18th November 2016

Fire and Safety Department Report

To: LFB/Fire Investigation Team - Dowgate
For the attention of: WM M Boyle
Our ref: LFB/16-372
Your ref: 110281

Examination of Cladding Panels – Flat 28 Shepherds Court, 21 Shepherd's Bush Green, W12.

1 Introduction

1.1 Following a fire at the above address on 19th August 2016 with a time of call at 15:42 hours, Bureau Veritas was asked to examine some cladding panels from the exterior of Shepherds Court to assess ignition potential.

1.2 The Fire Brigade sample number was MCL/110281/01.

1.3 The sample was received at our Bureau Veritas London laboratory on 22nd August 2016.

1.4 The sample was examined by Peter Cope of Bureau Veritas, with Jim Flin, Charles Romeyer, Lynsey Seal, and John Sutherland of the London Fire Brigade (Fire Engineering Department) on 30th August 2016.

1.5 Photographs are shown in the appendix.

2 Examination of Cladding Panels (Laboratory)

2.1 The sample received from the fire scene was 2 separate external cladding panels, measuring approximately 80cm by 127cm.

2.2 The first panel (incomplete) was sampled from outside the living room flat 58, on the 12th floor.

2.3 The second panel (complete) was sampled from outside the living room of the flat of fire origin (flat 28, 7th floor).

2.4 It was not known at the time of examination how long the panels had been fitted at the scene.

2.5 The first panel was incomplete as the external surface had come away during the fire, exposing blue plastic foam underneath.

2.6 The blue plastic foam was mounted on a plywood board, the thickness of which varied across the width of the panel (approximately in the range 17-23mm).

2.7 The blue foam had melted in some places, and had been blackened in others, particularly along the lowest edge of the panel.

2.8 The melting of the blue foam had exposed the plywood layer of the panel, particularly along the lowest edge of the panel.

2.9 A sample of the blue foam was removed for further testing, and it was confirmed to be Polystyrene foam by Infra-red spectroscopy.

2.10 A Beilstein flame test was also conducted on the foam that indicated no presence of any halogen additives in the blue foam.

2.11 The second (complete) panel had suffered slight superficial fire damage on the front face from falling fire debris, but was otherwise intact.

2.12 The front surface of the complete panel was a metal sheet approximately 1mm in thickness; the metal sheet attracted a magnet and was therefore presumed to be steel.

2.13 The steel sheet was finished with a white decorative paint.

2.14 The complete panel (all layers together) was a thickness of approximately 31mm.

2.15 The edges of the complete panel were enclosed by a thin metal foil.

2.16 The complete panel was subjected to 3 different flame test involving 3 different sized ignition sources to gauge the ease with which it could be ignited, and also to obtain a basic understanding of the fire behaviour of the panel (see photographs in the appendix).

2.17 The first ignition source used was a small flame produced from a Gas oven lighter, the second ignition source was larger and was a butane fuelled blowtorch, and the third ignition source was a 'Crib 6' as detailed in BS5852:2006 (Methods of test for assessment of the ignitability of upholstered seating by smouldering and flaming ignition sources).

2.18 The tests were conducted for 1 minute on the complete panel, with the exception of the 'Crib 6' test, which was run for 10 minutes in total.

2.19 None of the flame tests penetrated the steel sheet, however, removal of the steel sheet revealed varying degrees of fire damage to the blue foam layer underneath.

2.20 The tests were repeated with the same ignition sources using the incomplete panel that did not have the metal sheet on the front of it.

2.21 The ignition sources were placed directly against the blue foam layer.

2.22 The panel used for the repeat tests had its blue foam layer rapidly destroyed by fire during the different flame tests, exposing the plywood layer underneath.

3 Discussion

3.1 The flame tests used on the complete panel were simple tests conducted with varying sizes of ignition source, and were only intend to determine basic fire behaviour of the complete panel. They were not intended to be a conclusive test against any particular British or European Standard.

3.2 The negative response from the Beilstein test confirmed that there was no halogenated fire retardant present in the blue polystyrene foam layer of the panels. However, the Beilstein flame test is only for halogenated species, and therefore the presence of other flame retardant species cannot be ruled out.

3.3 The flame tests all inflicted negligible fire damage to the metal surface of the complete panel. Removal of the external steel sheet showed that the blue foam layer underneath the steel sheet at the location of the flame tests had melted away. In the 'Crib 6' flame test, the blue foam had also been completely destroyed in some areas exposing the plywood underneath.

3.4 The flame tests showed that small ignition sources, acting in a localised fashion, would not significantly threaten the integrity of the panel, and would be unlikely to ignite a panel. However, as a fire develops and grows further, it is possible that a wide flame front could end up acting on the steel sheet of the panel. The heat from the flames would be conducted through the steel sheet and would therefore melt away the blue foam layer underneath. This would occur in a progressive fashion as the fire develops and would ultimately lead to the steel sheet not being held in place by sufficient bonded blue foam. The weight of the steel sheet would then ensure that it would become detached from the remainder of the panel (likely fall away) and expose the heat damaged blue foam and plywood layers to the developed flame front. This situation is likely to have occurred to the panels above the flat of fire origin when the living room windows of the flat of fire origin failed during the fire at this scene.

3.5 The repeat flame tests, with the ignition sources placed directly against the blue foam layer, behaved as per the previous tests, except the destruction of the foam layer was significantly accelerated.

3.6 The mechanism of fire attack on the front of the panels outlined above is likely to have assisted the fire in spreading up the outside of the building, as this mechanism progressively exposes a plywood surface to a developing fire.

4 Conclusion

4.1 Flames tests using small ignition sources are unlikely to cause failure of the panels, or cause significant fire damage to them.

4.2 Fire attack on the panels across a wider flame front over time would likely compromise the structure of the panels and ultimately lead to a combustible plywood surface being exposed to a developed flame front.

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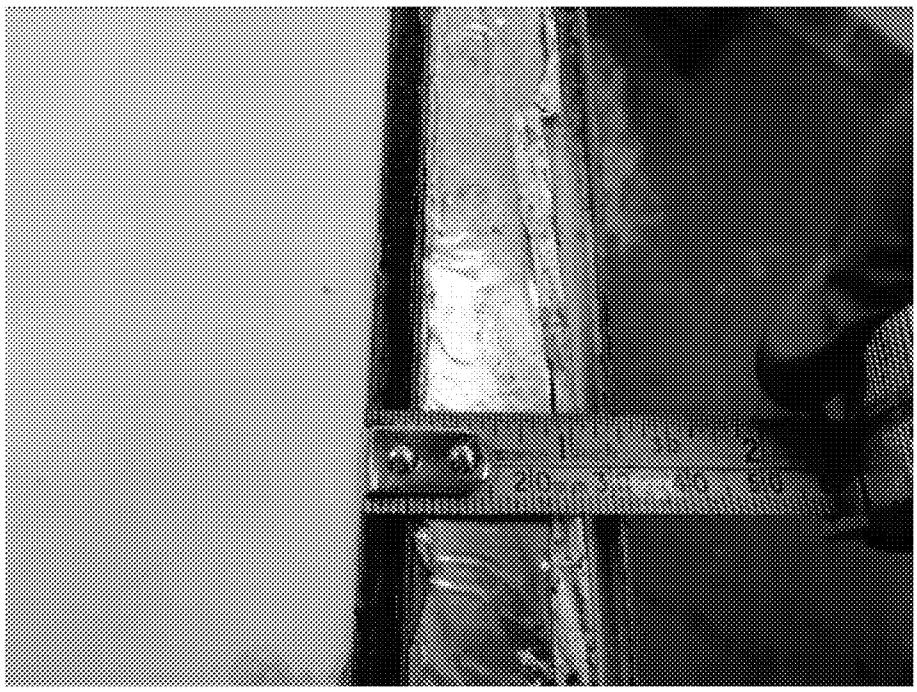
5 Appendix Photos

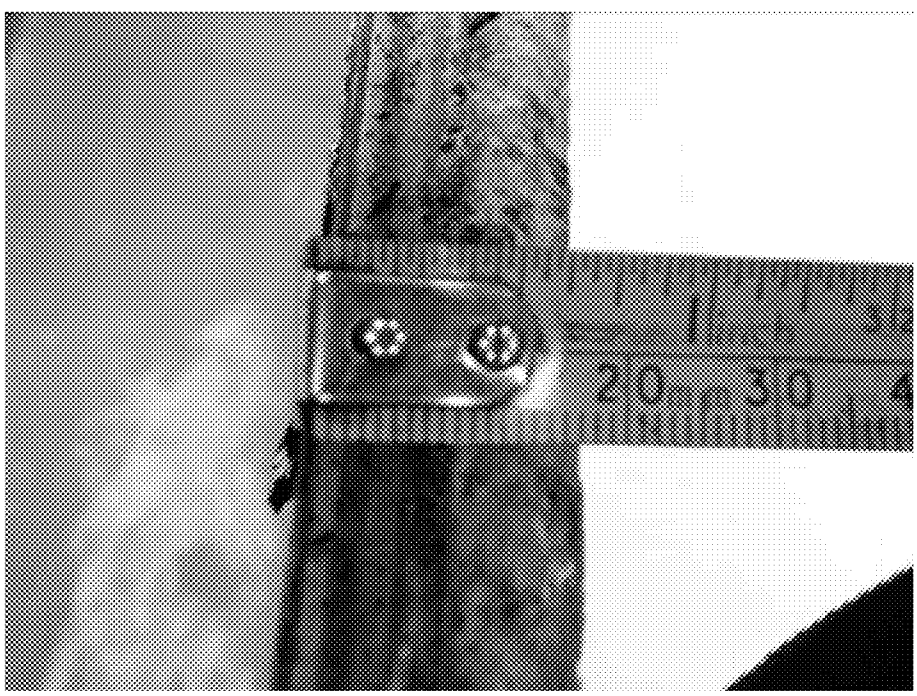
Photograph 1: Sample as received from the fire scene.

Photograph 2: Front (external) face of the complete panel.

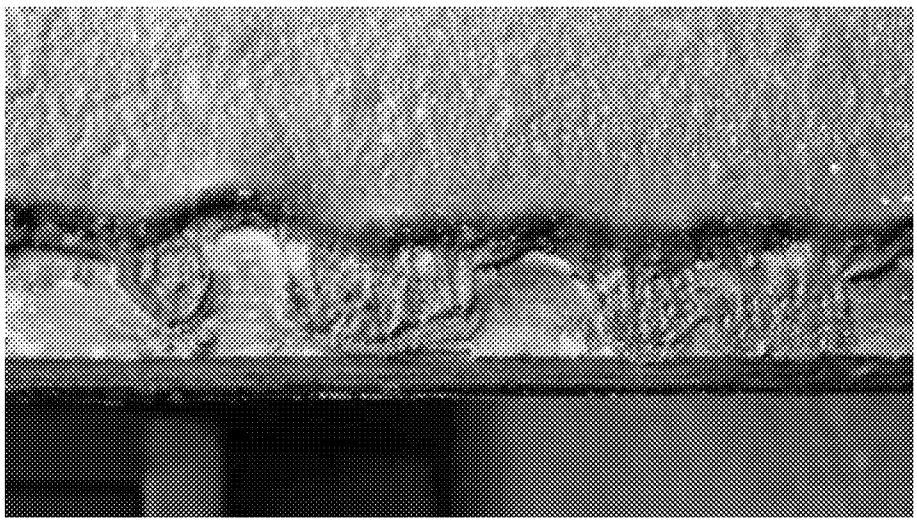
Photograph 3: Front face of the damaged panel.



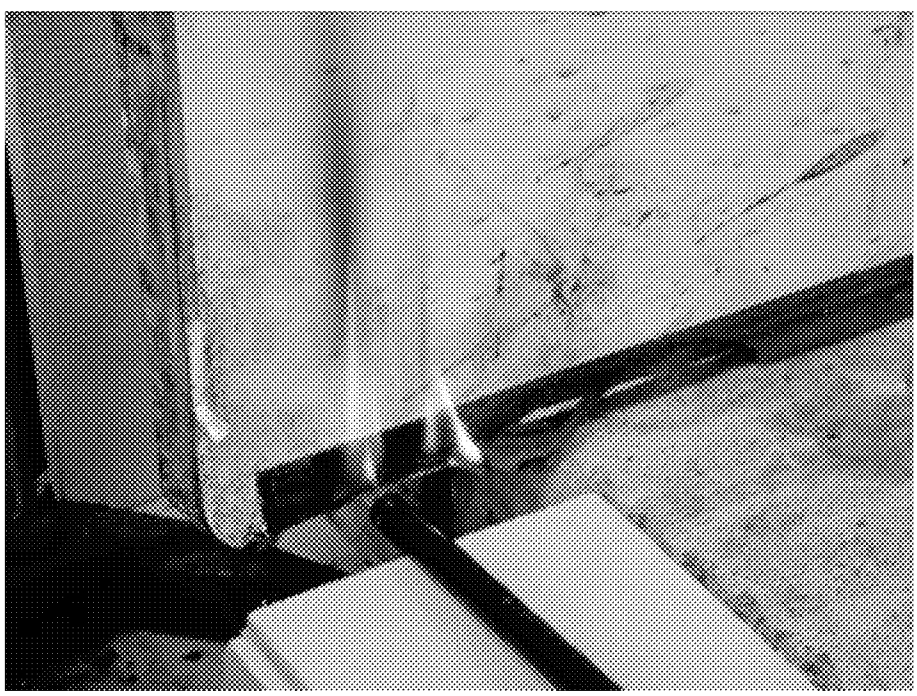
Photograph 4: Thickness of the complete panel (31 mm).



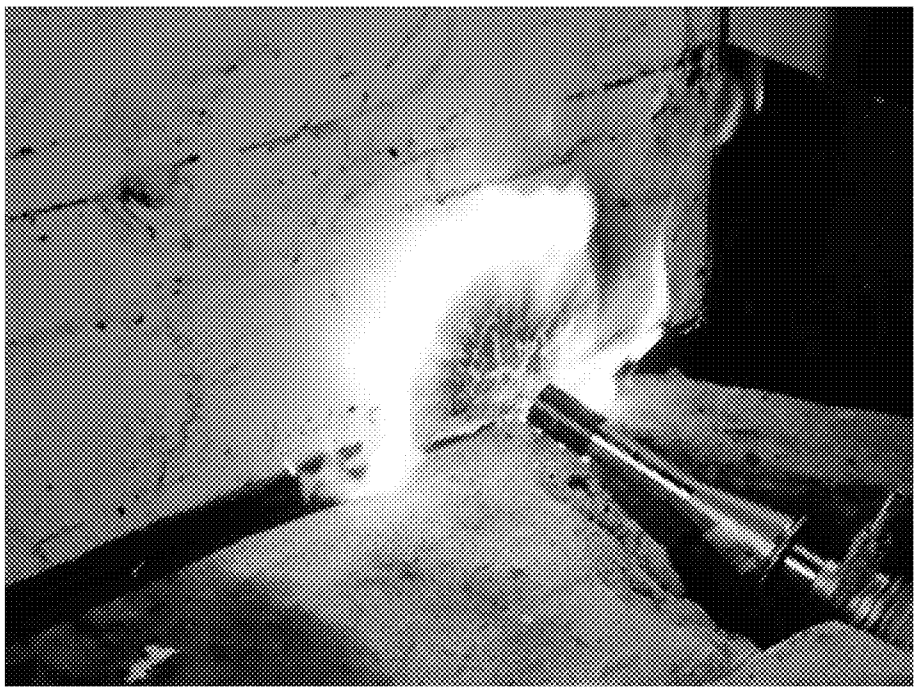
Photograph 5: Thickness of damaged panel (17mm pictured – although varied from 17-23mm across the width of the panel)



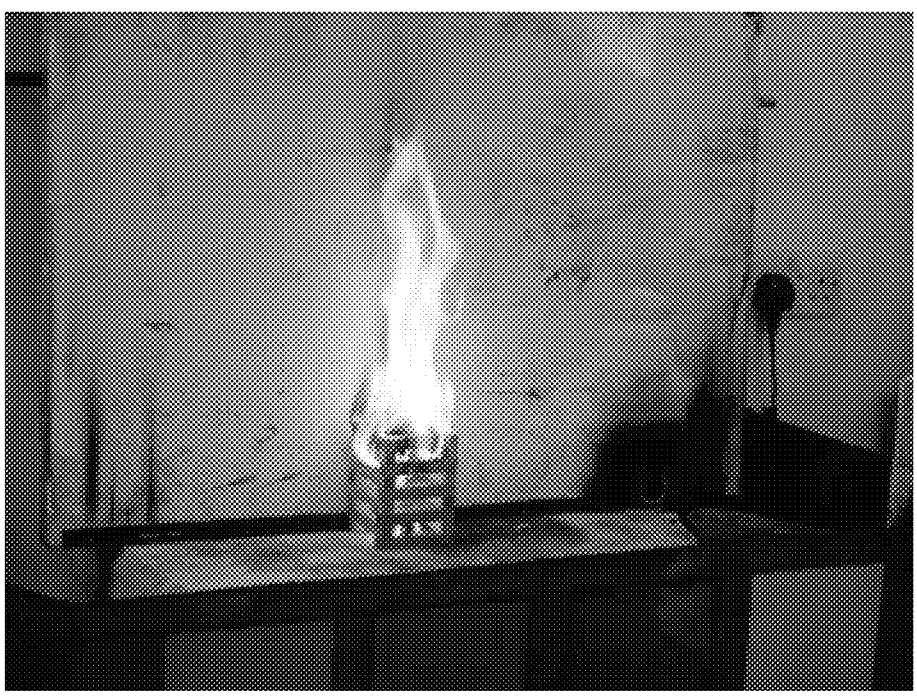
Photograph 6: Close up of fire damage to the blue plastic foam layer, exposing plywood layer underneath.



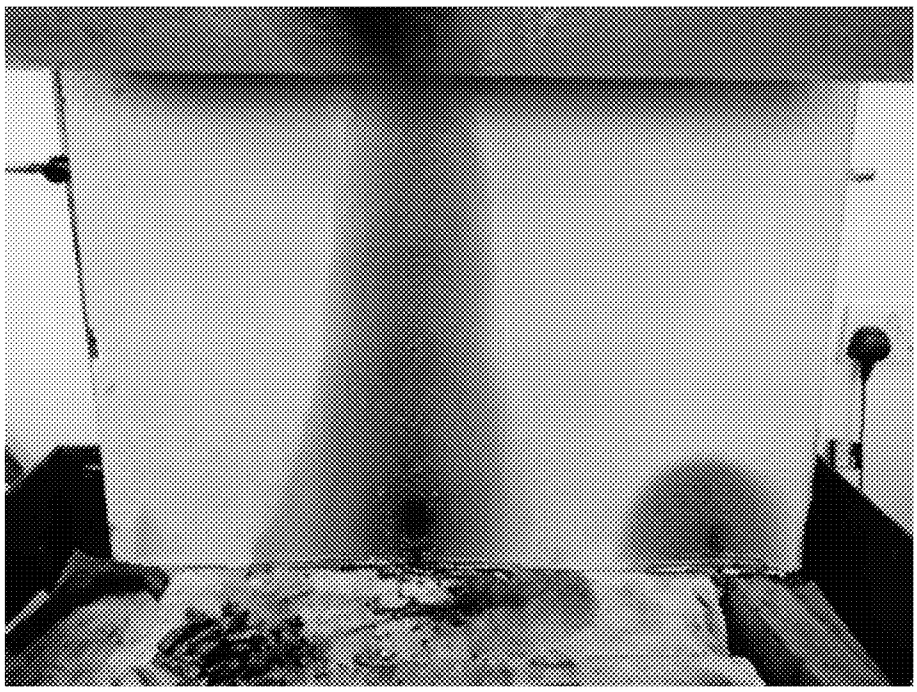
Photograph 7: 'Small flame' test on complete panel.



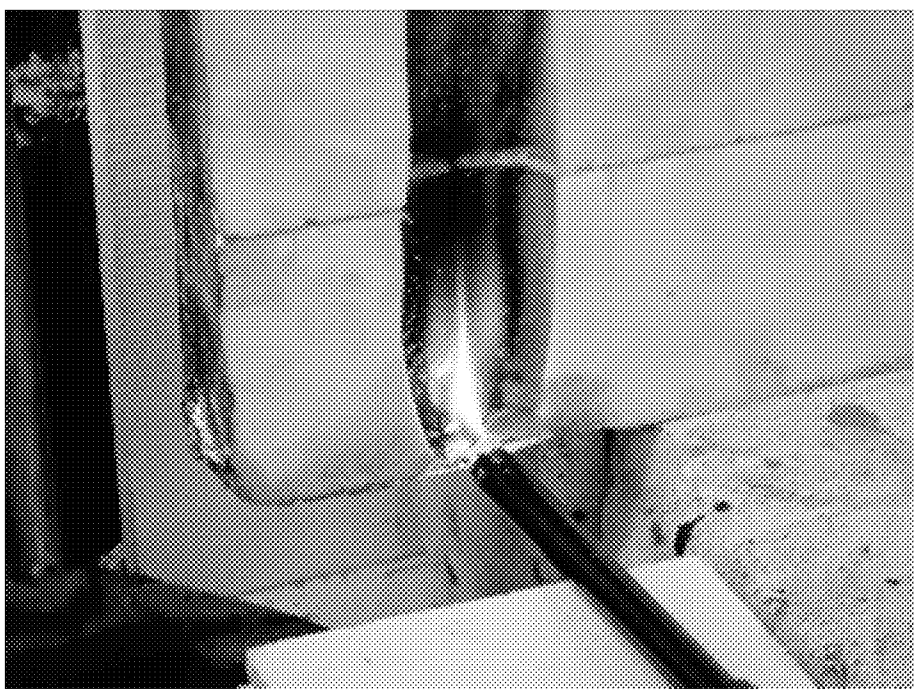
Photograph 8: 'Large flame' test on complete panel.



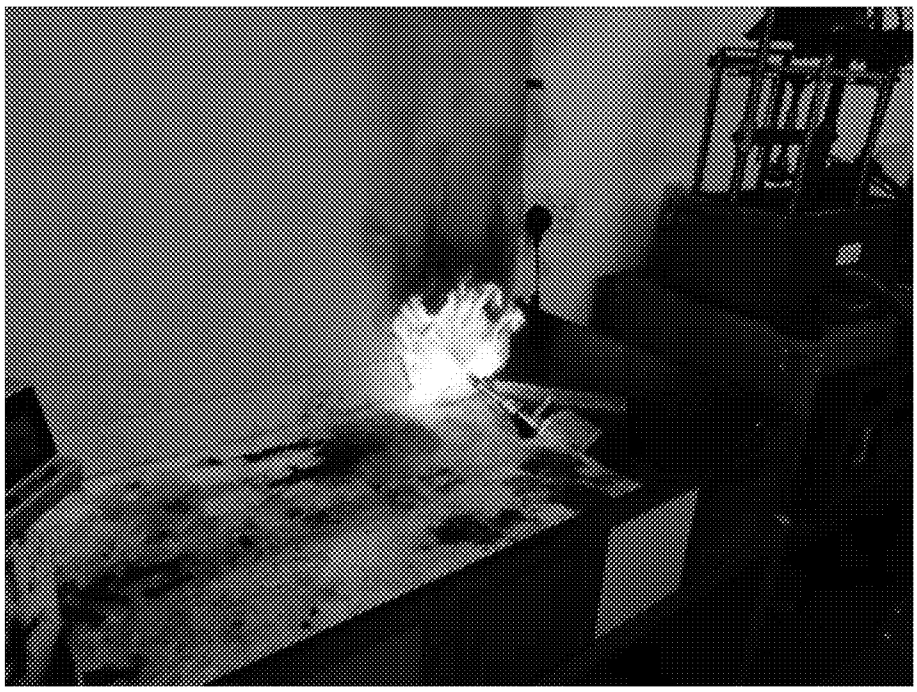
Photograph 9: 'Crib 6' test on the complete panel.



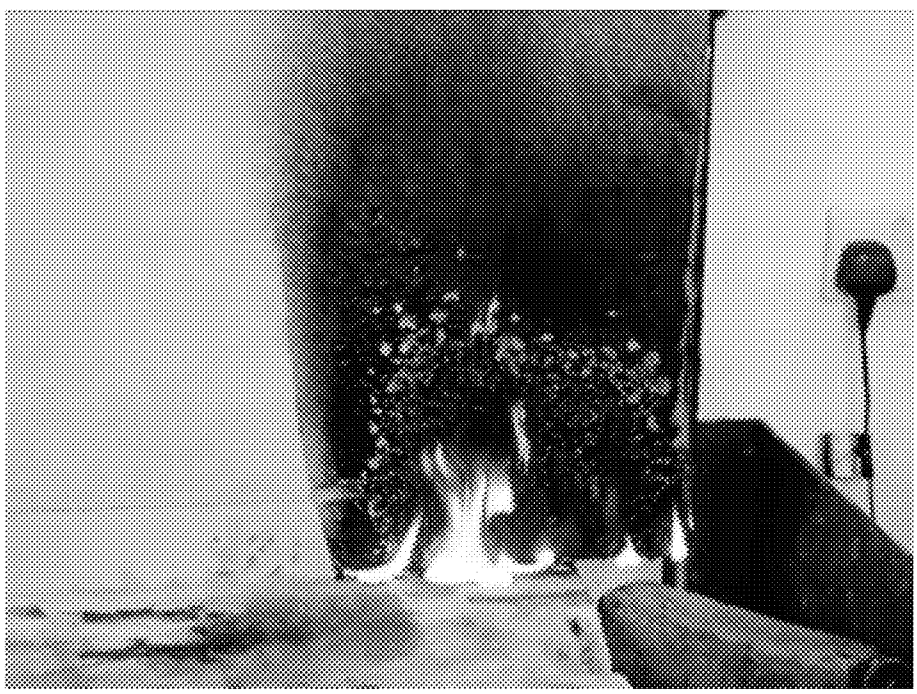
Photograph 10: Complete panel after the 3 flame tests with front steel sheet removed.



Photograph 11: Repeat of the 'Small flame' test against the blue foam layer.



Photograph 12: Repeat of the 'Large flame' test against the blue foam layer.



Photograph 13: After the 'Large flame' source had been withdrawn.

Photograph 14: Repeat of the 'Crib 6' test against the blue foam layer.