pre test 1 seconds, 326957_1121239

Figure 431. 0 seconds, 326957_1121240

Figure 432. 2 seconds, 326957_1121241

Figure 433. 9 seconds, 326957_1121242

Figure 434. 13 seconds, 326957_1121243

Figure 435. 21 seconds, 326957_1121244

Figure 436. 25 seconds, 326957_1121245

Figure 437. 32 seconds, 326957_1121246

Figure 438. 34 seconds, 326957_1121247

Figure 439. 45 seconds, 326957_1121248

Figure 440. 47 seconds, 326957_1121249

Figure 441. 61 seconds, 326957_1121250

Figure 442. 64 seconds, 326957_1121251

Figure 443. 85 seconds, 326957_1121252

Figure 444. 87 seconds, 326957_1121253

Figure 445. 99 seconds, 326957_1121254

Figure 446. 103 seconds, 326957_1121255

Figure 447. 106 seconds, 326957_1121256

Figure 448. 124 seconds, 326957_1121257

Figure 449. 128 seconds, 326957_1121258

Figure 450. Post test 0 minutes, 326957_1121259

Figure 451. Post test 0 minutes, 326957_1121260

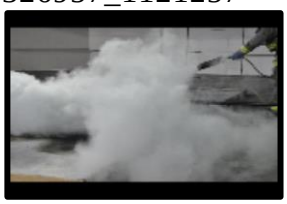

Figure 452. Post test 0 minutes, 326957_1121261

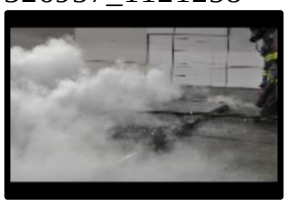

Figure 453. Post test 0 minutes, 326957_1121262

Figure 454. Post test 0 minutes, 326957_1121263

Figure 455. Post test 0 minutes, 326957_1121264

Figure 456. Post test 0 minutes, 326957_1121265

Figure 457. Post test 0 minutes, 326957_1121266

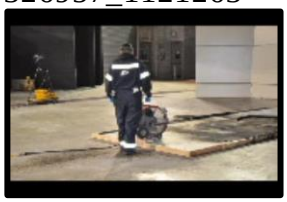

Figure 458. Post test 2 minutes, 326957_1121267

Figure 459. Post test 2 minutes, 326957_1121268

Results for Test 7 (ID 326958)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

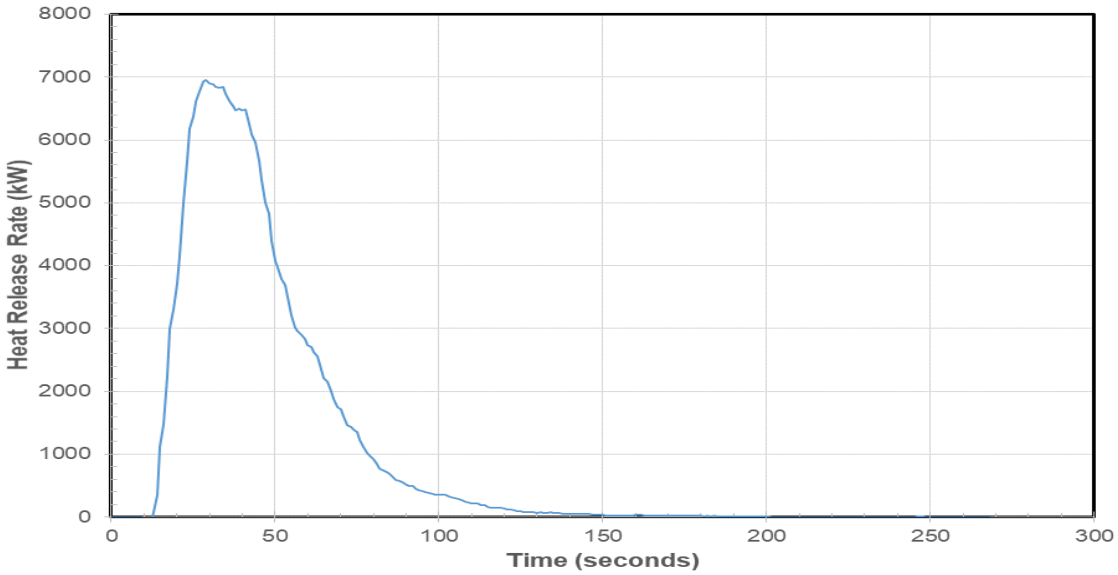

Figure 460. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

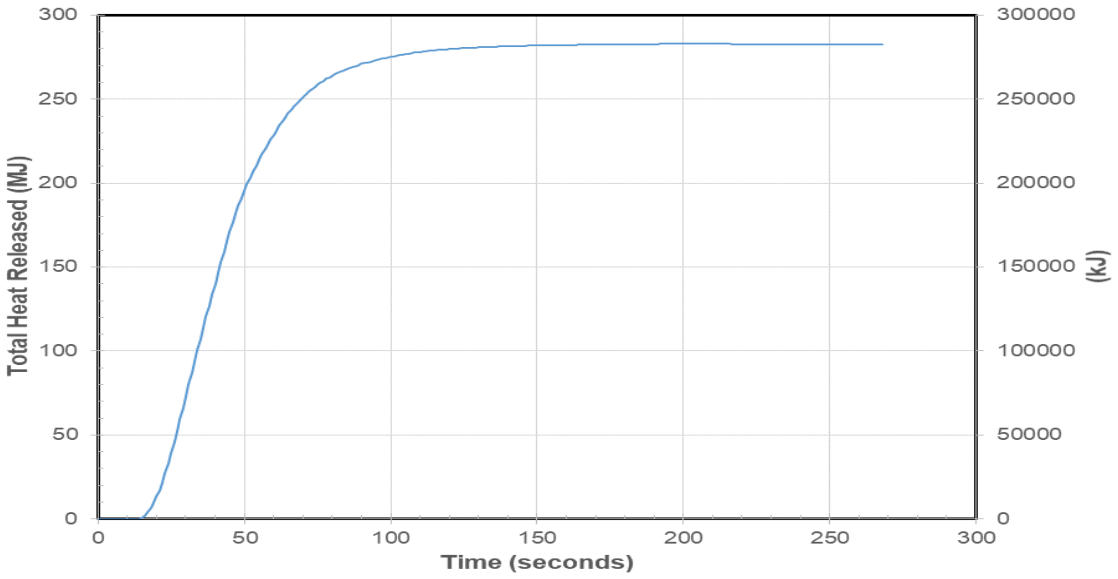

Figure 461. Total Heat Released

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

Table 12. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	02:29:55	270	326958_20200831_142955_1.mov
SIDE VIEW	02:29:56	270	326958_20200831_142956_9.mov
FRONT VIEW	02:29:57	270	326958_20200831_142957_10.mov
CLOSE UP	02:29:58	270	326958_20200831_142958_11.mov
MASTER			326958_1124099.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.

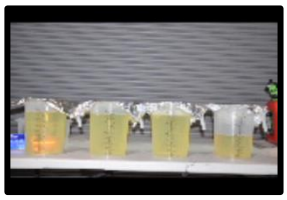

Figure 462. Pre test 9 minutes, 326958_1121286

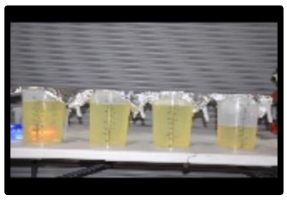

Figure 463. Pre test 8 minutes, 326958_1121287

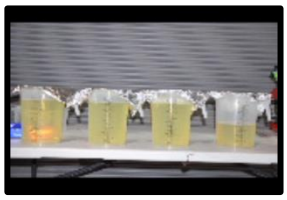

Figure 464. Pre test 8 minutes, 326958_1121288

Figure 465. Pre test 63 seconds, 326958_1121289

Figure 466. Pre test 61 seconds, 326958_1121290

Figure 467. Pre test 61 seconds, 326958_1121291

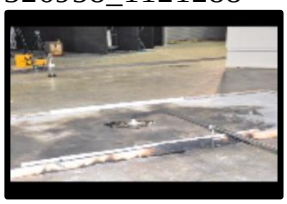

Figure 468. Pre test 55 seconds, 326958_1121292

Figure 469. Pre test 51 seconds, 326958_1121293

Figure 470. Pre test 49 seconds, 326958_1121294

Figure 471. Pre test 45 seconds, 326958_1121295

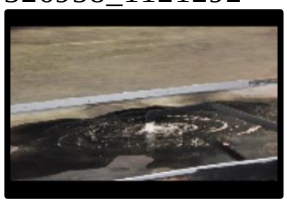

Figure 472. Pre test 43 seconds, 326958_1121296

Figure 473. Pre test 39 seconds, 326958_1121297

Figure 474. Pre test 37 seconds, 326958_1121298

Figure 475. Pre test 35 seconds, 326958_1121299

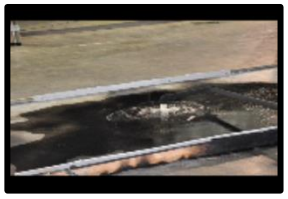

Figure 476. Pre test 33 seconds, 326958_1121300

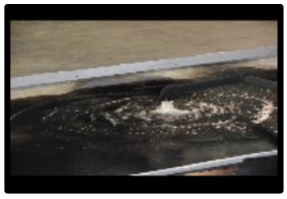

Figure 477. Pre test 31 seconds, 326958_1121301

Figure 478. Pre test 29 seconds, 326958_1121302

Figure 479. Pre test 27 seconds, 326958_1121303

Figure 480. Pre test 23 seconds, 326958_1121304

Figure 481. Pre test 21 seconds, 326958_1121305

Figure 482. Pre test 19 seconds, 326958_1121306

Figure 483. Pre test 7 seconds, 326958_1121307

Figure 484. Pre test 1 seconds, 326958_1121308

Figure 485. 1 seconds, 326958_1121309

Figure 486. 19 seconds, 326958_1121310

Figure 487. 27 seconds, 326958_1121311

Figure 488. 35 seconds, 326958_1121312

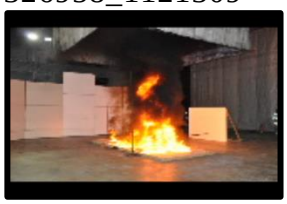

Figure 489. 37 seconds, 326958_1121313

Figure 490. 51 seconds, 326958_1121314

Figure 491. 53 seconds, 326958_1121315

Figure 492. 67 seconds, 326958_1121316

Figure 493. 71 seconds, 326958_1121317

Figure 494. 85 seconds, 326958_1121318

Figure 495. 87 seconds, 326958_1121319

Figure 496. 99 seconds, 326958_1121320

Figure 497. 113 seconds, 326958_1121321

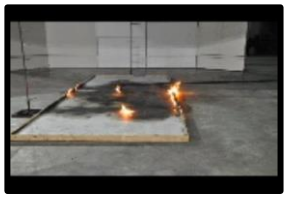

Figure 498. 133 seconds, 326958_1121322

Figure 499. 137 seconds, 326958_1121323

Figure 500. 141 seconds, 326958_1121324

Figure 501. 165 seconds, 326958_1121325

Figure 502. 169 seconds, 326958_1121326

Figure 503. 171 seconds, 326958_1121327

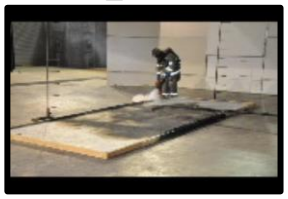

Figure 504. 177 seconds, 326958_1121328

Figure 505. 179 seconds, 326958_1121329

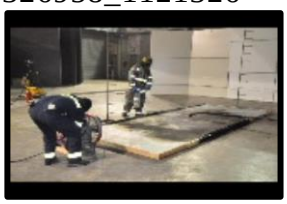

Figure 506. Post test 0 minutes, 326958_1121330

Figure 507. Post test 0 minutes, 326958_1121331

Figure 508. Post test 0 minutes, 326958_1121332

Figure 509. Post test 0 minutes, 326958_1121333

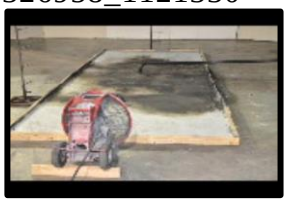

Figure 510. Post test 0 minutes, 326958_1121334

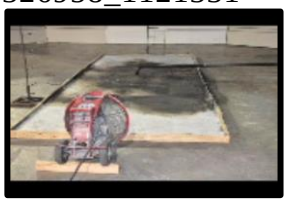

Figure 511. Post test 0 minutes, 326958_1121335

Results for Test 8 (ID 326960)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

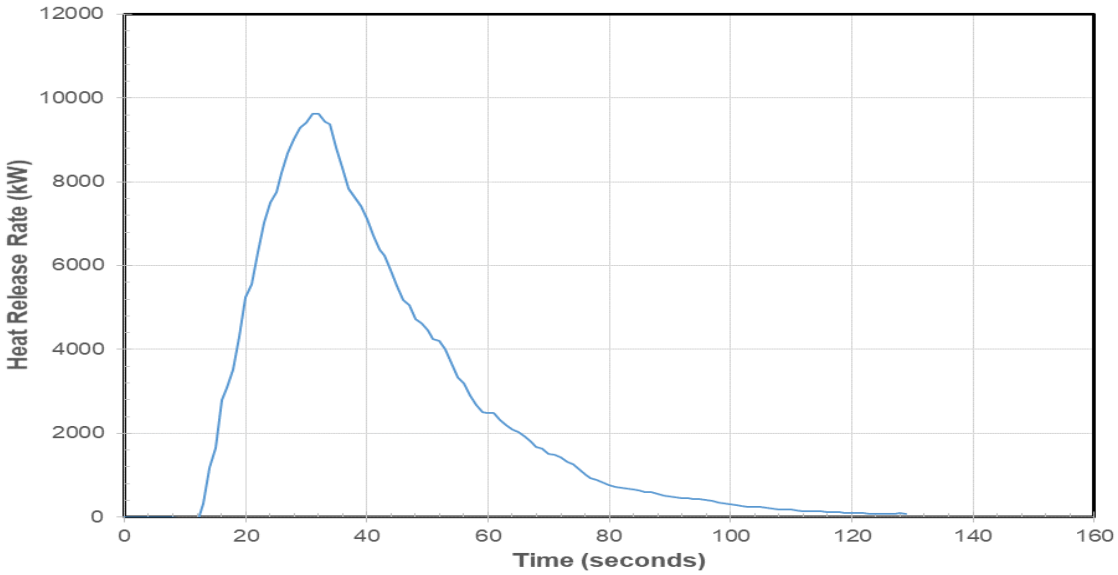

Figure 512. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

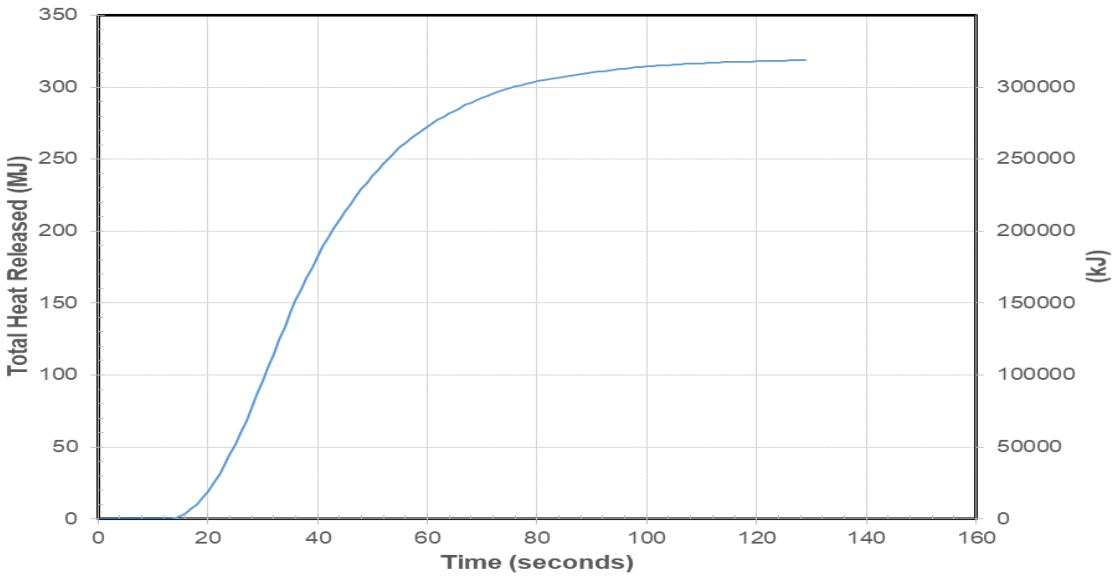

Figure 513. Total Heat Released

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

Table 13. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	03:17:26	265	326960_20200831_151726_1.mov
SIDE VIEW	03:17:27	265	326960_20200831_151727_9.mov
FRONT VIEW	03:17:28	265	326960_20200831_151728_10.mov
CLOSE UP	03:17:29	265	326960_20200831_151729_11.mov
MASTER			326960_1122967.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 514. Pre test 20 minutes, 326960_1121343

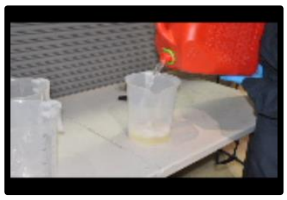

Figure 515. Pre test 20 minutes, 326960_1121344

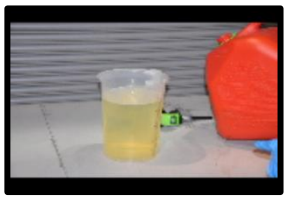

Figure 516. Pre test 19 minutes, 326960_1121345

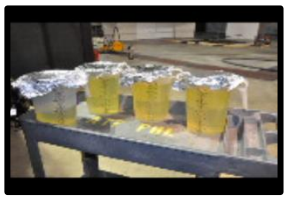

Figure 517. Pre test 18 minutes, 326960_1121346

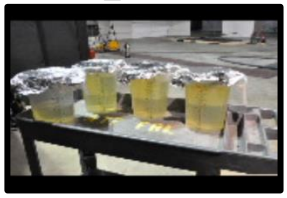

Figure 518. Pre test 18 minutes, 326960_1121347

Figure 519. Pre test 67 seconds, 326960_1121348

Figure 520. Pre test 65 seconds, 326960_1121349

Figure 521. Pre test 60 seconds, 326960_1121350

Figure 522. Pre test 58 seconds, 326960_1121351

Figure 523. Pre test 54 seconds, 326960_1121352

Figure 524. Pre test 52 seconds, 326960_1121353

Figure 525. Pre test 49 seconds, 326960_1121354

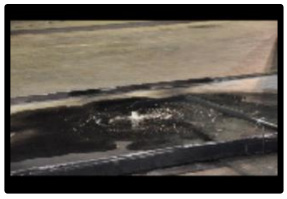

Figure 526. Pre test 43 seconds, 326960_1121355

Figure 527. Pre test 39 seconds, 326960_1121356

Figure 528. Pre test 37 seconds, 326960_1121357

Figure 529. Pre test 32 seconds, 326960_1121358

Figure 530. Pre test 31 seconds, 326960_1121359

Figure 531. Pre test 28 seconds, 326960_1121360

Figure 532. Pre test 23 seconds, 326960_1121361

Figure 533. Pre test 21 seconds, 326960_1121362

Figure 534. Pre test 17 seconds, 326960_1121363

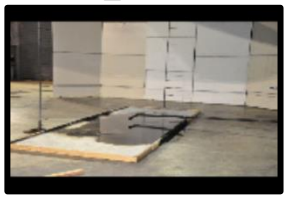

Figure 535. Pre test 4 seconds, 326960_1121364

Figure 536. 0 seconds, 326960_1121365

Figure 537. 1 seconds, 326960_1121366

Figure 538. 4 seconds, 326960_1121367

Figure 539. 14 seconds, 326960_1121368

Figure 540. 16 seconds, 326960_1121369

Figure 541. 20 seconds, 326960_1121370

Figure 542. 27 seconds, 326960_1121371

Figure 543. 40 seconds, 326960_1121372

Figure 544. 42 seconds, 326960_1121373

Figure 545. 54 seconds, 326960_1121374

Figure 546. 57 seconds, 326960_1121375

Figure 547. 71 seconds, 326960_1121376

Figure 548. 76 seconds, 326960_1121377

Figure 549. 88 seconds, 326960_1121378

Figure 550. 103 seconds, 326960_1121379

Figure 551. 110 seconds, 326960_1121380

Figure 552. 125 seconds, 326960_1121381

Figure 553. Post test 0 minutes, 326960_1121382

Figure 554. Post test 0 minutes, 326960_1121383

Figure 555. Post test 0 minutes, 326960_1121384

Figure 556. Post test 0 minutes, 326960_1121385

Figure 557. Post test 1 minutes, 326960_1121386

Figure 558. Post test 1 minutes, 326960_1121387

Results for Test 9 (ID 326961)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

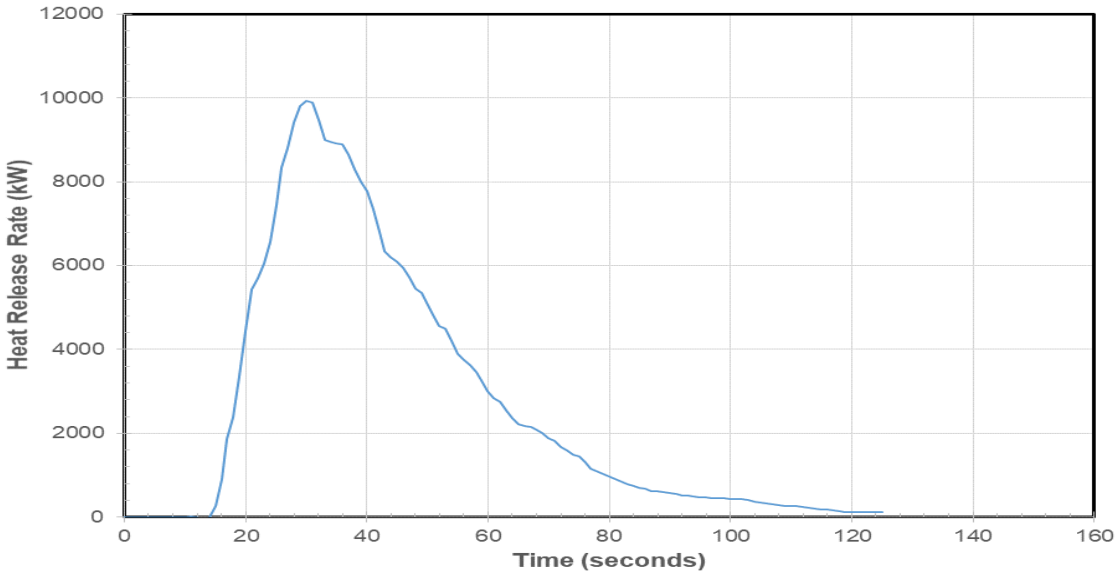

Figure 559. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

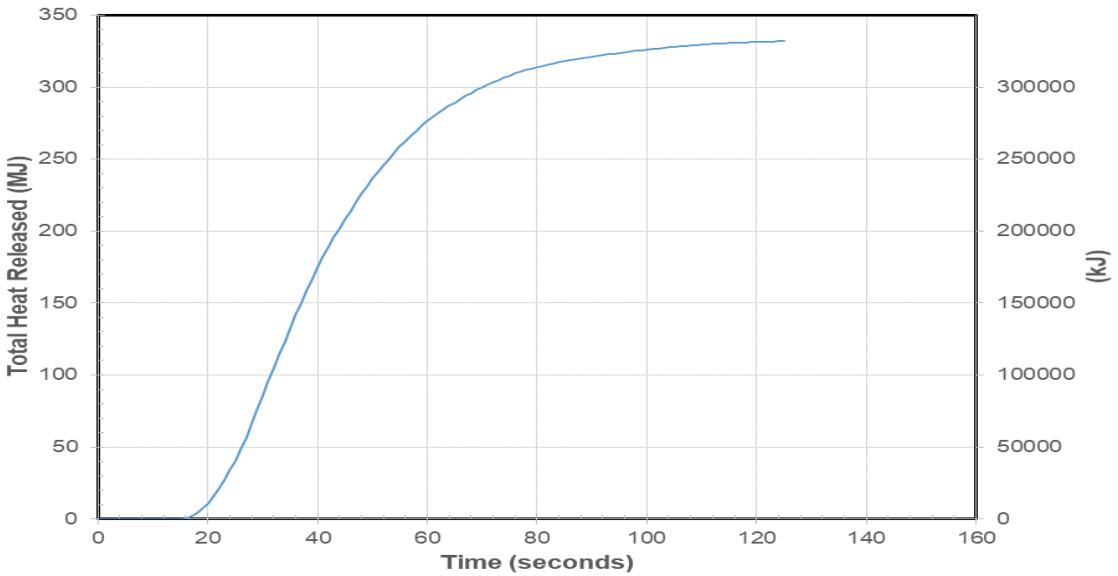

Figure 560. Total Heat Released

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

Table 14. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	08:54:22	256	326961_20200901_085422_1.mov
SIDE VIEW	08:54:24	255	326961_20200901_085424_9.mov
FRONT VIEW	08:54:25	254	326961_20200901_085425_10.mov
CLOSE UP	08:54:26	259	326961_20200901_085426_11.mov
MASTER			326961_1124100.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.

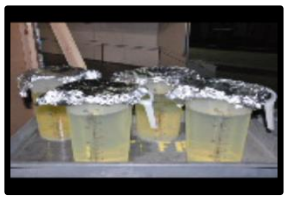

Figure 561. Pre test 10 minutes, 326961_1121394

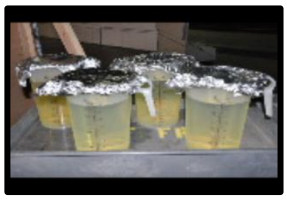

Figure 562. Pre test 10 minutes, 326961_1121395

Figure 563. Pre test 72 seconds, 326961_1121396

Figure 564. Pre test 69 seconds, 326961_1121397

Figure 565. Pre test 56 seconds, 326961_1121398

Figure 566. Pre test 35 seconds, 326961_1121399

Figure 567. Pre test 31 seconds, 326961_1121400

Figure 568. Pre test 27 seconds, 326961_1121401

Figure 569. Pre test 22 seconds, 326961_1121402

Figure 570. Pre test 18 seconds, 326961_1121403

Figure 571. Pre test 12 seconds, 326961_1121404

Figure 572. Pre test 7 seconds, 326961_1121405

Figure 573. 0 seconds, 326961_1121406

Figure 574. 4 seconds, 326961_1121407

Figure 575. 10 seconds, 326961_1121408

Figure 576. 19 seconds, 326961_1121409

Figure 577. 25 seconds, 326961_1121410

Figure 578. 29 seconds, 326961_1121411

Figure 579. 38 seconds, 326961_1121412

Figure 580. 44 seconds, 326961_1121413

Figure 581. 57 seconds, 326961_1121414

Figure 582. 66 seconds, 326961_1121415

Figure 583. 71 seconds, 326961_1121416

Figure 584. 82 seconds, 326961_1121417

Figure 585. 94 seconds, 326961_1121418

Figure 586. 108 seconds, 326961_1121419

Figure 587. 114 seconds, 326961_1121420

Figure 588. 129 seconds, 326961_1121421

Figure 589. 142 seconds, 326961_1121422

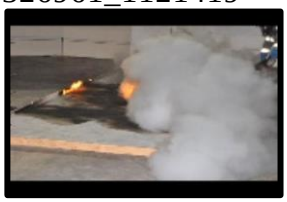

Figure 590. Post test 0 minutes, 326961_1121423

Figure 591. Post test 0 minutes, 326961_1121424

Figure 592. Post test 0 minutes, 326961_1121425

Figure 593. Post test 0 minutes, 326961_1121426

Figure 594. Post test 1 minutes, 326961_1121427

Figure 595. Post test 1 minutes, 326961_1121428

Results for Test 10 (ID 326962)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

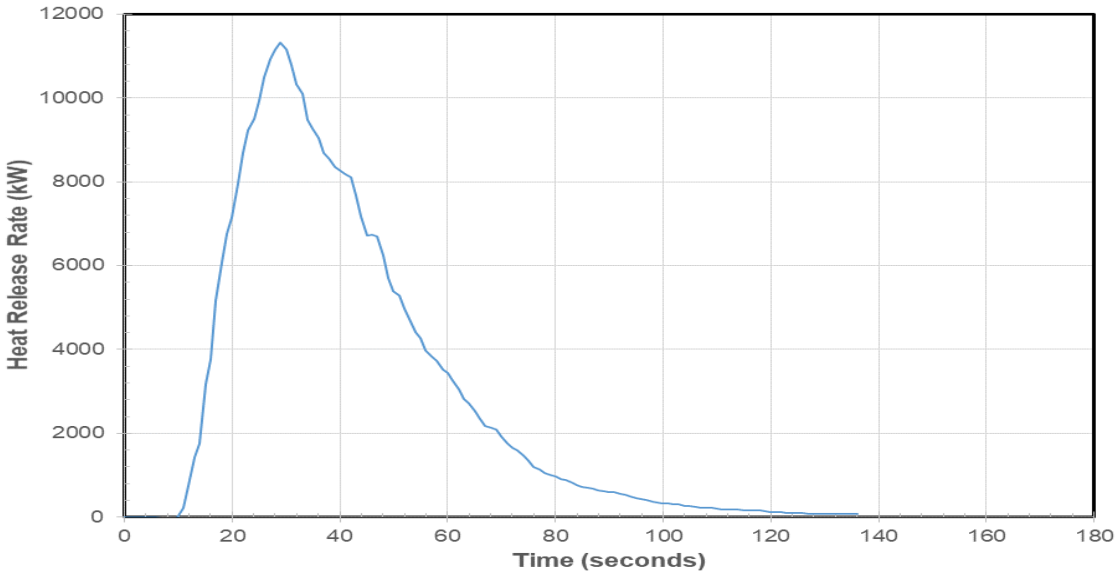

Figure 596. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

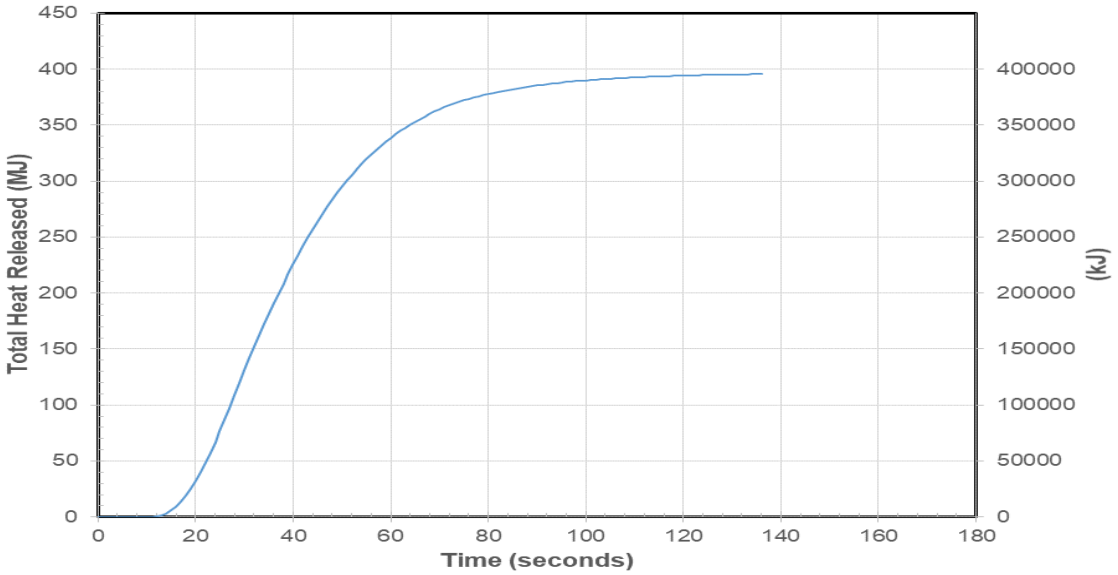

Figure 597. Total Heat Released

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

Table 15. Video Log

Description	Start Time	Duration (s)	Filename
SIDE VIEW	09:36:22	391	326962_20200901_093622_9.mov
FRONT VIEW	09:36:22	397	326962_20200901_093622_10.mov
CLOSE UP	09:36:23	397	326962_20200901_093623_11.mov
FLIR	09:37:09	343	326962_20200901_093709_1.mov
MASTER			326962_1124101.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 598. Pre test 9 minutes, 326962_1121442

Figure 599. Pre test 9 minutes, 326962_1121443

Figure 600. Pre test 9 minutes, 326962_1121444

Figure 601. Pre test 3 minutes, 326962_1121445

Figure 602. Pre test 3 minutes, 326962_1121446

Figure 603. Pre test 84 seconds, 326962_1121447

Figure 604. Pre test 82 seconds, 326962_1121448

Figure 605. Pre test 78 seconds, 326962_1121449

Figure 606. Pre test 72 seconds, 326962_1121450

Figure 607. Pre test 70 seconds, 326962_1121451

Figure 608. Pre test 68 seconds, 326962_1121452

Figure 609. Pre test 62 seconds, 326962_1121453

Figure 610. Pre test 62 seconds, 326962_1121454

Figure 611. Pre test 56 seconds, 326962_1121455

Figure 612. Pre test 54 seconds, 326962_1121456

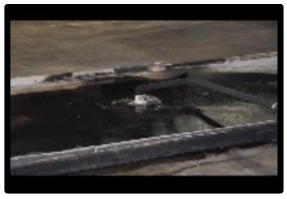

Figure 613. Pre test 50 seconds, 326962_1121457

Figure 614. Pre test 48 seconds, 326962_1121458

Figure 615. Pre test 42 seconds, 326962_1121459

Figure 616. Pre test 40 seconds, 326962_1121460

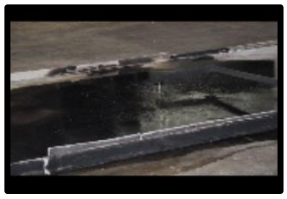

Figure 617. Pre test 36 seconds, 326962_1121461

Figure 618. Pre test 34 seconds, 326962_1121462

Figure 619. Pre test 30 seconds, 326962_1121463

Figure 620. Pre test 26 seconds, 326962_1121464

Figure 621. Pre test 24 seconds, 326962_1121465

Figure 622. Pre test 16 seconds, 326962_1121466

Figure 623. Pre test 14 seconds, 326962_1121467

Figure 624. Pre test 10 seconds, 326962_1121468

Figure 625. 10 seconds, 326962_1121469

Figure 626. 14 seconds, 326962_1121470

Figure 627. 22 seconds, 326962_1121471

Figure 628. 28 seconds, 326962_1121472

Figure 629. 40 seconds, 326962_1121473

Figure 630. 50 seconds, 326962_1121474

Figure 631. 52 seconds, 326962_1121475

Figure 632. 62 seconds, 326962_1121476

Figure 633. 68 seconds, 326962_1121477

Figure 634. 84 seconds, 326962_1121478

Figure 635. 90 seconds, 326962_1121479

Figure 636. 108 seconds, 326962_1121480

Figure 637. 112 seconds, 326962_1121481

Figure 638. 124 seconds, 326962_1121482

Figure 639. 130 seconds, 326962_1121483

Figure 640. 154 seconds, 326962_1121484

Figure 641. 154 seconds, 326962_1121485

Figure 642. Post test 0 minutes, 326962_1121486

Figure 643. Post test 0 minutes, 326962_1121487

Figure 644. Post test 0 minutes, 326962_1121488

Figure 645. Post test 0 minutes, 326962_1121489

Figure 646. Post test 0 minutes, 326962_1121490

Figure 647. Post test 0 minutes, 326962_1121491

Figure 648. Post test 1 minutes, 326962_1121492

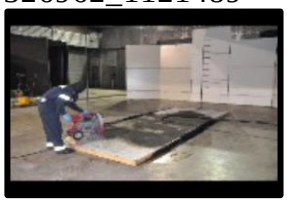

Figure 649. Post test 1 minutes, 326962_1121493

Figure 650. Post test 1 minutes, 326962_1121496

Figure 651. Post test 1 minutes, 326962_1121494

Figure 652. Post test 1 minutes, 326962_1121497

Figure 653. Post test 1 minutes, 326962_1121495

Figure 654. Post test 1 minutes, 326962_1121498

Results for Test 11 (ID 326963)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

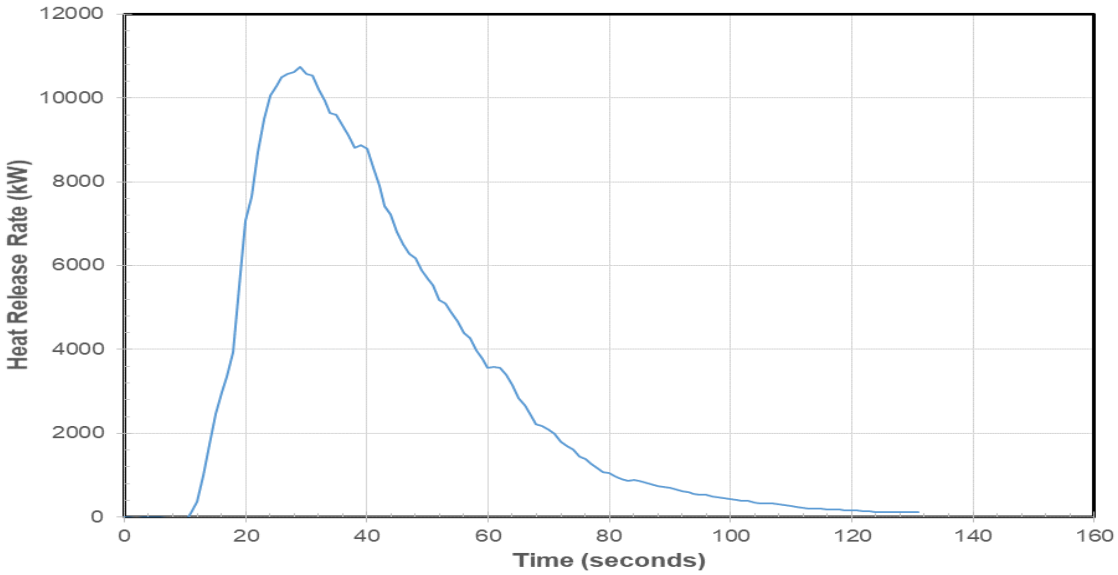

Figure 655. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

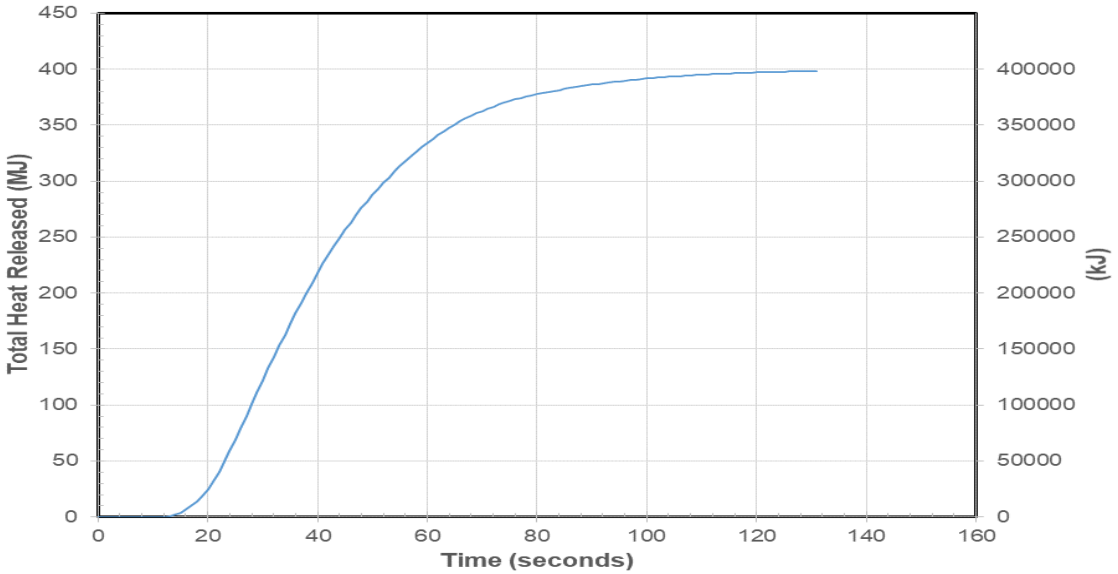

Figure 656. Total Heat Released

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

Table 16. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	10:33:24	280	326963_20200901_103324_1.mov
SIDE VIEW	10:33:25	280	326963_20200901_103325_9.mov
FRONT VIEW	10:33:26	280	326963_20200901_103326_10.mov
CLOSE UP	10:33:27	279	326963_20200901_103327_11.mov
MASTER			326963_1124102.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.

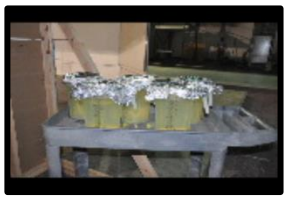

Figure 657. Pre test 18 minutes, 326963_1121507

Figure 658. Pre test 18 minutes, 326963_1121508

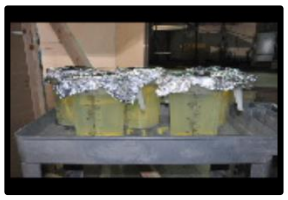

Figure 659. Pre test 18 minutes, 326963_1121509

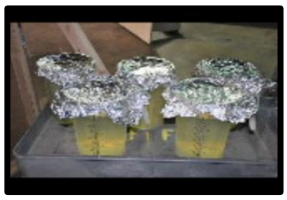

Figure 660. Pre test 3 minutes, 326963_1121510

Figure 661. Pre test 3 minutes, 326963_1121511

Figure 662. Pre test 3 minutes, 326963_1121512

Figure 663. Pre test 90 seconds, 326963_1121513

Figure 664. Pre test 82 seconds, 326963_1121514

Figure 665. Pre test 80 seconds, 326963_1121515

Figure 666. Pre test 76 seconds, 326963_1121516

Figure 667. Pre test 74 seconds, 326963_1121517

Figure 668. Pre test 70 seconds, 326963_1121518

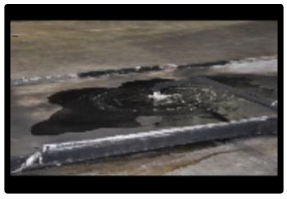

Figure 669. Pre test 68 seconds, 326963_1121519

Figure 670. Pre test 60 seconds, 326963_1121520

Figure 671. Pre test 56 seconds, 326963_1121521

Figure 672. Pre test 48 seconds, 326963_1121522

Figure 673. Pre test 48 seconds, 326963_1121523

Figure 674. Pre test 42 seconds, 326963_1121524

Figure 675. Pre test 40 seconds, 326963_1121525

Figure 676. Pre test 36 seconds, 326963_1121526

Figure 677. Pre test 30 seconds, 326963_1121527

Figure 678. Pre test 24 seconds, 326963_1121528

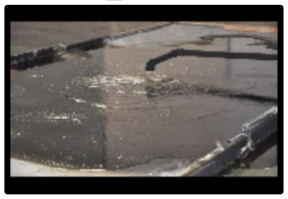

Figure 679. Pre test 22 seconds, 326963_1121529

Figure 680. Pre test 18 seconds, 326963_1121530

Figure 681. Pre test 16 seconds, 326963_1121531

Figure 682. 0 seconds, 326963_1121532

Figure 683. 2 seconds, 326963_1121533

Figure 684. 6 seconds, 326963_1121534

Figure 685. 12 seconds, 326963_1121535

Figure 686. 16 seconds, 326963_1121536

Figure 687. 22 seconds, 326963_1121537

Figure 688. 24 seconds, 326963_1121538

Figure 689. 32 seconds, 326963_1121539

Figure 690. 36 seconds, 326963_1121540

Figure 691. 48 seconds, 326963_1121541

Figure 692. 50 seconds, 326963_1121542

Figure 693. 66 seconds, 326963_1121543

Figure 694. 80 seconds, 326963_1121544

Figure 695. 92 seconds, 326963_1121545

Figure 696. 114 seconds, 326963_1121546

Figure 697. 130 seconds, 326963_1121547

Figure 698. 144 seconds, 326963_1121548

Figure 699. 148 seconds, 326963_1121549

Figure 700. Post test 0 minutes, 326963_1121550

Figure 701. Post test 0 minutes, 326963_1121551

Figure 702. Post test 0 minutes, 326963_1121552

Figure 703. Post test 0 minutes, 326963_1121553

Figure 704. Post test 1 minutes, 326963_1121554

Results for Test 12 (ID 326964)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

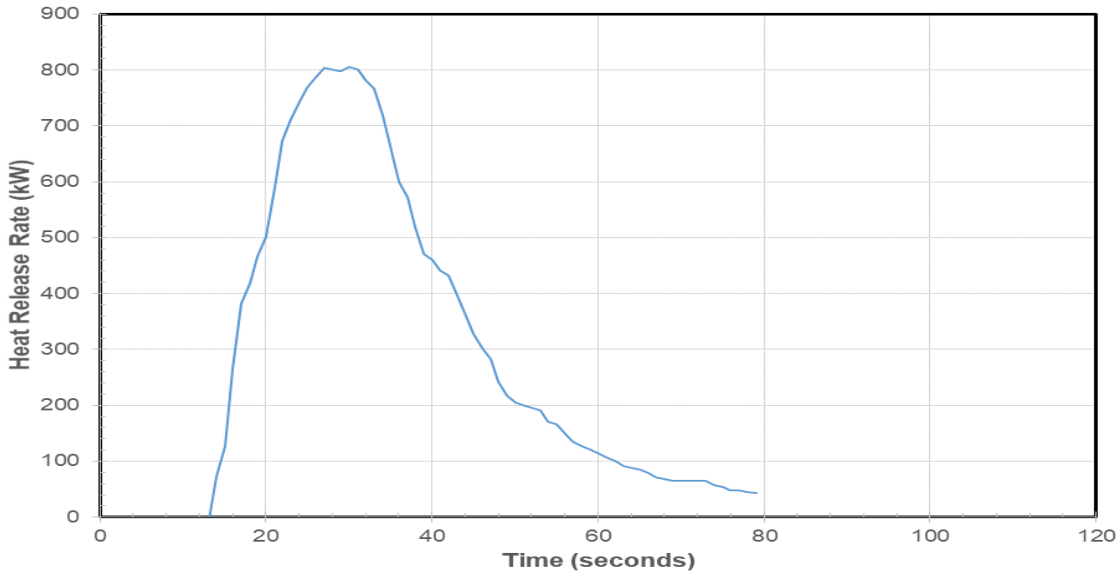

Figure 705. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

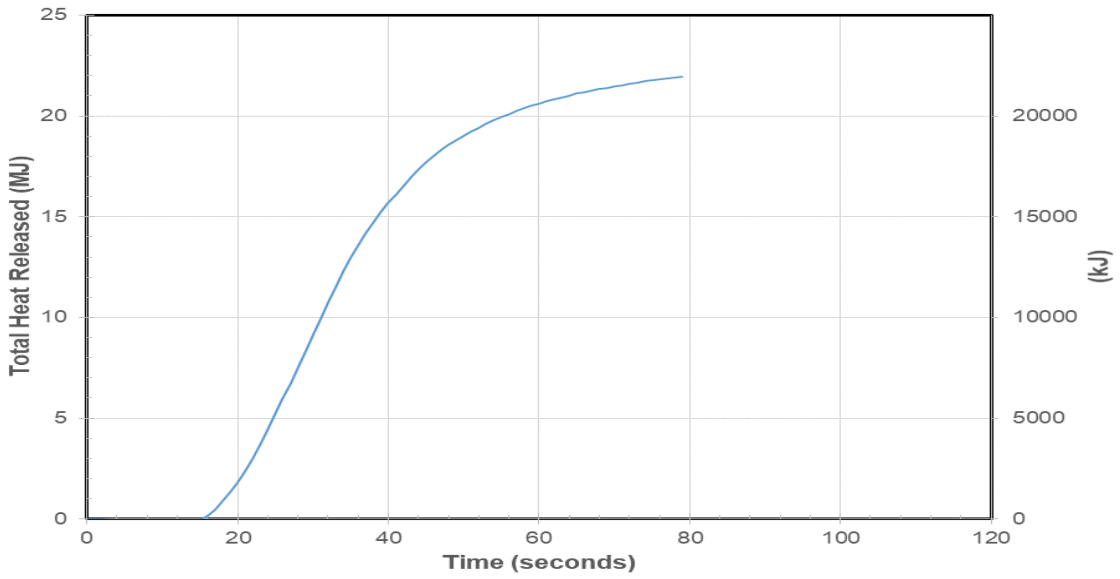

Figure 706. Total Heat Released

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

Table 17. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	12:58:12	165	326964_20200901_125812_1.mov
SIDE VIEW	12:58:13	165	326964_20200901_125813_9.mov
FRONT VIEW	12:58:14	164	326964_20200901_125814_10.mov
CLOSE UP	12:58:15	169	326964_20200901_125815_11.mov
MASTER			326964_1124103.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.

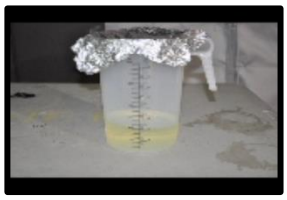

Figure 707. Pre test 6 minutes, 326964_1121564

Figure 708. Pre test 6 minutes, 326964_1121565

Figure 709. Pre test 31 seconds, 326964_1121566

Figure 710. Pre test 29 seconds, 326964_1121567

Figure 711. Pre test 23 seconds, 326964_1121568

Figure 712. Pre test 21 seconds, 326964_1121569

Figure 713. Pre test 11 seconds, 326964_1121570

Figure 714. Pre test 9 seconds, 326964_1121571

Figure 715. Pre test 5 seconds, 326964_1121572

Figure 716. 1 seconds, 326964_1121573

Figure 717. 3 seconds, 326964_1121574

Figure 718. 9 seconds, 326964_1121575

Figure 719. 11 seconds, 326964_1121576

Figure 720. 17 seconds, 326964_1121577

Figure 721. 25 seconds, 326964_1121578

Figure 722. 29 seconds, 326964_1121579

Figure 723. 41 seconds, 326964_1121580

Figure 724. 49 seconds, 326964_1121581

Figure 725. 63 seconds, 326964_1121582

Figure 726. 75 seconds, 326964_1121583

Figure 727. 77 seconds, 326964_1121584

Figure 728. 87 seconds, 326964_1121585

Figure 729. 93 seconds, 326964_1121586

Figure 730. 107 seconds, 326964_1121587

Figure 731. 107 seconds, 326964_1121588

Figure 732. 109 seconds, 326964_1121589

Figure 733. Post test 0 minutes, 326964_1121590

Figure 734. Post test 0 minutes, 326964_1121591

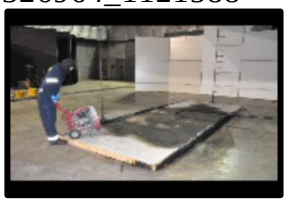

Figure 735. Post test 0 minutes, 326964_1121592

Figure 736. Post test 1 minutes, 326964_1121593

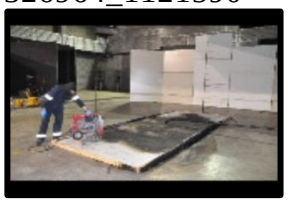

Figure 737. Post test 1 minutes, 326964_1121594

Figure 738. Post test 1 minutes, 326964_1121595

Results for Test 13 (ID 326973)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

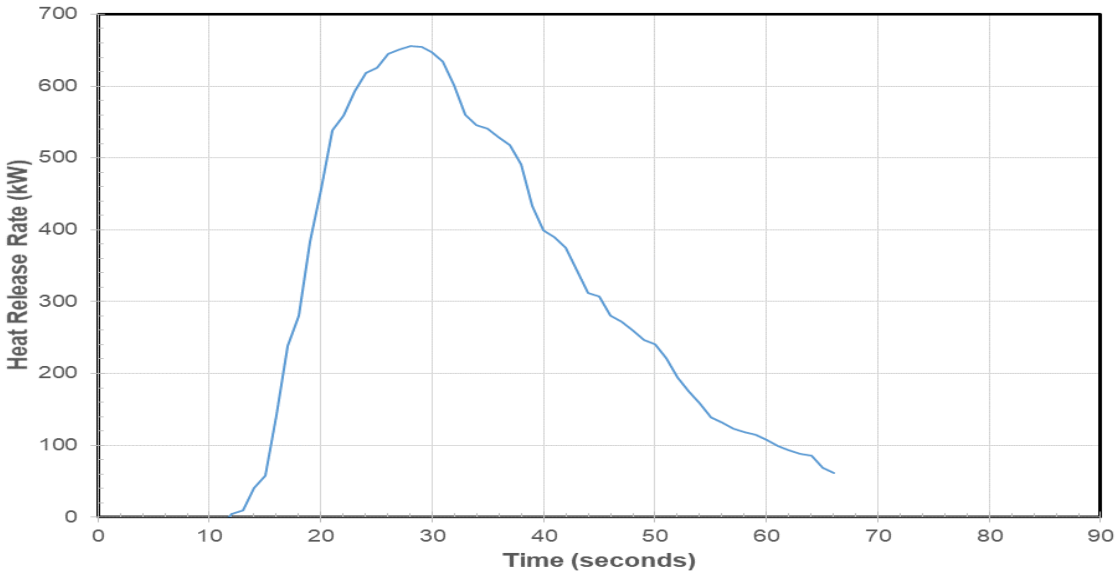

Figure 739. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

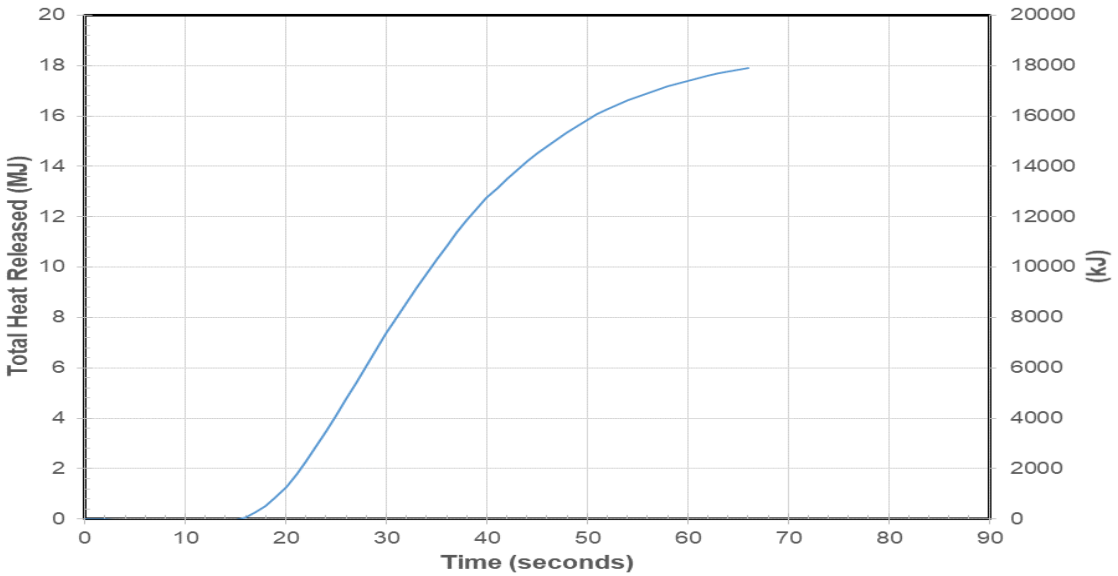

Figure 740. Total Heat Released

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

Table 18. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	09:05:15	180	326973_20200904_090515_1.mov
SIDE VIEW	09:05:17	179	326973_20200904_090517_9.mov
FRONT VIEW	09:05:18	179	326973_20200904_090518_10.mov
CLOSE UP	09:05:18	180	326973_20200904_090518_11.mov
MASTER			326973_1122968.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 741. Pre test 4 minutes, 326973_1121660

Figure 742. Pre test 4 minutes, 326973_1121661

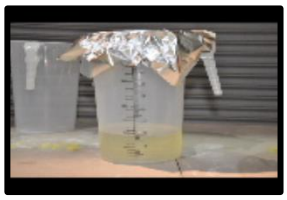

Figure 743. Pre test 3 minutes, 326973_1121662

Figure 744. Pre test 3 minutes, 326973_1121663

Figure 745. Pre test 39 seconds, 326973_1121664

Figure 746. Pre test 37 seconds, 326973_1121665

Figure 747. Pre test 36 seconds, 326973_1121666

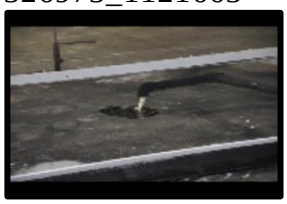

Figure 748. Pre test 32 seconds, 326973_1121667

Figure 749. Pre test 30 seconds, 326973_1121668

Figure 750. Pre test 29 seconds, 326973_1121669

Figure 751. Pre test 21 seconds, 326973_1121670

Figure 752. Pre test 12 seconds, 326973_1121671

Figure 753. Pre test 1 seconds, 326973_1121672

Figure 754. 0 seconds, 326973_1121673

Figure 755. 2 seconds, 326973_1121674

Figure 756. 9 seconds, 326973_1121675

Figure 757. 13 seconds, 326973_1121676

Figure 758. 21 seconds, 326973_1121677

Figure 759. 24 seconds, 326973_1121678

Figure 760. 35 seconds, 326973_1121679

Figure 761. 37 seconds, 326973_1121680

Figure 762. 39 seconds, 326973_1121681

Figure 763. 59 seconds, 326973_1121682

Figure 764. 63 seconds, 326973_1121683

Figure 765. 68 seconds, 326973_1121684

Figure 766. 79 seconds, 326973_1121685

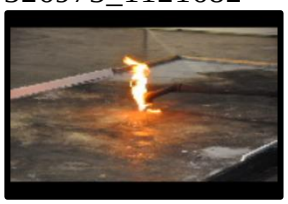

Figure 767. 82 seconds, 326973_1121686

Figure 768. Post test 0 minutes, 326973_1121687

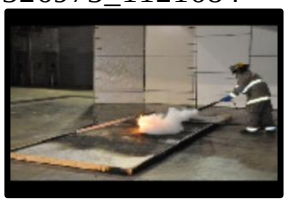

Figure 769. Post test 0 minutes, 326973_1121688

Figure 770. Post test 0 minutes, 326973_1121689

Figure 771. Post test 0 minutes, 326973_1121690

Figure 772. Post test 0 minutes, 326973_1121691

Figure 773. Post test 0 minutes, 326973_1121692

Figure 774. Post test 0 minutes, 326973_1121693

Results for Test 14 (ID 326974)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

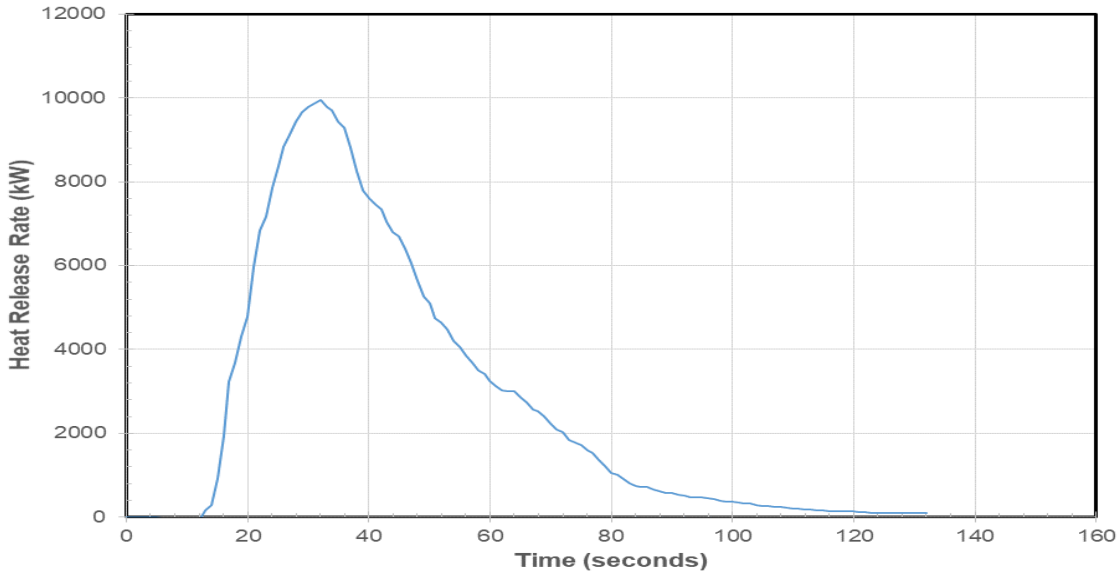

Figure 775. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

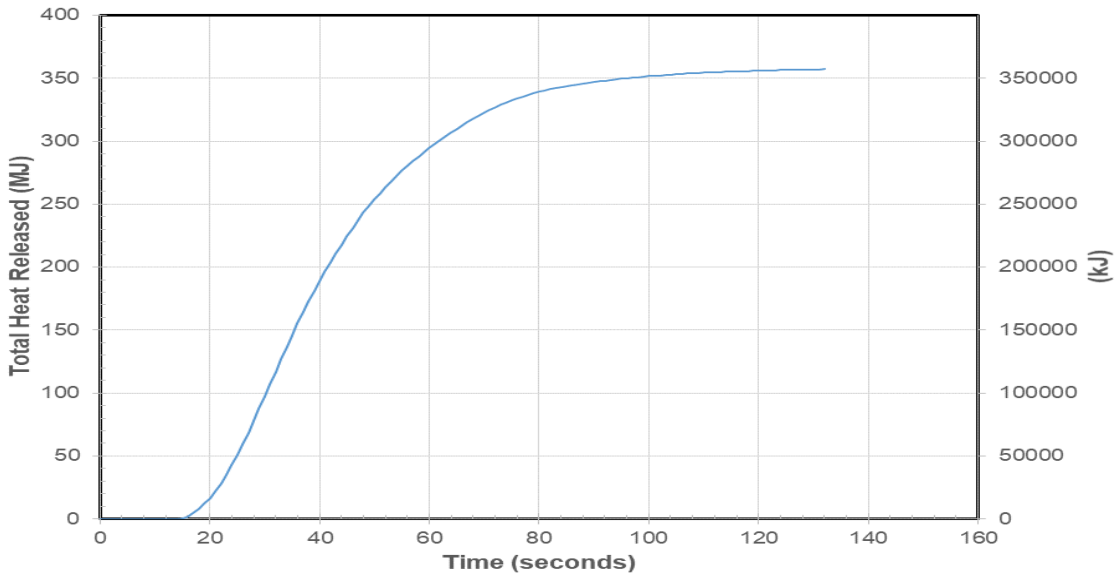

Figure 776. Total Heat Released

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

Table 19. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	09:31:04	276	326974_20200904_093104_1.mov
SIDE VIEW	09:31:06	280	326974_20200904_093106_9.mov
FRONT VIEW	09:31:07	279	326974_20200904_093107_10.mov
CLOSE UP	09:31:08	279	326974_20200904_093108_11.mov
MASTER			326974_1122969.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.

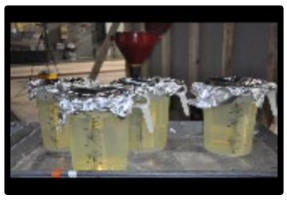

Figure 777. Pre test 10 minutes, 326974_1121703

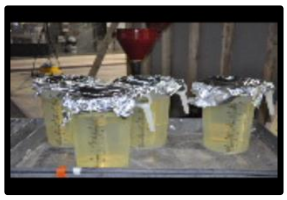

Figure 778. Pre test 10 minutes, 326974_1121704

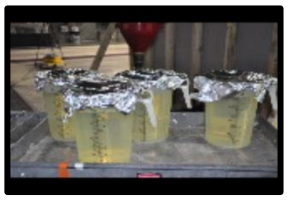

Figure 779. Pre test 10 minutes, 326974_1121705

Figure 780. Pre test 87 seconds, 326974_1121706

Figure 781. Pre test 86 seconds, 326974_1121707

Figure 782. Pre test 79 seconds, 326974_1121708

Figure 783. Pre test 77 seconds, 326974_1121709

Figure 784. Pre test 70 seconds, 326974_1121710

Figure 785. Pre test 67 seconds, 326974_1121711

Figure 786. Pre test 62 seconds, 326974_1121712

Figure 787. Pre test 61 seconds, 326974_1121713

Figure 788. Pre test 53 seconds, 326974_1121714

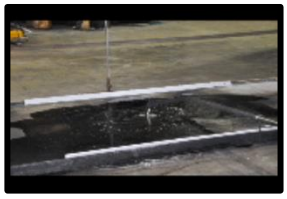

Figure 789. Pre test 40 seconds, 326974_1121715

Figure 790. Pre test 37 seconds, 326974_1121716

Figure 791. Pre test 33 seconds, 326974_1121717

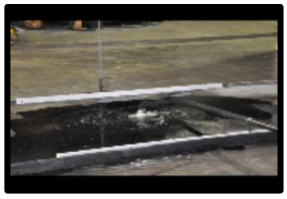

Figure 792. Pre test 31 seconds, 326974_1121718

Figure 793. Pre test 22 seconds, 326974_1121719

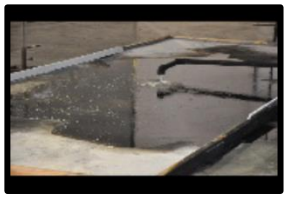

Figure 794. Pre test 21 seconds, 326974_1121720

Figure 795. Pre test 19 seconds, 326974_1121721

Figure 796. Pre test 16 seconds, 326974_1121722

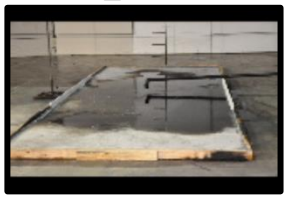

Figure 797. Pre test 8 seconds, 326974_1121723

Figure 798. Pre test 6 seconds, 326974_1121724

Figure 799. Pre test 1 seconds, 326974_1121725

Figure 800. 0 seconds, 326974_1121726

Figure 801. 4 seconds, 326974_1121727

Figure 802. 10 seconds, 326974_1121728

Figure 803. 15 seconds, 326974_1121729

Figure 804. 22 seconds, 326974_1121730

Figure 805. 24 seconds, 326974_1121731

Figure 806. 35 seconds, 326974_1121732

Figure 807. 37 seconds, 326974_1121733

Figure 808. 51 seconds, 326974_1121734

Figure 809. 55 seconds, 326974_1121735

Figure 810. 68 seconds, 326974_1121736

Figure 811. 82 seconds, 326974_1121737

Figure 812. 97 seconds, 326974_1121738

Figure 813. 110 seconds, 326974_1121739

Figure 814. 116 seconds, 326974_1121740

Figure 815. 133 seconds, 326974_1121741

Figure 816. Post test 0 minutes, 326974_1121742

Figure 817. Post test 0 minutes, 326974_1121743

Figure 818. Post test 0 minutes, 326974_1121744

Figure 819. Post test 0 minutes, 326974_1121745

Figure 820. Post test 0 minutes, 326974_1121746

Figure 821. Post test 0 minutes, 326974_1121747

Figure 822. Post test 0 minutes, 326974_1121748

Results for Test 15 (ID 326975)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

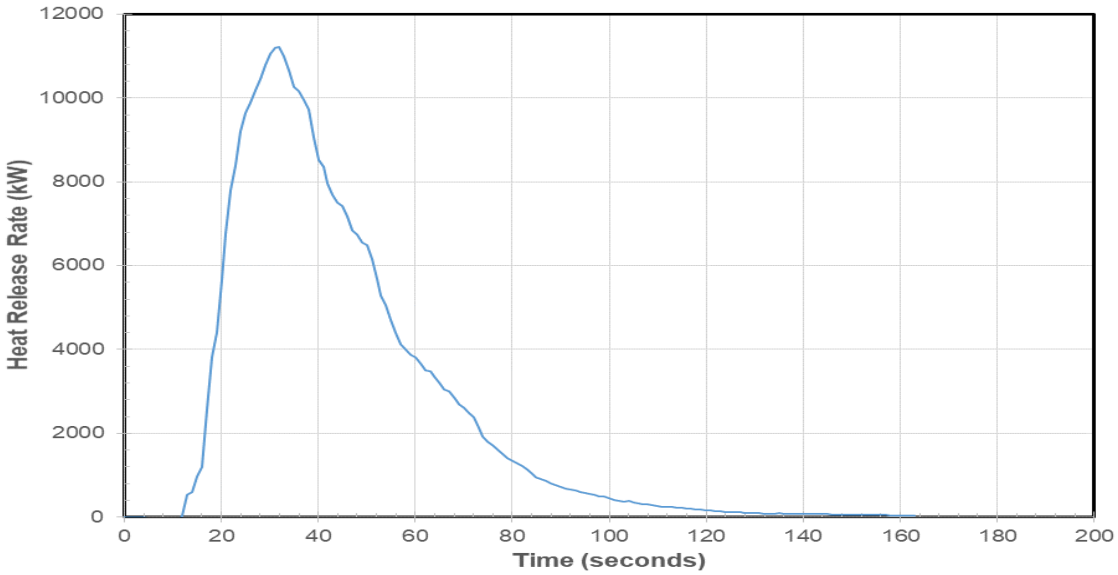

Figure 823. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

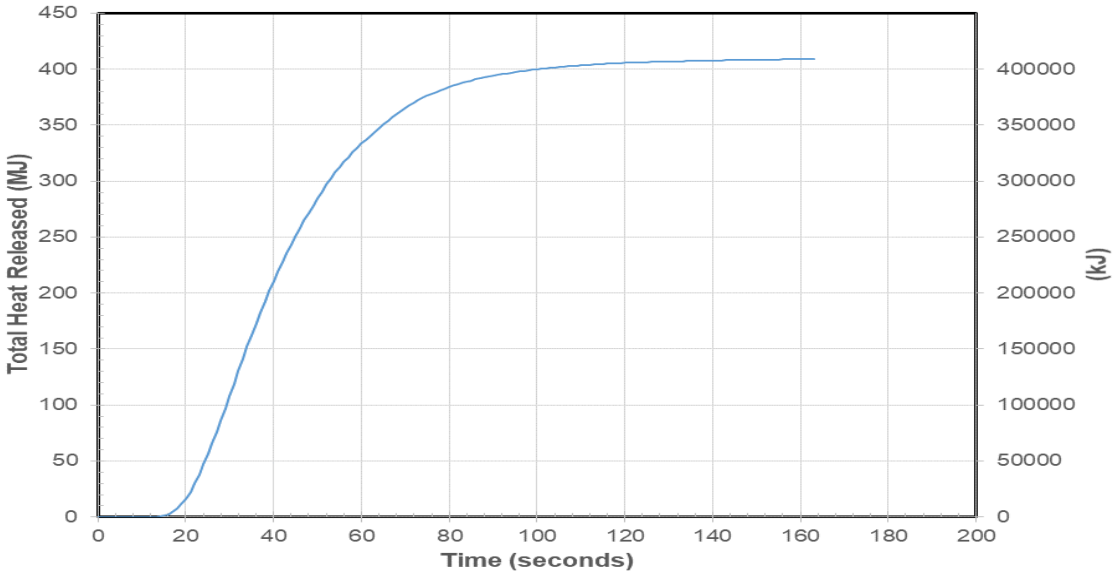

Figure 824. Total Heat Released

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

Table 20. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	10:15:55	330	326975_20200904_101555_1.mov
SIDE VIEW	10:15:56	335	326975_20200904_101556_9.mov
FRONT VIEW	10:15:57	335	326975_20200904_101557_10.mov
CLOSE UP	10:15:58	335	326975_20200904_101558_11.mov
MASTER			326975_1122970.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 825. Pre test 4 minutes, 326975_1121758

Figure 826. Pre test 4 minutes, 326975_1121759

Figure 827. Pre test 4 minutes, 326975_1121760

Figure 828. Pre test 3 minutes, 326975_1121761

Figure 829. Pre test 2 minutes, 326975_1121762

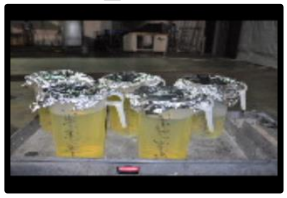

Figure 830. Pre test 2 minutes, 326975_1121763

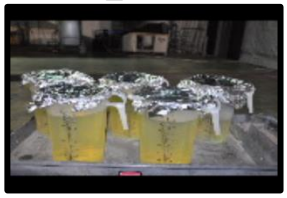

Figure 831. Pre test 2 minutes, 326975_1121764

Figure 832. Pre test 99 seconds, 326975_1121765

Figure 833. Pre test 98 seconds, 326975_1121766

Figure 834. Pre test 92 seconds, 326975_1121767

Figure 835. Pre test 90 seconds, 326975_1121768

Figure 836. Pre test 85 seconds, 326975_1121769

Figure 837. Pre test 83 seconds, 326975_1121770

Figure 838. Pre test 78 seconds, 326975_1121771

Figure 839. Pre test 75 seconds, 326975_1121772

Figure 840. Pre test 67 seconds, 326975_1121773

Figure 841. Pre test 61 seconds, 326975_1121774

Figure 842. Pre test 59 seconds, 326975_1121775

Figure 843. Pre test 51 seconds, 326975_1121776

Figure 844. Pre test 50 seconds, 326975_1121777

Figure 845. Pre test 47 seconds, 326975_1121778

Figure 846. Pre test 44 seconds, 326975_1121779

Figure 847. Pre test 41 seconds, 326975_1121780

Figure 848. Pre test 36 seconds, 326975_1121781

Figure 849. Pre test 34 seconds, 326975_1121782

Figure 850. Pre test 30 seconds, 326975_1121783

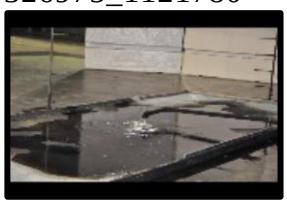

Figure 851. Pre test 23 seconds, 326975_1121784

Figure 852. Pre test 21 seconds, 326975_1121785

Figure 853. Pre test 15 seconds, 326975_1121786

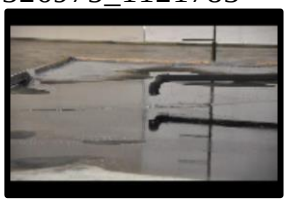

Figure 854. Pre test 13 seconds, 326975_1121787

Figure 855. Pre test 2 seconds, 326975_1121788

Figure 856. Pre test 1 seconds, 326975_1121789

Figure 857. 15 seconds, 326975_1121790

Figure 858. 20 seconds, 326975_1121791

Figure 859. 34 seconds, 326975_1121792

Figure 860. 39 seconds, 326975_1121793

Figure 861. 45 seconds, 326975_1121794

Figure 862. 47 seconds, 326975_1121795

Figure 863. 64 seconds, 326975_1121796

Figure 864. 66 seconds, 326975_1121797

Figure 865. 83 seconds, 326975_1121798

Figure 866. 93 seconds, 326975_1121799

Figure 867. 95 seconds, 326975_1121800

Figure 868. 109 seconds, 326975_1121801

Figure 869. 113 seconds, 326975_1121802

Figure 870. 128 seconds, 326975_1121803

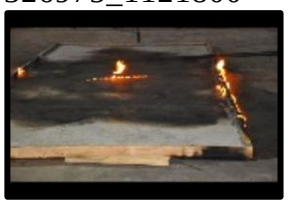

Figure 871. 150 seconds, 326975_1121804

Figure 872. 156 seconds, 326975_1121805

Figure 873. Post test 0 minutes, 326975_1121806

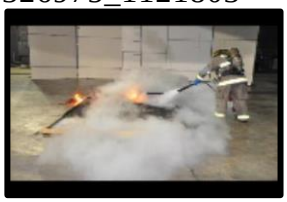

Figure 874. Post test 0 minutes, 326975_1121807

Figure 875. Post test 0 minutes, 326975_1121808

Figure 876. Post test 0 minutes, 326975_1121809

Figure 877. Post test 0 minutes, 326975_1121810

Figure 878. Post test 0 minutes, 326975_1121811

Figure 879. Post test 1 minutes, 326975_1121812

Figure 880. Post test 1 minutes, 326975_1121813

Figure 881. Post test 1 minutes, 326975_1121814

Figure 882. Post test 1 minutes, 326975_1121815

Results for Test 16 (ID 326976)

The following chart shows the heat release rate of the fire during the experiment. The heat release rate is calculated based on the principle of oxygen consumption calorimetry.

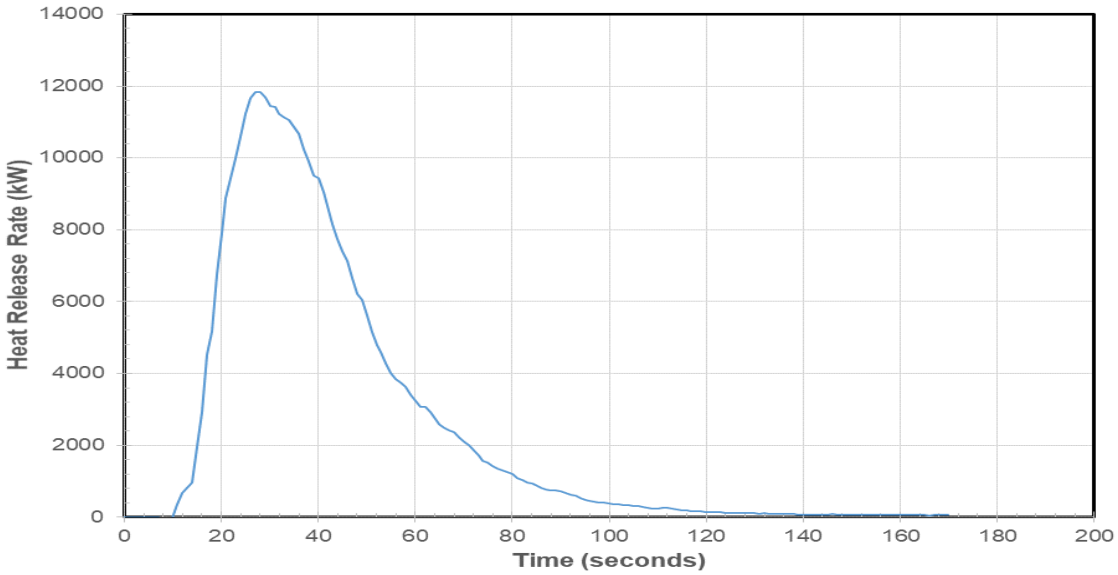

Figure 883. Heat Release Rate

The following chart shows the total heat released from the fire during the experiment. The total heat released is calculated by integrating the heat release rate over time.

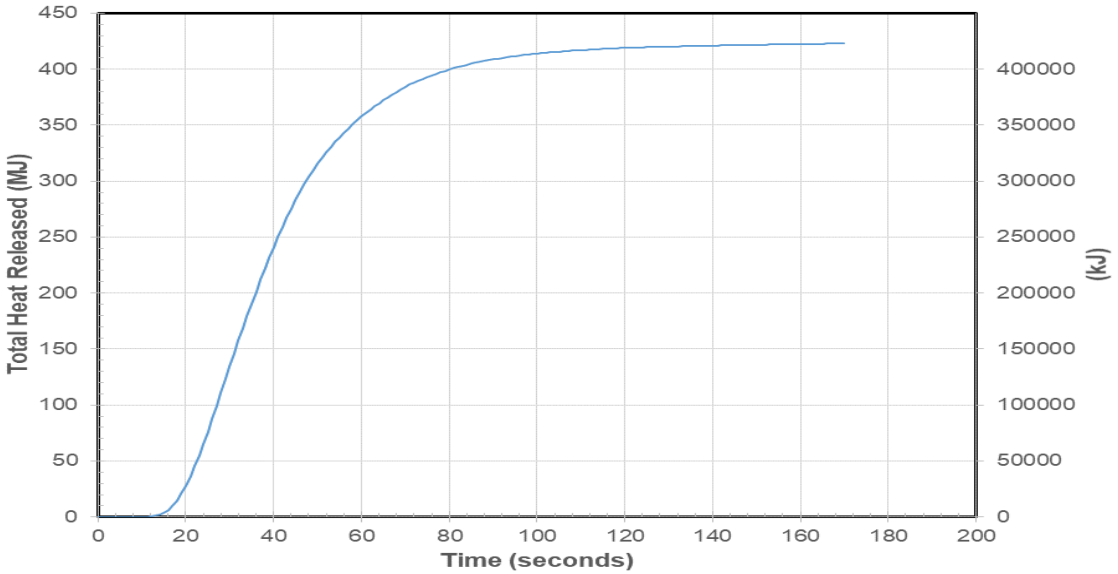

Figure 884. Total Heat Released

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

Table 21. Video Log

Description	Start Time	Duration (s)	Filename
FLIR	11:15:06	341	326976_20200904_111506_1.mov
SIDE VIEW	11:15:08	339	326976_20200904_111508_9.mov
FRONT VIEW	11:15:14	339	326976_20200904_111514_10.mov
CLOSE UP	11:15:14	340	326976_20200904_111514_11.mov
MASTER			326976_1122971.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 885. Pre test 10 minutes, 326976_1121825

Figure 886. Pre test 9 minutes, 326976_1121826

Figure 887. Pre test 9 minutes, 326976_1121827

Figure 888. Pre test 9 minutes, 326976_1121828

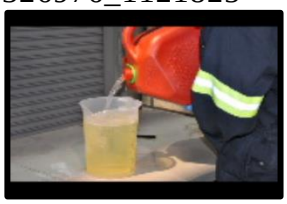

Figure 889. Pre test 9 minutes, 326976_1121829

Figure 890. Pre test 8 minutes, 326976_1121830

Figure 891. Pre test 8 minutes, 326976_1121831

Figure 892. Pre test 8 minutes, 326976_1121832

Figure 893. Pre test 8 minutes, 326976_1121833

Figure 894. Pre test 7 minutes, 326976_1121834

Figure 895. Pre test 7 minutes, 326976_1121835

Figure 896. Pre test 7 minutes, 326976_1121836

Figure 897. Pre test 7 minutes, 326976_1121837

Figure 898. Pre test 7 minutes, 326976_1121838

Figure 899. Pre test 7 minutes, 326976_1121839

Figure 900. Pre test 7 minutes, 326976_1121840

Figure 901. Pre test 6 minutes, 326976_1121841

Figure 902. Pre test 4 minutes, 326976_1121842

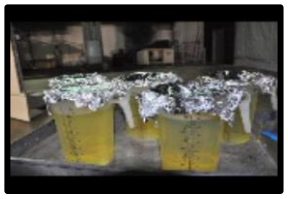

Figure 903. Pre test 4 minutes, 326976_1121843

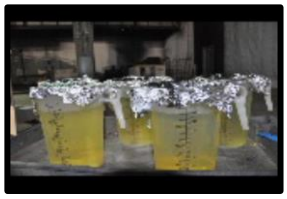

Figure 904. Pre test 4 minutes, 326976_1121844

Figure 905. Pre test 117 seconds, 326976_1121845

Figure 906. Pre test 117 seconds, 326976_1121846

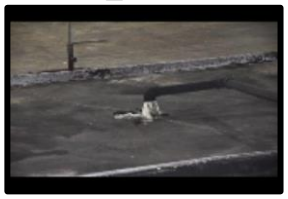

Figure 907. Pre test 110 seconds, 326976_1121847

Figure 908. Pre test 109 seconds, 326976_1121848

Figure 909. Pre test 102 seconds, 326976_1121849

Figure 910. Pre test 100 seconds, 326976_1121850

Figure 911. Pre test 96 seconds, 326976_1121851

Figure 912. Pre test 94 seconds, 326976_1121852

Figure 913. Pre test 86 seconds, 326976_1121853

Figure 914. Pre test 85 seconds, 326976_1121854

Figure 915. Pre test 81 seconds, 326976_1121855

Figure 916. Pre test 79 seconds, 326976_1121856

Figure 917. Pre test 75 seconds, 326976_1121857

Figure 918. Pre test 65 seconds, 326976_1121858

Figure 919. Pre test 62 seconds, 326976_1121859

Figure 920. Pre test 59 seconds, 326976_1121860

Figure 921. Pre test 56 seconds, 326976_1121861

Figure 922. Pre test 50 seconds, 326976_1121862

Figure 923. Pre test 48 seconds, 326976_1121863

Figure 924. Pre test 42 seconds, 326976_1121864

Figure 925. Pre test 41 seconds, 326976_1121865

Figure 926. Pre test 38 seconds, 326976_1121866

Figure 927. Pre test 32 seconds, 326976_1121867

Figure 928. Pre test 19 seconds, 326976_1121868

Figure 929. Pre test 1 seconds, 326976_1121869

Figure 930. 0 seconds, 326976_1121870

Figure 931. 1 seconds, 326976_1121871

Figure 932. 13 seconds, 326976_1121872

Figure 933. 22 seconds, 326976_1121873

Figure 934. 26 seconds, 326976_1121874

Figure 935. 39 seconds, 326976_1121875

Figure 936. 41 seconds, 326976_1121876

Figure 937. 54 seconds, 326976_1121877

Figure 938. 72 seconds, 326976_1121878

Figure 939. 81 seconds, 326976_1121879

Figure 940. 84 seconds, 326976_1121880

Figure 941. 94 seconds, 326976_1121881

Figure 942. 105 seconds, 326976_1121882

Figure 943. 136 seconds, 326976_1121883

Figure 944. 149 seconds, 326976_1121884

Figure 945. 151 seconds, 326976_1121885

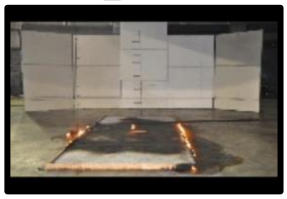

Figure 946. 173 seconds, 326976_1121886

Figure 947. 187 seconds, 326976_1121887

Figure 948. Post test 0 minutes, 326976_1121888

Figure 949. Post test 0 minutes, 326976_1121889

Figure 950. Post test 0 minutes, 326976_1121890

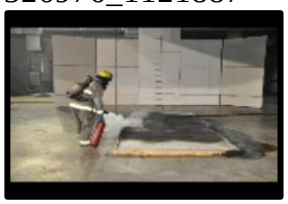

Figure 951. Post test 0 minutes, 326976_1121891

Figure 952. Post test 0 minutes, 326976_1121892

Figure 953. Post test 0 minutes, 326976_1121893

Figure 954. Post test 0 minutes, 326976_1121894

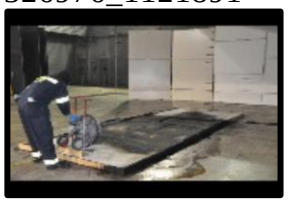

Figure 955. Post test 0 minutes, 326976_1121895

Figure 956. Post test 0 minutes, 326976_1121896

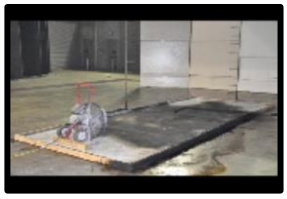

Figure 957. Post test 1 minutes, 326976_1121897

Results Summary

The following table provides a summary of the heat release rate (HRR) results from the experiments. The maximum HRR recorded during the experiment is provided in the "Maximum" column. The "Maximum Average" values, which are calculated from average values of heat release rate over specified time periods, provide a means to compare the severity of different fires over these time spans.

Table 22. Heat Release Rate Result Summary

Test Number	Experiment ID	Max (kW)	30 sec Maximum Average (kW)	1 min Maximum Average (kW)	5 minute Maximum Average (kW)	10 minute Maximum Average (kW)
1	326951	1658	1391	883	181	89
2	326953	3450	2651	1634	334	163
3	326954	4922	4027	2578	531	259
4	326955	6013	5166	3412	701	344
5	326956	7439	6111	4103	862	425
6	326957	8256	6718	4538	967	475
7	326958	6954	6076	4296	942	468
8	326960	9621	7314	4961	1063	533
9	326961	9941	7513	5149	1104	550
10	326962	11333	8820	6129	1318	658
11	326963	10739	8782	6135	1324	658
12	326964	805	595	364	67	29
13	326973	655	494	300	50	18
14	326974	9946	7909	5534	1182	584
15	326975	11227	8948	6265	1361	678
16	326976	11832	9646	6492	1409	704

The following table provides a summary of the total heat released (THR) during the experiments. The "Total Heat Released" is calculated by integrating the HRR over time for the duration of the experiment.

Table 23. Total Heat Release Summary

Test Number	Experiment ID	Total Heat Release (kJ)
1	326951	54598
2	326953	101744
3	326954	161856
4	326955	212747
5	326956	260724
6	326957	292832
7	326958	282718
8	326960	318777
9	326961	332019
10	326962	395699
11	326963	398432
12	326964	21965
13	326973	17910
14	326974	357150
15	326975	408997
16	326976	422999

The following chart compares heat release rates measured by the FPC during several experiments.

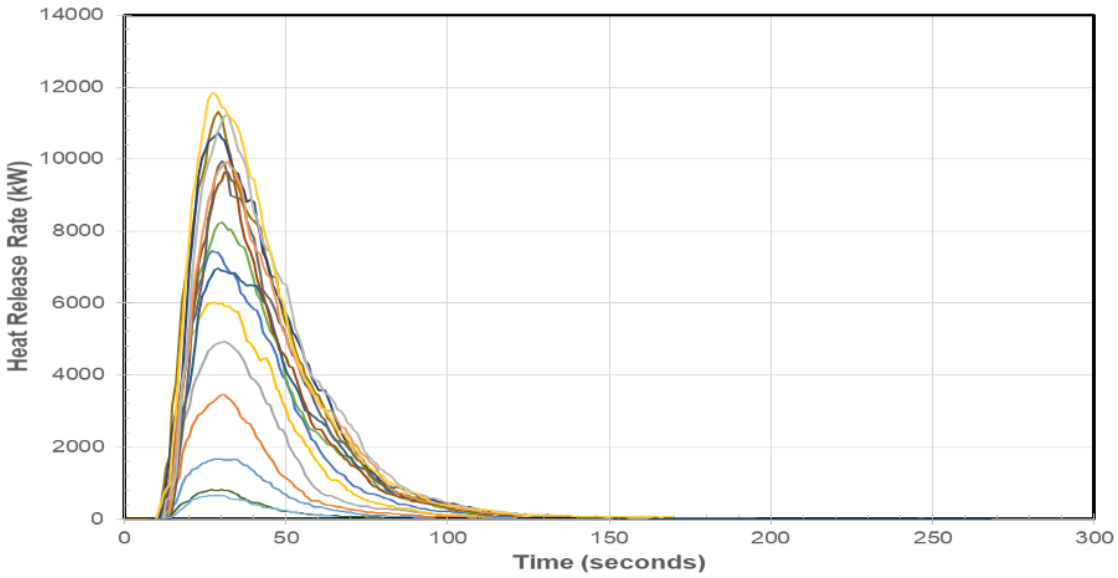

Figure 958. Heat Release Rate Summary

References

1. Laboratory Instruction LI017 – Laboratory Conditions, Bureau of Alcohol, Tobacco, Firearms and Explosives - Fire Research Laboratory, Beltsville, MD.

2. Laboratory Instruction – Fire Products Collectors – LI011, Bureau of Alcohol, Tobacco, Firearms and Explosives – Fire Research Laboratory, Beltsville, MD.
3. Laboratory Instruction LI003 - Digital Cameras, Bureau of Alcohol, Tobacco, Firearms and Explosives - Fire Research Laboratory, Beltsville, MD