



**Report To: Southwark Council**

**Title: Assessment of the Ignitability of Cladding  
Panels**

**Ref: 6453919**

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## 1 Introduction

- 1.1 This report refers to a request from Mr David Rowson to assess the ignitability of a two types of cladding panel removed from two properties operated by Southwark Council: Canute Gardens and Medina House.
- 1.2 The purpose of the testing was to assess the burning behaviour of the panels, taking into account various scenarios as might be anticipated during a building fire. The panels are used in the open air and as a consequence will be exposed to natural weathering.
- 1.3 For external cladding panels, *Approved Document B (Volume 2 – Buildings other than dwellinghouses)* recommends that they be materials of limited combustibility.
- 1.4 The panelling from Medina House is understood to comprise a laminated structure, with facings of stainless steel (approximately 1-2 mm thick) painted on its top surface, plastic edge seals, and inherently flame-retardant extruded polystyrene foam insulation.
- 1.5 The panelling from Canute Gardens is understood to comprise a solid board of unknown composition, approximately 9 mm thick.
- 1.6 The fire safety design strategy for the respective buildings should be taken into account when finally deciding on the appropriateness of the cladding. This report does not include reference to the fire safety design strategy.
- 1.7 Proposed indicative tests were carried out at Bureau Veritas laboratories. Observations from these tests are summarised herein.
- 1.8 Testing was carried out between 30 June – 6 July 2017 by Alastair Pert.
- 1.9 Digital photographs are shown in the appendices.

## 2 Methodology

### 2.1 Laboratory Testing

- 2.1.1 Two laboratory scale tests were proposed. These were informed by *BS EN ISO 1182:2010 (Reaction to fire tests for products – Non-combustibility test)* and *BS EN ISO 11925-2:2010 (Reaction to fire tests – Ignitability of products subjected to direct impingement of flame, Part 2: Single-flame source test)*. Both tests are cited in *Approved Document B (Volume 2 – Buildings other than dwellinghouses)*, with the former forming part of the testing criteria for cladding, and the latter a general test for products. Due to the indicative nature of the testing, it was not deemed necessary to follow the British Standard methods in their entirety, rather the principle sections and criteria. The respective tests are described in more detail below, as well as details of additional testing that was performed.
- 2.1.2 Testing was carried out using samples from supplied sections of cladding. Samples were cut from the steel faced panels using hand tools only to avoid damaging the foam inner through friction.
- 2.1.3 Samples were conditioned for at least 24 hours prior to testing in a sealed cabinet at 24°C and 62% humidity.
- 2.1.4 *BS EN ISO 1182:2010 Reaction to fire tests for products – Non-combustibility test:* This simulates the effects of thermal irradiance from a fully developed venting compartment fire. Under the testing protocol, samples are exposed to a hot furnace environment. The furnace temperature was set to approximately 750°C and monitored throughout via a thermocouple placed approximately 7 cm inside the furnace. Cut sections of the samples were individually placed onto a heatproof steel mesh and placed inside the furnace at the approximate midway point, then monitored for 30 minutes. Observations were made for sustained ignition plus mass loss following testing. Sustained flaming ignition times should not exceed 20 seconds, and mass loss should not exceed 50%. The ignitability of volatile flammable gases produced by decomposition can also be assessed, and smoke production can be visually assessed. The test was repeated on five samples.
- 2.1.5 *BS EN ISO 11925-2:2010 Reaction to fire tests – Ignitability of products subjected to direct impingement of flame – Part 2: Single-flame source test.* The testing protocol used requires surface and bottom edge ignition, with a 30 second flame application time, testing in both “lengthwise” and “cross” directions, with a total test

duration of 60 seconds from the time of initial flame contact. The sample sizes are approximately 25 x 9 cm, full thickness, with three samples in each direction tested. Surface flaming should not exceed 15 cm above the point of initial contact, nor should there be any flaming droplets capable of spreading fire.

2.1.6 *Beilstein test*: This is a simple chemical test used as a qualitative test for halides. In this context, it can be used to demonstrate the presence of a halide-based flame-retardant within the foam inserts. A copper wire was cleaned and heated in a gas flame to form a coating of copper (II) oxide, exposed to the test material, and then reinserted into the flame. A positive result is indicated by a green flame.

2.1.7 *Ignitability of foam*: The foam insulation from the Medina House cladding panels was exposed to a gas flame, and the resultant burning observed. The time taken for flames to extinguish was measured, and observations made of smoke production, burning droplets, and propensity to spread fire.

### 3 Results

#### 3.1 BS EN ISO 1182:2010 Reaction to fire tests for products – Non-combustibility test

3.1.1 A summary of the samples and outcomes are shown in Table 1 and Table 2 for Medina House and Canute Gardens respectively.

Table 1: Summary of test – Medina House

Sample	Sample Dimensions (l x b x t)/ mm	Initial Mass/ g	Final Mass/ g	% Mass Loss	Flaming Ignition > 20s	Comments
Medina House 1	50 x 46 x 51	81.4	44.3	45.6	Yes	Corner piece. Ignition of foam within 3 seconds. Significant volumes of noxious black smoke produced.
Medina House 2	52 x 44 x 51	64.8	35.5	45.2	Yes	Edge piece. Ignition of foam within 2 seconds. Significant volumes of noxious black smoke produced.
Medina House 3	91 x 47 x 51	101.7	63.5	37.6	Yes	Long edge piece. Ignition of foam within 3 seconds. Significant volumes of noxious black smoke produced.
Medina House 4	44 x 52 x 51	65.7	36.1	45.0	Yes	Edge piece. Ignition of foam within 6 seconds. Significant volumes of noxious black smoke produced.
Medina House 5	100 x 45 x 51	96.1	61.2	36.3	Yes	Long edge piece. Ignition of foam within 3 seconds. Significant volumes of noxious black smoke produced.

3.1.2 The insulation foam, in all cases, ignited and continued burning for a period in excess of 20 seconds; therefore it is not considered compliant with the test criteria.

Table 2: Summary of test – Canute Gardens

Sample	Sample Dimensions (l x b x t)/ mm	Initial Mass/ g	Final Mass/ g	% Mass Loss	Flaming Ignition > 20s	Comments
Canute Gardens 1	51 x 43 x 9	31.9	25.2	21.1	No	No ignition occurred. No visible smoke produced.
Canute Gardens 2	52 x 44 x 9	32.5	25.7	20.9	No	No ignition occurred. No visible smoke produced.
Canute Gardens 3	50 x 46 x 9	33.4	26.3	21.4	No	No ignition occurred. No visible smoke produced.
Canute Gardens 4	51 x 43 x 9	32.4	25.4	21.5	No	No ignition occurred. No visible smoke produced.
Canute Gardens 5	49 x 43 x 9	30.5	24.2	20.9	No	No ignition occurred. No visible smoke produced.

3.1.3 The insulation foam, in all cases, did not ignite for the duration of testing; therefore it is considered compliant with the test criteria.

### **3.2 BS EN ISO 11925-2:2010 Reaction to fire tests – Ignitability of products subjected to direct impingement of flame – Part 2: Single-flame source test**

3.2.1 A summary of the test conditions is shown in Table 3, with the results for the respective tests shown in Tables 4a&b for Medina House, and Tables 5a&b for Canute Gardens respectively. The test was carried out on cut sections of the full thickness of the assembly.

3.2.2 The cladding panels from both Medina House and Canute Gardens were considered compliant with the test criteria.

3.2.3 A block of the foam on its own was subjected to testing, to assess the unprotected response. The material did not ignite or produce burning droplets, and would be considered compliant with the test criteria.



Table 3: Summary of test conditions

<b>Fuel source</b>	Laboratory grade propane
<b>Flame application time</b>	30 seconds
<b>Total test duration</b>	60 seconds
<b>Burner horizontal distance (surface ignition)</b>	0.5 cm
<b>Burner horizontal distance (bottom edge ignition)</b>	1.6 cm

Table 4a: Summary of test – Medina House – Surface Ignition

<b>Sample</b>	<b>Duration of Flaming/ s</b>	<b>Max. Extent of Flame/ cm</b>	<b>Flaming Reaches an Edge</b>	<b>Flaming Debris</b>	<b>Comments</b>
Medina House L1	0	1.5	No	No	No ignition of foam. Some light grey smoke produced. Minimal surface damage.
Medina House L2	0	1.4	No	No	No ignition of foam. Some light grey smoke produced. Minimal surface damage.
Medina House L3	0	1.5	No	No	No ignition of foam. Some light grey smoke produced. Minimal surface damage.
Medina House C1	0	1.2	No	No	No ignition of foam. Some light grey smoke produced. Minimal surface damage.
Medina House C2	0	1.3	No	No	No ignition of foam. Some light grey smoke produced. Minimal surface damage.
Medina House C3	0	1.4	No	No	No ignition of foam. Some light grey smoke produced. Minimal surface damage.
Insulating foam block	0	2.6	No	No	No ignition of foam. Some light grey smoke produced. Foam shrank away from the heat source in a vertical plane.

Table 4b: Summary of test – Medina House – Bottom Edge Ignition

Sample	Duration of Flaming/ s	Max. Extent of Flame/ cm	Flaming Reaches an Edge	Flaming Debris	Comments
Medina House L1	0	1.1	No	No	No ignition of foam. Some light grey smoke produced. Glowing of plastic edging observed, but no ignition. Minimal surface damage.
Medina House L2	0	1.0	No	No	No ignition of foam. Some light grey smoke produced. Glowing of plastic edging observed, but no ignition. Minimal surface damage.
Medina House L3	0	0.7	No	No	No ignition of foam. Some light grey smoke produced. Glowing of plastic edging observed, but no ignition. Minimal surface damage.
Medina House C1	0	0.8	No	No	No ignition of foam. Some light grey smoke produced. Glowing of plastic edging observed, but no ignition. Minimal surface damage.
Medina House C2	0	0.7	No	No	No ignition of foam. Some light grey smoke produced. Glowing of plastic edging observed, but no ignition. Minimal surface damage.
Medina House C2	0	0.6	No	No	No ignition of foam. Some light grey smoke produced. Glowing of plastic edging observed, but no ignition. Minimal surface damage.

*Table 5a: Summary of test – Canute Gardens – Surface Ignition*

<b>Sample</b>	<b>Duration of Flaming/ s</b>	<b>Max. Extent of Flame/ cm</b>	<b>Flaming Reaches an Edge</b>	<b>Flaming Debris</b>	<b>Comments</b>
Canute Gardens L1	0	1.4	No	No	No ignition occurred. No visible smoke produced.
Canute Gardens L2	0	1.3	No	No	No ignition occurred. No visible smoke produced.
Canute Gardens L3	0	1.2	No	No	No ignition occurred. No visible smoke produced.
Canute Gardens C1	0	1.3	No	No	No ignition occurred. No visible smoke produced.
Canute Gardens C2	0	1.4	No	No	No ignition occurred. No visible smoke produced.
Canute Gardens C3	0	1.5	No	No	No ignition occurred. No visible smoke produced.

*Table 5b: Summary of test – Canute Gardens – Bottom Edge Ignition*

<b>Sample</b>	<b>Duration of Flaming/ s</b>	<b>Max. Extent of Flame/ cm</b>	<b>Flaming Reaches an Edge</b>	<b>Flaming Debris</b>	<b>Comments</b>
Canute Gardens L1	0	1.2	No	No	No ignition occurred. No visible smoke produced. Minimal surface damage.
Canute Gardens L2	0	1.3	No	No	No ignition occurred. No visible smoke produced. Minimal surface damage.
Canute Gardens L3	0	1.0	No	No	No ignition occurred. No visible smoke produced. Minimal surface damage.
Canute Gardens C1	0	1.6	No	No	No ignition occurred. No visible smoke produced. Minimal surface damage.
Canute Gardens C2	0	1.6	No	No	No ignition occurred. No visible smoke produced. Minimal surface damage.
Canute Gardens C3	0	1.0	No	No	No ignition occurred. No visible smoke produced. Minimal surface damage.

### 3.3 Beilstein Test

2.2.1 The flame test was repeated three times on samples of the insulation foam and plastic edging from the Medina House cladding panels, with the outcome summarised in Table 6.

Table 6: Outcome of Beilstein test.

Test	Result	Conclusion
Foam 1	Positive	The insulation foam contains fire retardant
Foam 2	Positive	
Foam 3	Positive	
Plastic edging 1	Positive	The plastic edging contains fire retardant
Plastic edging 2	Positive	
Plastic edging 3	Positive	

### 3.4 Ignitability of foam

2.3.1 A 5 cm x 2 cm sample of foam was fixed in a horizontal orientation and a blowtorch applied for 5 seconds, then the sample observed for sustained burning, smoke production and burning droplets (*Table 7*). Burning droplets were considered to be those that ignited a piece of filter paper placed beneath the sample.

Table 7: Ignition of foam

Test Iteration	Sustained burning on removal of flame	Self-extinguished	Burning drips produced	Black smoke produced
1	<1s	Yes	No	Yes
2	<1s	Yes	No	Yes
3	<1s	Yes	No	Yes

2.3.2 The foam was observed to retreat from the flame, and any sustained burning tended to rapidly self-extinguish. Molten droplets and black smoke were observed in most cases during application of the flame. Whilst some of those droplets were initially flaming, they tended to rapidly self-extinguish without igniting the paper below.

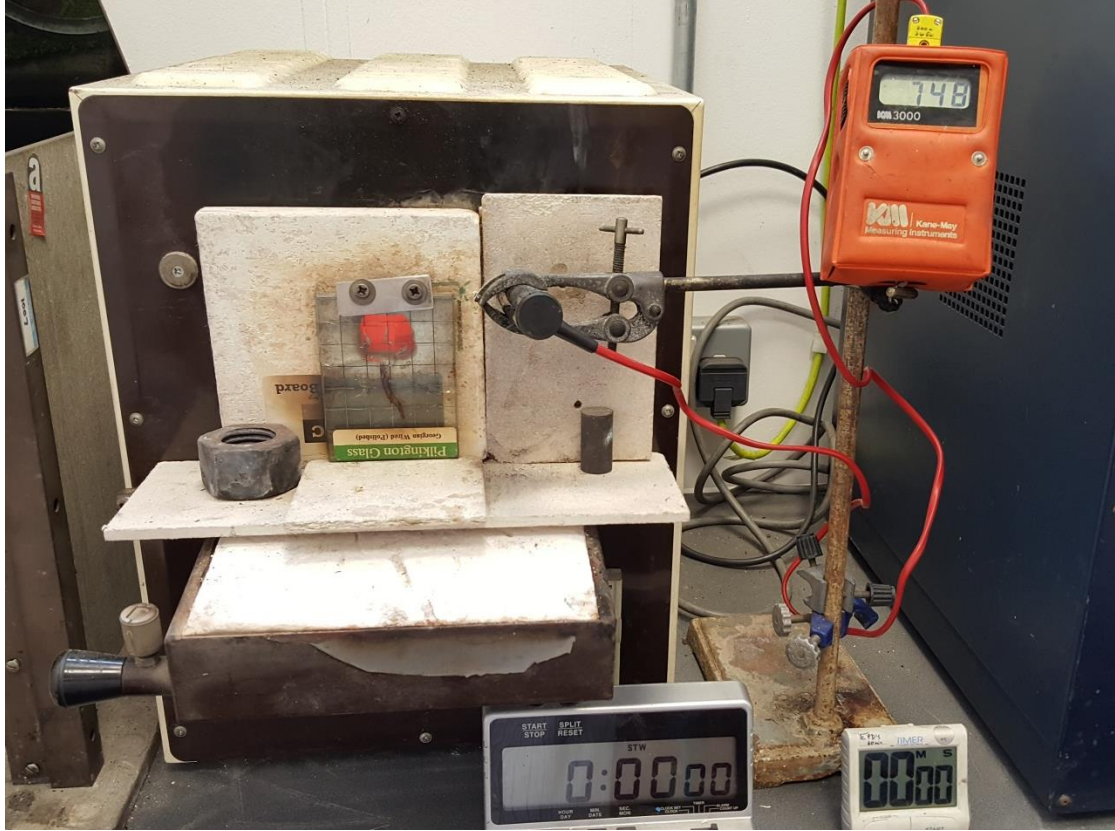
## 4 Discussion

- 3.1 The tests carried out in this project indicated that the cladding panels from Canute Gardens were unlikely to ignite and sustain spread of burning under most normal fire scenarios that might be expected given the context of its use; even when subjected to intense heat flux, ignition did not occur, and there was no significant production of smoke.
- 3.2 The tests carried out in this project indicated that the cladding panels from Medina House had the potential to ignite and sustain spread of burning under intense fire situations that might be expected to occur from a fully developed compartment fire venting through a window. Nevertheless, the insulation foam itself was flame retardant and under lower intensity fire conditions is considered unlikely to burn, particularly if it remained sealed within the steel panels.
- 3.3 The foam insulation of the Medina House cladding was formed from extruded polystyrene, which is inherently flame retarding *i.e.* it will not sustain burning under normal fire conditions. Under repeated testing with a single flame source, it was observed to self-extinguish. Nevertheless, under conditions of intense heat flux, it was capable of acting as a fuel and generating significant quantities of noxious, combustible black smoke.
- 3.4 With consideration to the results of the testing, the cladding from Canute Gardens demonstrated qualities in line with it being a material of limited combustibility, and would most likely be suitable for use.
- 3.5 With consideration to the results of the testing, the cladding from Medina House might not qualify as being a material of limited combustibility, and hence would not be considered suitable for use. However, this should be confirmed by further testing.

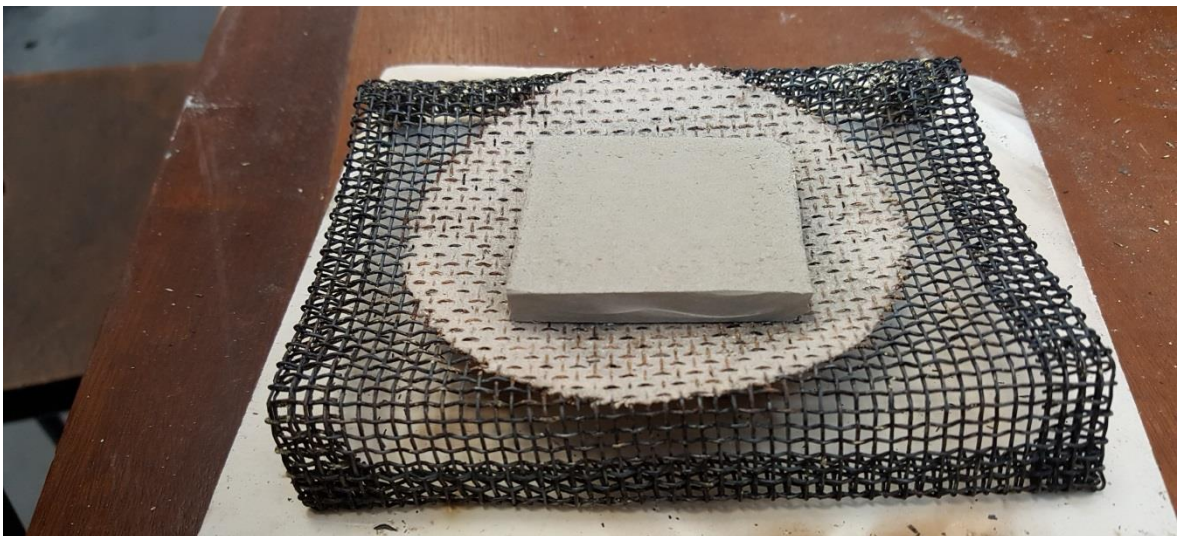
## 5 Conclusions & Recommendations

- ❑ The cladding panel from Canute Gardens did not ignite or spread flame under both applied single-flame source and intense radiant heat conditions.
- ❑ The cladding panel from Medina House did not ignite or spread flame under applied single-flame source, but rapidly did so under conditions of intense radiant heat.
- ❑ The insulation foam from the Medina House cladding ignited when directly exposed to a flame, but rapidly self-extinguished once the flame source was removed. It did not ignite when contained within the panel and the panel was exposed to a single-flame heat source.
- ❑ The cladding from Canute Gardens would most likely be considered compliant with the “*material of limited combustibility*” requirements of Approved Document B for external cladding.
- ❑ The cladding from Medina House might not be considered compliant with the “*material of limited combustibility*” requirements of Approved Document B for external cladding, and should undergo further testing.

## Appendix 1 – Photographs

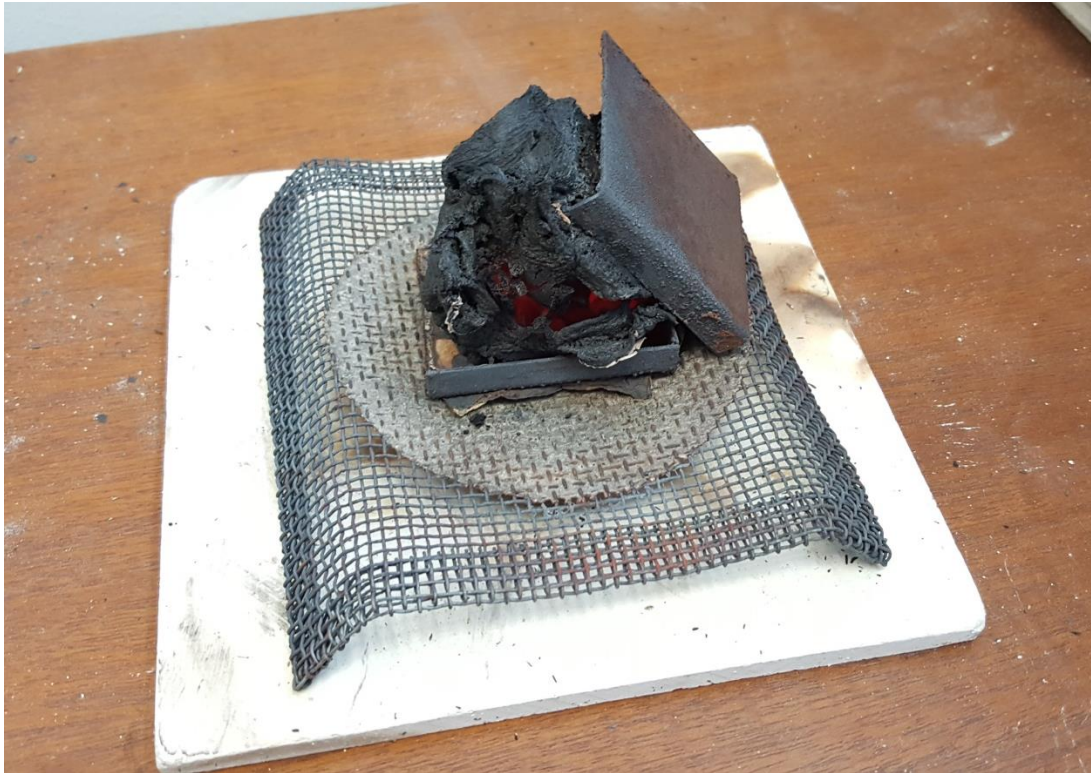


**Photograph 1:** Experimental arrangement for non-combustibility test



**Photograph 2:** Sample from Canute Garden cladding following non-combustibility test.

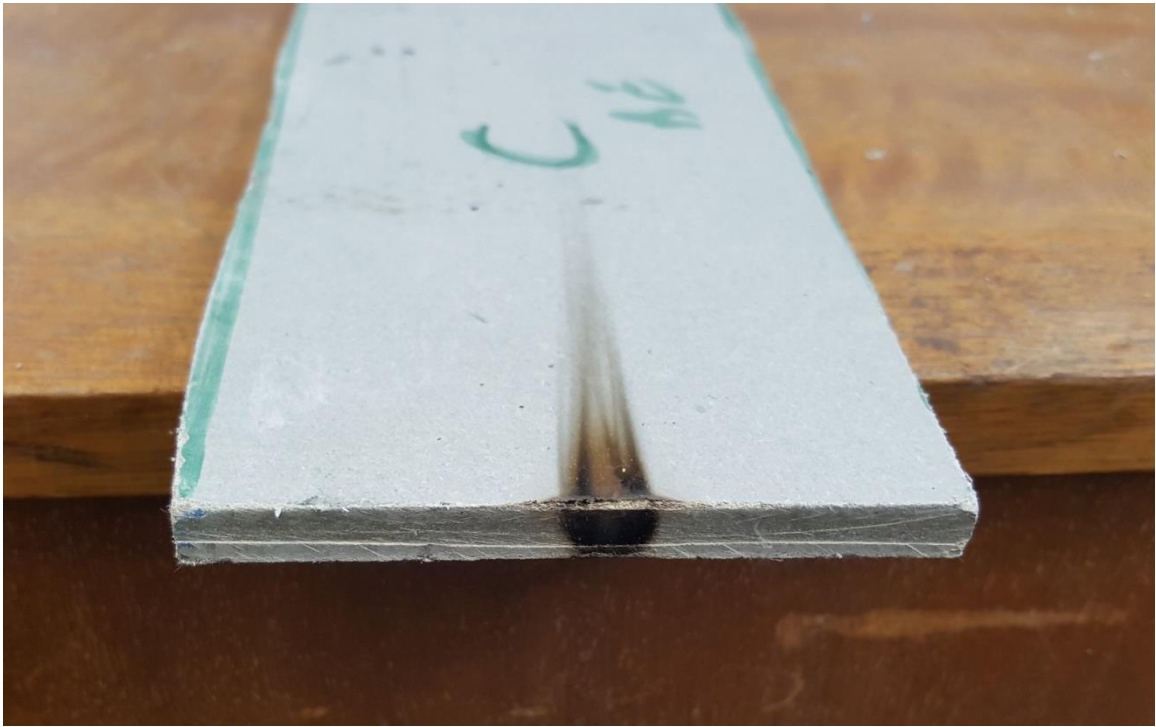




**Photograph 3:** Sample from Medina House cladding following non-combustibility test.



**Photograph 4:** Sample from Canute Garden cladding following single-flame source surface ignition test.



**Photograph 5:** Sample from Canute Garden cladding following single-flame source bottom edge ignition test.



**Photograph 6:** Sample from Medina House cladding following single-flame source surface ignition test.





**Photograph 7:** Sample from Medina House cladding following single-flame source bottom edge ignition test.



**Photograph 8:** Sample of the insulating foam from the Medina House cladding panels subjected to single-flame source surface ignition test.