

Subject	Briefing Note		
Date	1 March 2019	Job No/Ref	258294

Briefing Note (legally privileged and confidential)

This briefing note is a record of witnessing inspections of a fire control switches taken from Level Ground and 2 in Grenfell Tower; as well as an exemplar fire control switch, for comparison purposes.

All activities were carried out by the MPS.
No photographic record of the removal of the two fire control switches was seen during this inspection.

Inspection Location

BRE Building Research Establishment
Bucknalls Lane
Watford, Hertfordshire, WD25 9XX
UK

Date

15th February 2019

Present

(MT)	CSM Martin Tucker	Forensic Manager - MPS
(JT)	Jeff Turner	Locksmith - for MPS
(AH)	Andre Horne	Marks & Traces - for MPS
(CH)	Ciara Holland	BRE
(RP)	Rupert Pool	Metallurgist - BRE
(DC)	David Crowder	Fire Expert - BRE
(RH)	Roger Howkins	Lift Expert - GTI
	Exhibits Officer	MPS
	Photographer	MPS

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Observations

MT started the meeting and informed all present that the MPS photographer would take photos and would distribute them after the meeting. Also, if any specific photographs were required, the MPS photographer would take them and would be distributed.

The following exhibits were to be examined:

- **ER/1** the 'express' drop key provided to the MPS by WSP. This was a general Sample of the type of 'express' drop key. This was not the 'express' drop key used on the night of the fire.
- **ER/2** the unused new version of the fire control switch, this was provided to the MPS by WSP
- **BJG/74** the fire control switch taken from Level Ground of Grenfell Tower
- **BJG/75** the fire control switch taken from Level 2 of Grenfell Tower

A photographic record of exhibits was taken the detailed before examination started.

Note: all draft photographs used in this file note were taken by the MPS photographer - as agreed.



Photo 1 Evidence bag BJG/74

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Photo 2 Fire control switch – BJG/74 and fixing lugs (front view)

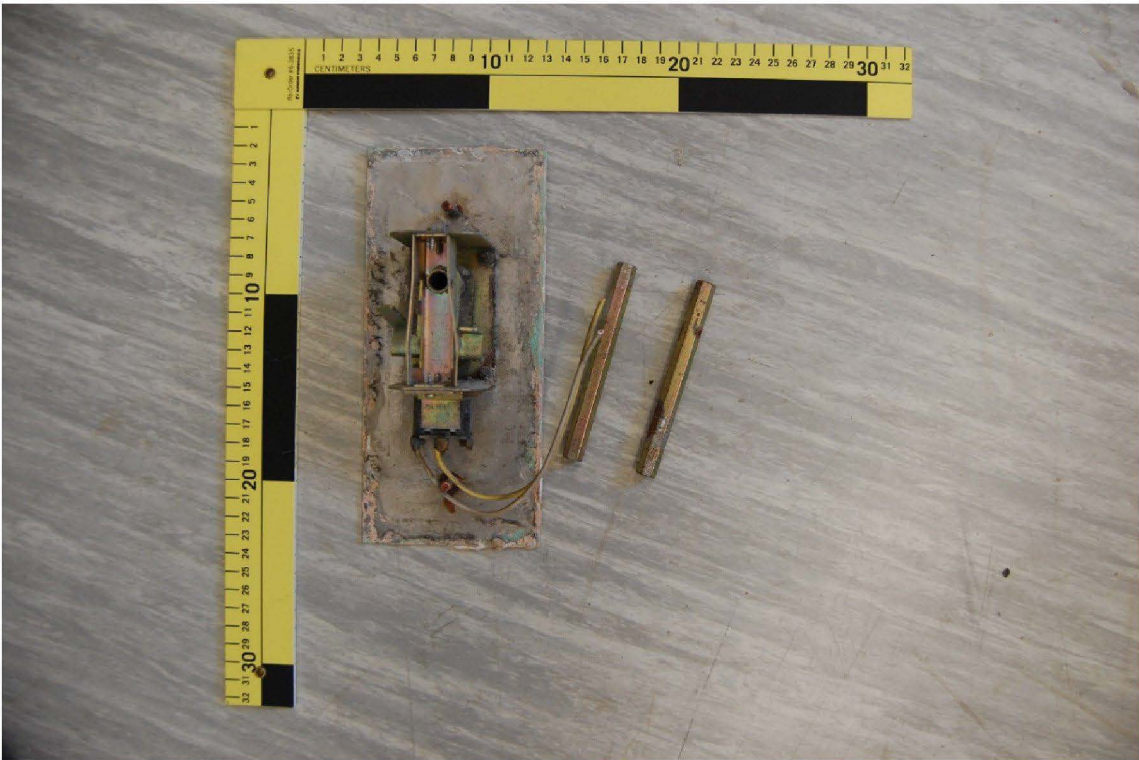


Photo 3 Fire control switch – BJG/74 and fixing lugs (rear view)

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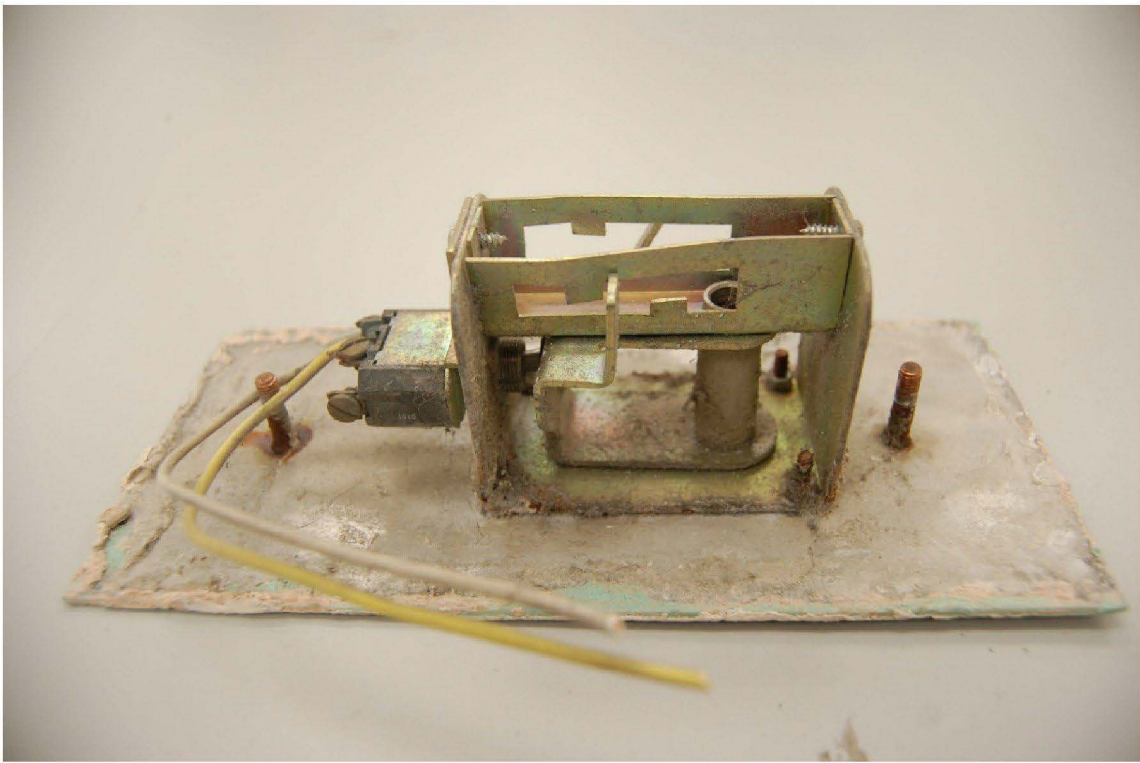


Photo 4 Fire control switch – BJG/74 (side view)

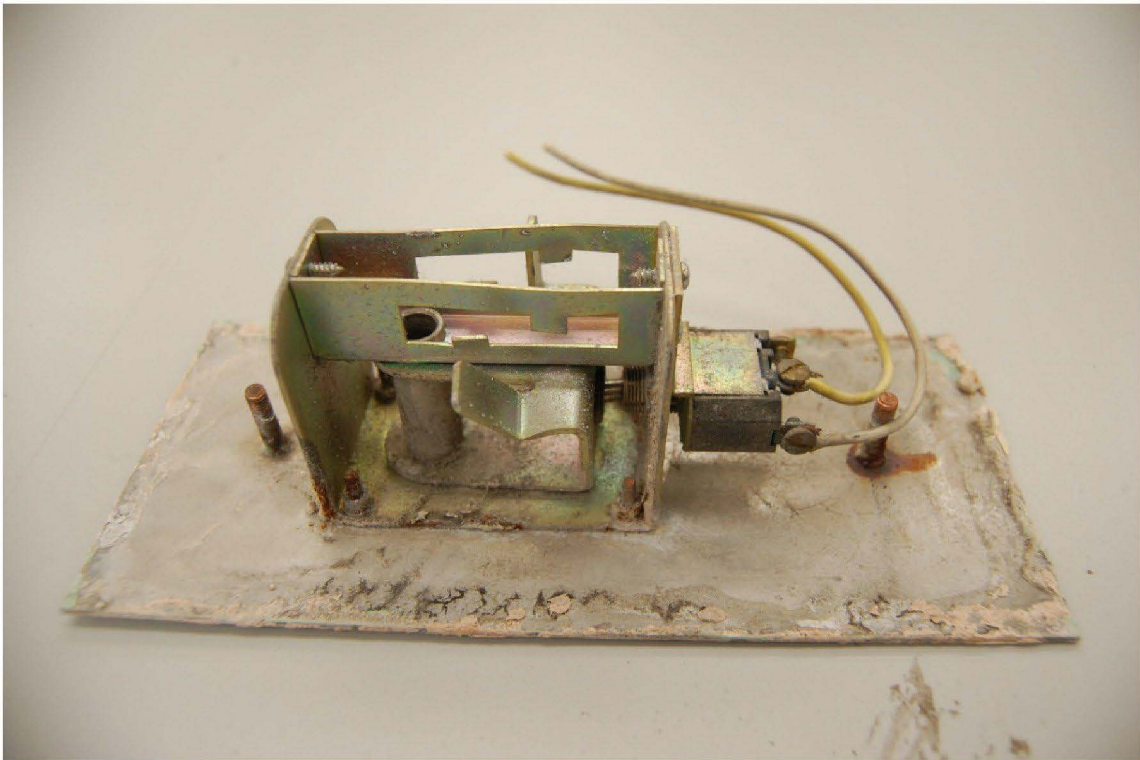


Photo 5 Fire control switch – BJG/74 (side view)

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Photo 6 Evidence bag and new fire control switch ER/2



Photo 7 Fire control switch – ER/2 (rear view)

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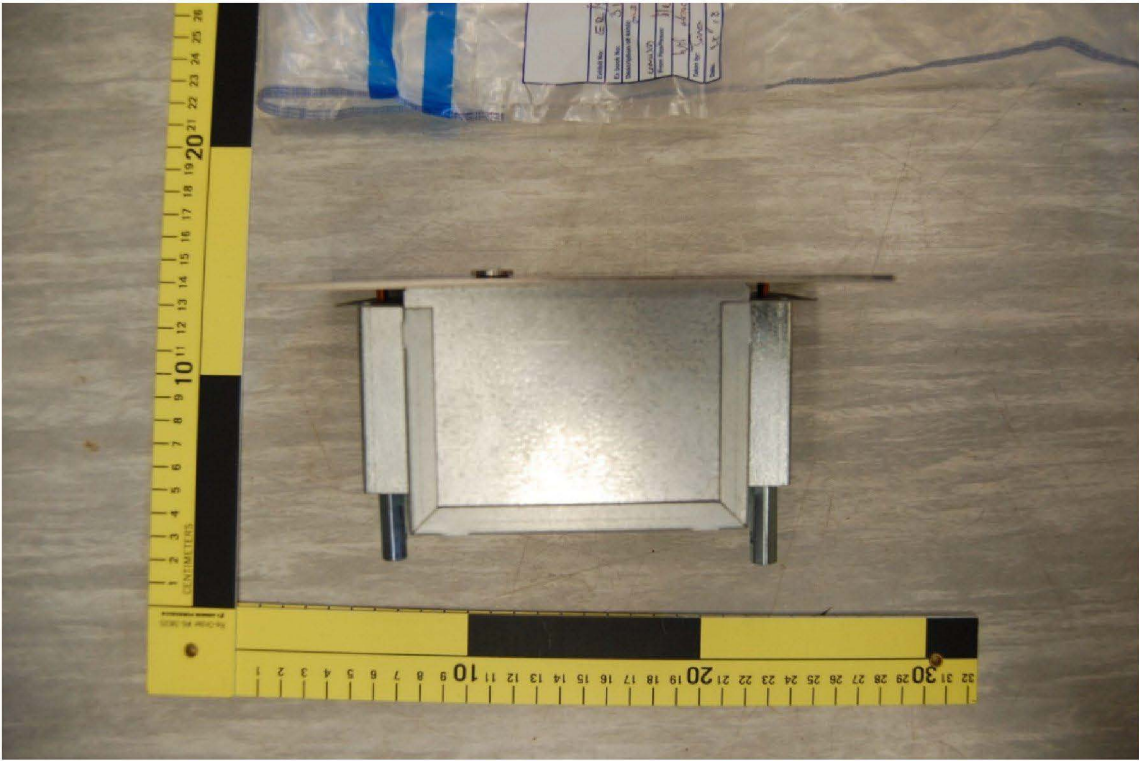


Photo 8 Fire control switch – ER/2 (side view)

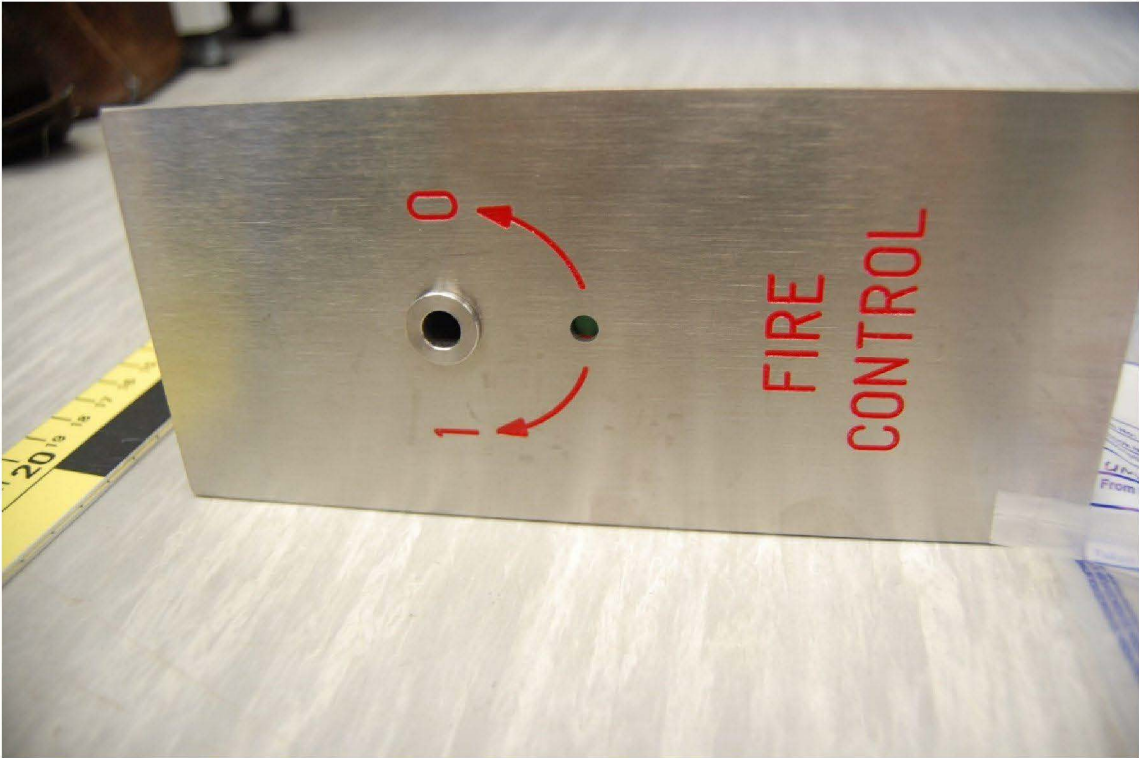


Photo 9 Fire control switch – ER/2 (front view – switch on side)

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Photo 10 Evidence bag and ‘Express’ drop release key ER/1 this key was provided to the MPS by WSP and was not the key used on the night of the fire

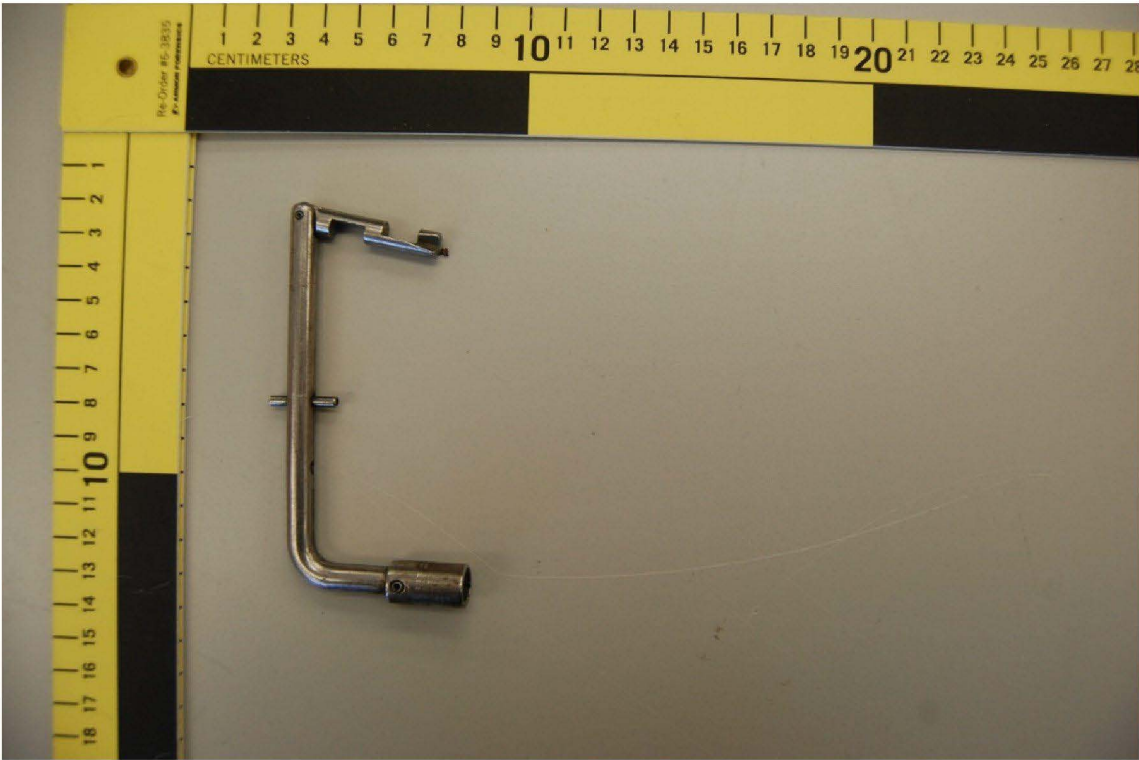


Photo 11 ‘Express’ drop release key provided to the MPS by WSP

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Comparison of BJG/74 and ER/2

A physical examination of the two switches was undertaken.

One switch was installed at Grenfell Tower on the night of the fire (BJG/74) and the other switch which was the exemplar switch (ER/2) was also examined.

There is no manufacturing data on either switch, therefore it is not known the age or installation date of BJG/74.

It is not known how the BJG/74 fixing lugs were installed into the building fabric.

It is not known how this switch was removed from Grenfell Tower or who removed it.

It is not known if there is photographic evidence of this extraction procedure.

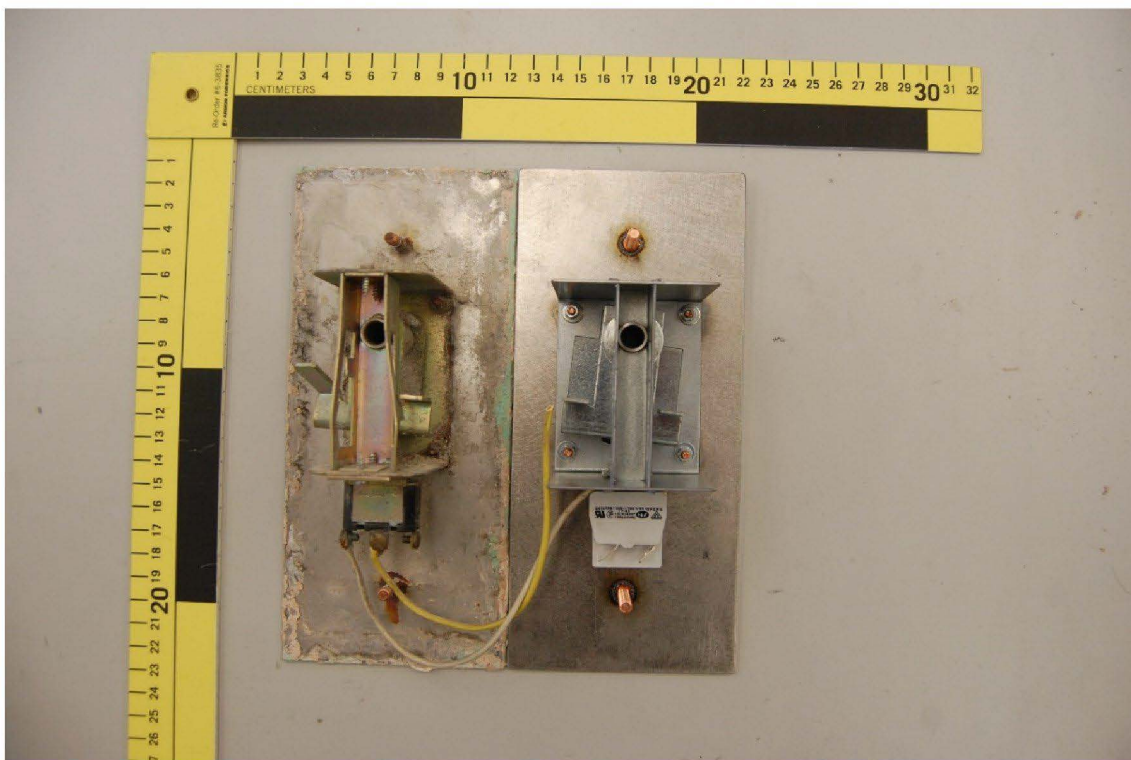


Photo 12 Comparison of fire switch BJG/74 (left) and ER/2 (right)

The examination of BJG/74 indicates deformation of the 'side wards' when compared with ER/2. In my opinion, this deformation could not have occurred during removal.

It is not known if the removal procedure was photographed.

Note: the 'yellow' and 'white' field wiring on BJG/74 has been cut during the removal of the fire control switch from Grenfell Tower. It is not known the specification of the field wiring fitted the fire control micro switch or the age of the field wiring.

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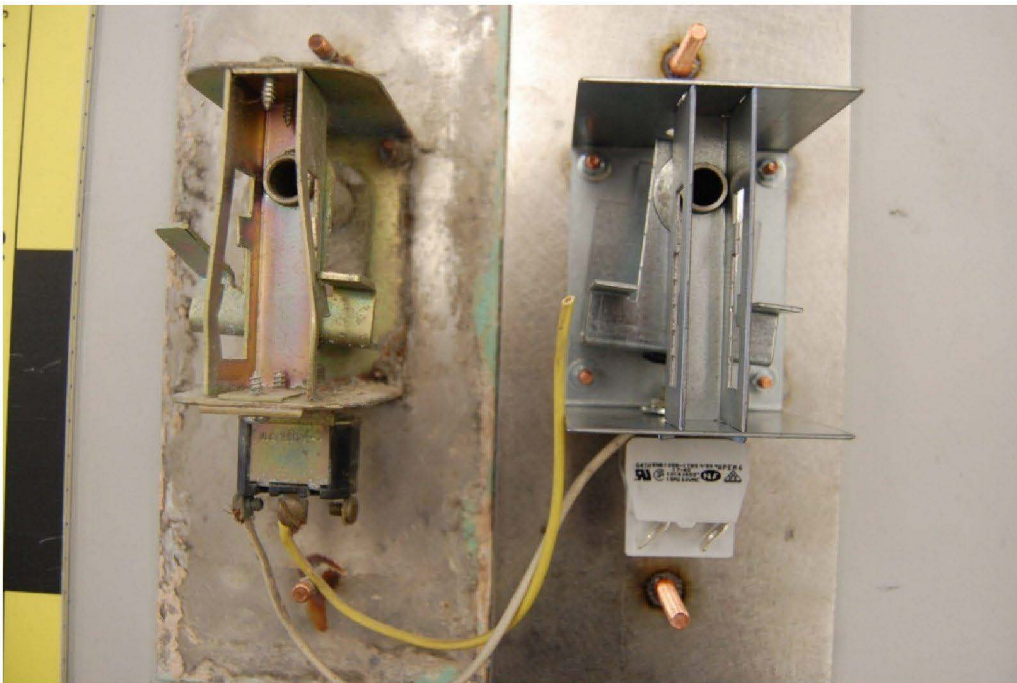


Photo 13 Deformation of ‘side wards’ to fire switch BJJ/74 (left) compared with ER/2 (right)

Observation: there is ‘green’ wall paint visible on the side and on the bottom of the fire control switch. It is not known the age of the paint.

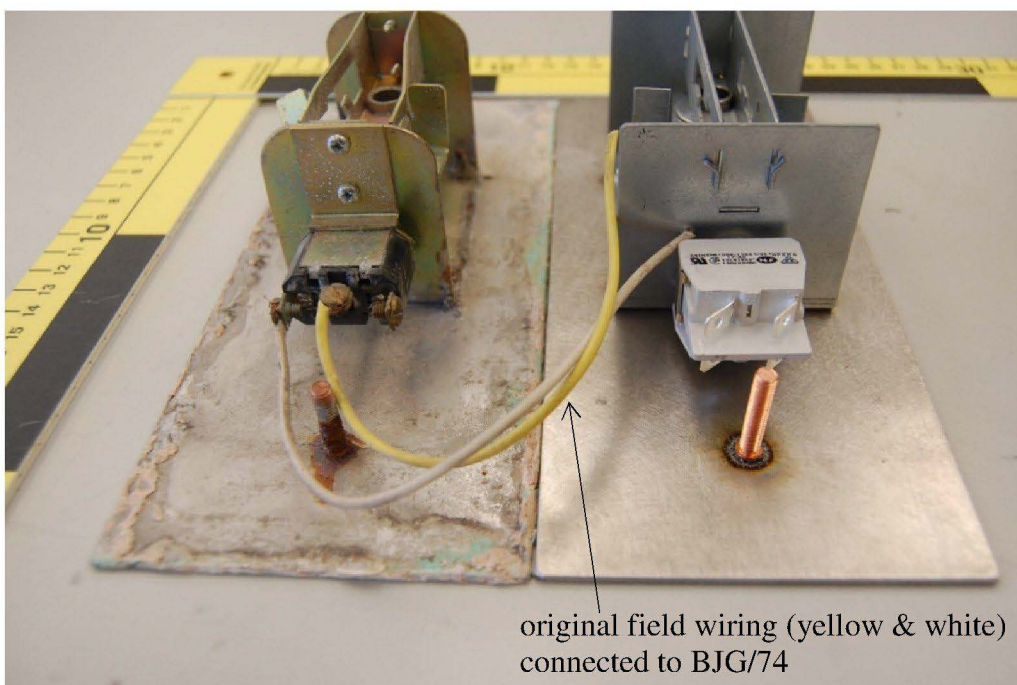


Photo 14 BJJ/74 (left) and ER/2 (right) – View from bottom showing electric micro switch

Note: the ‘yellow’ and ‘white’ field wiring was connected onto BJJ/74.

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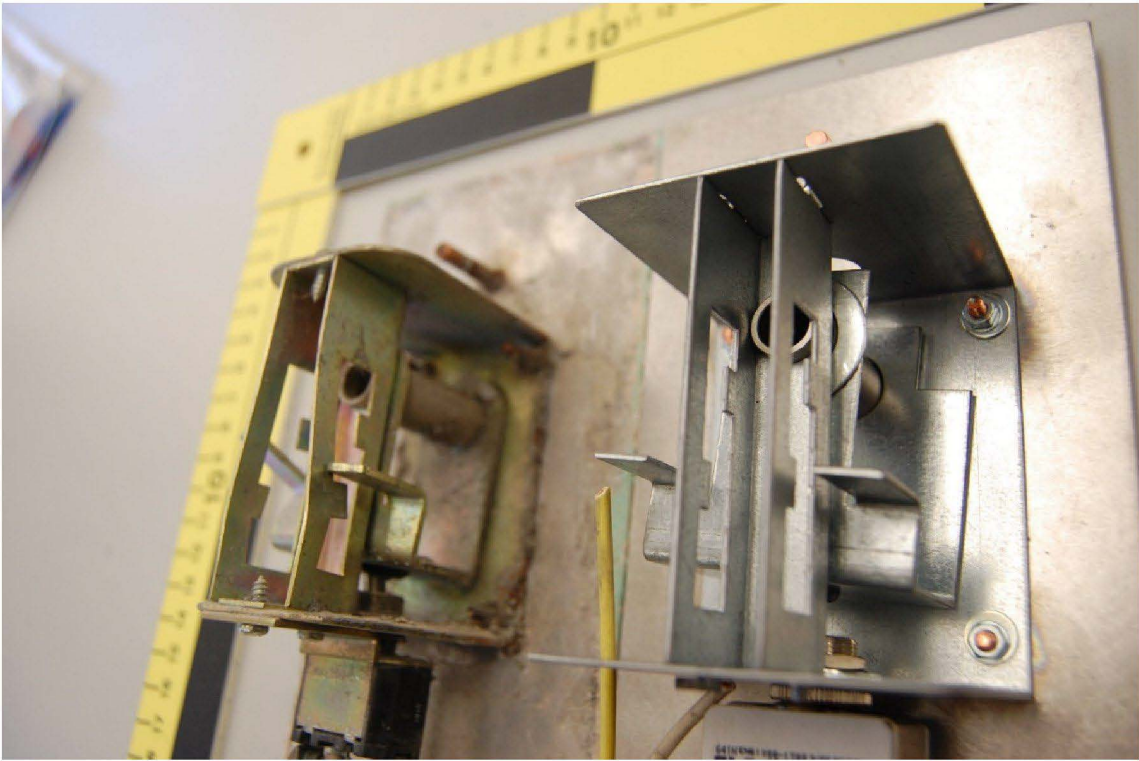


Photo 15 BJD/74 (left) and ER/2 (right) – Side view detailing deformer ‘side wards’

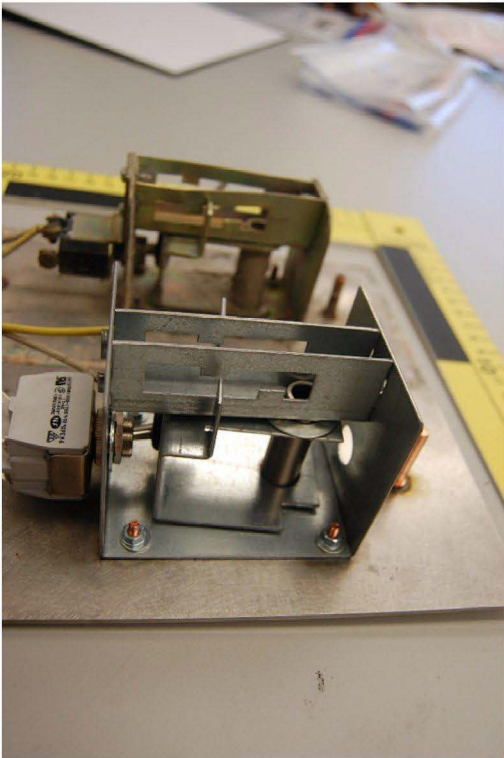


Photo 16 ER/2 ‘side wards’

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Photo 17 Comparison of ‘side wards’ BJK/74 (left) and ER/2 (right)

Corrosion

- The MPS visual examination of BJK/74 indicate a build up of builders’ material on the switch casing and also the micro switch (**Photo 14**) was jammed. It appeared to be a wall plaster used during the works.
- During the examination the micro switch became free and the microswitch operated. It is not known what caused the micro switch to jam, but there were plaster grains on the work bench.
- It is considered that the build up of builders’ material on the top of the switch was from the original works and not caused by the extraction of the switch. This is also my opinion.
- The micro switches installed on BJK/74 and ER/2 operated correctly when the jam was cleared. This was proved by using a digital multimeter provided by BRE.

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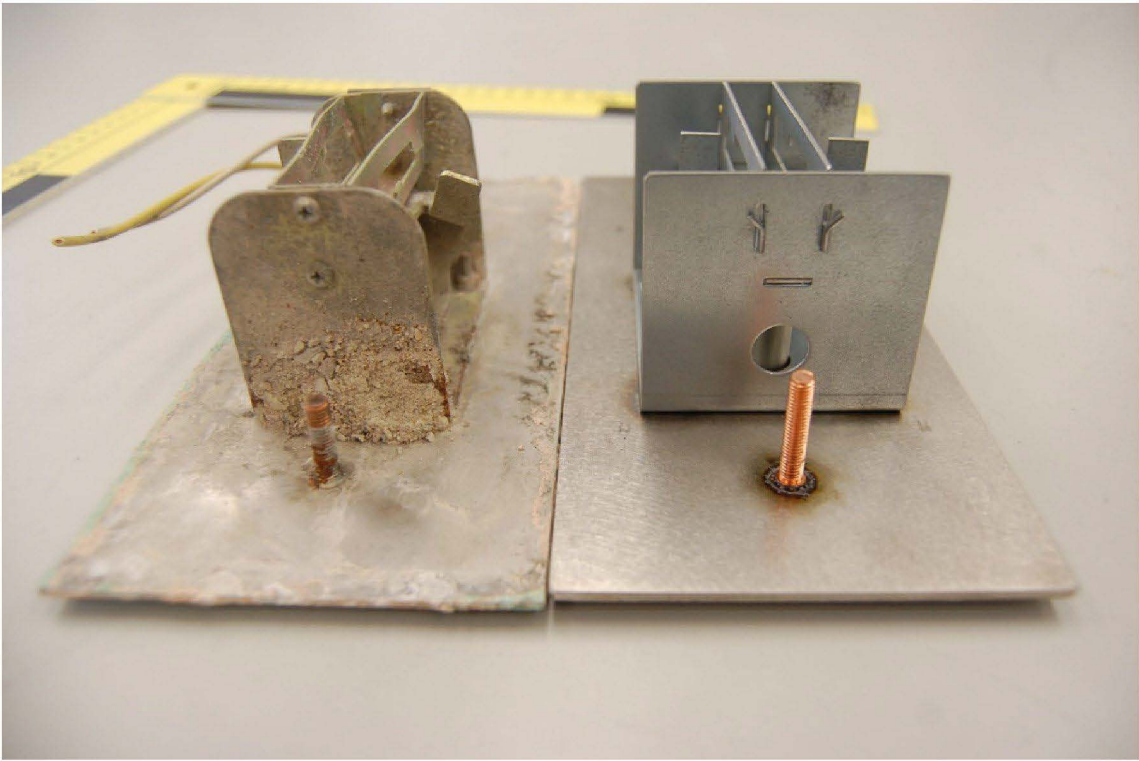


Photo 18 Builders’ material on top of fire control switch BJJ/74 (left) and new fire control switch ER/2 (right)

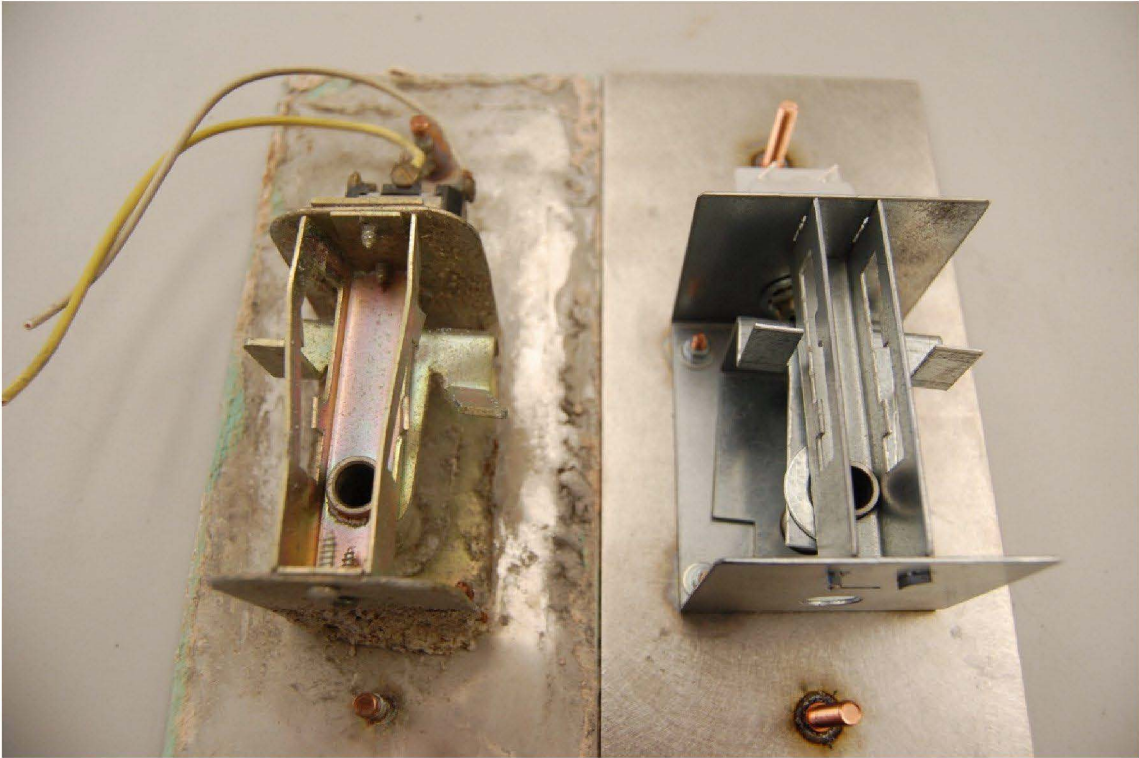


Photo 19 Comparison of BJJ/74 (left) and ER/2 (right) - Detailing builders’ material build up on BJJ/74

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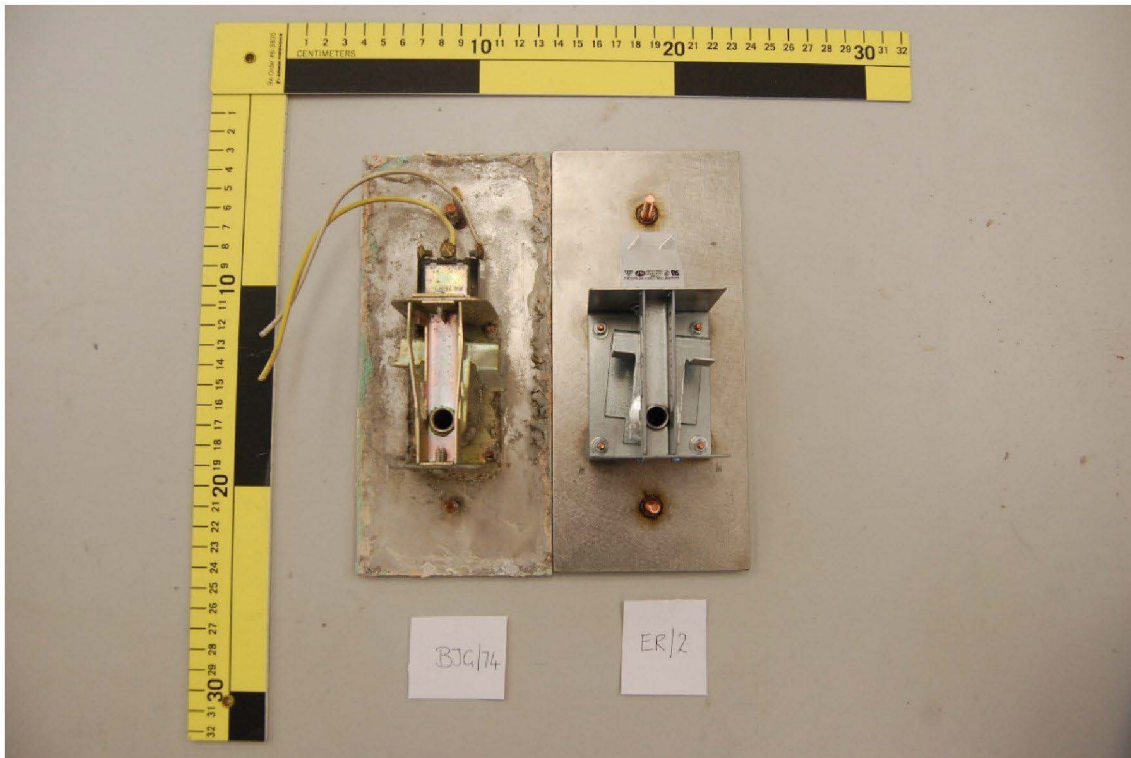


Photo 20 Comparison of BJJ/74 (left) and ER/2 (right)

Internal examination

The barrel of BJJ/74 was internally examined together with the 'side wards' by RH, AM, AH and JT and shared their observations.

It was agreed that there was no evidence of mis-use, vandalism or foreign objects (super glue) in the key barrel or 'side wards'.

The micro switch to BJJ/74 initially was jammed and did not operate. During the examination this switch became free and operated correctly. It is not known what caused this micro switch to jam. It is not known if the micro switch was jammed on the night of the fire.

It is not established if the damage to the 'side wards' was due to an incorrect 'drop' key being used or was damaged during installation.

In my opinion, the damage to the 'side wards' was caused by an incorrect drop key being used, which subsequently deformed the 'side wards', or by an 'express' drop key being inserted too far in the barrel and a high twisting force damaged the 'side wards'.

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Photo 35 Drop key barrel BJC/74 – Where the ‘express’ drop key would be inserted

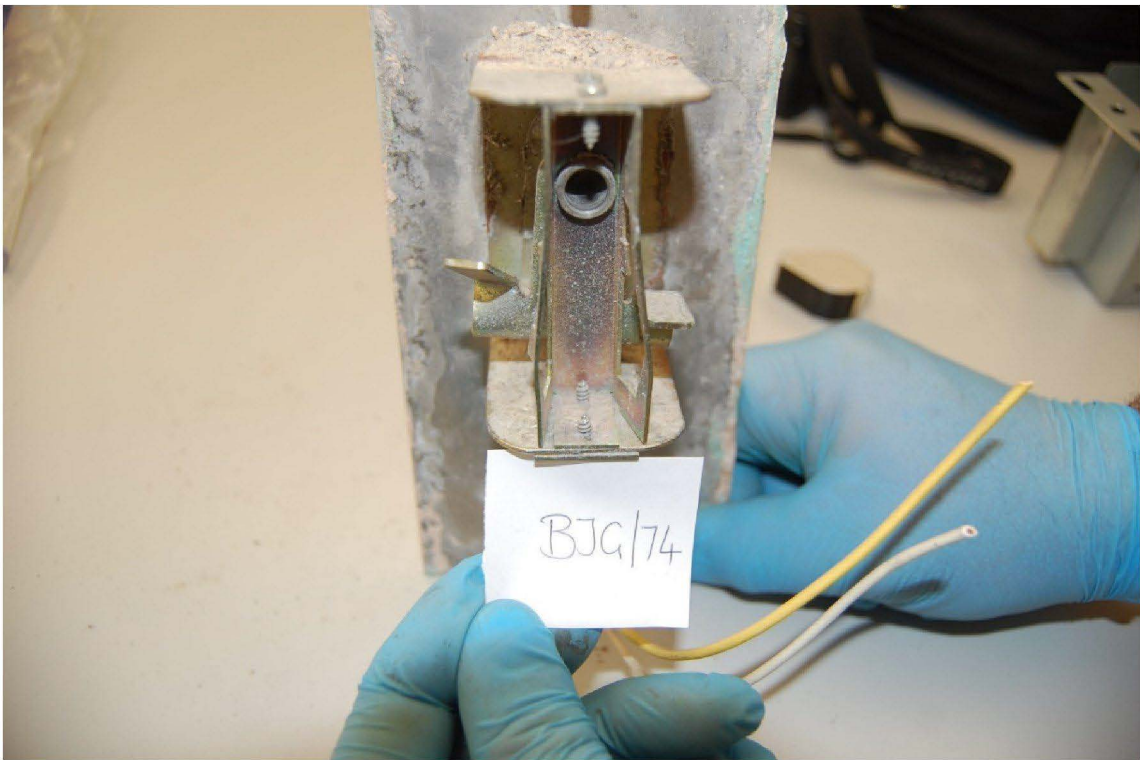


Photo 36 Drop key barrel BJC/74 – Where the ‘express’ drop key would be inserted

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Operation of fire control switches

BJG/74 and ER/2 were tested with 'express' drop keys.



Photo 21 BJG/74 (left) and ER/2 (right) with 'express' drop keys

It was noted that fire switches BJG/74 and ER/2 have different engraving (ON/OFF – 1/0) and status colours (red and green) when in same position.

In my opinion, this could cause confusion to the Emergency Service on the night of the fire.

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Photo 22 Different engraving (ON/OFF–1/0) and status colours BJG/74 (left) is green and ER/2 (right) is red

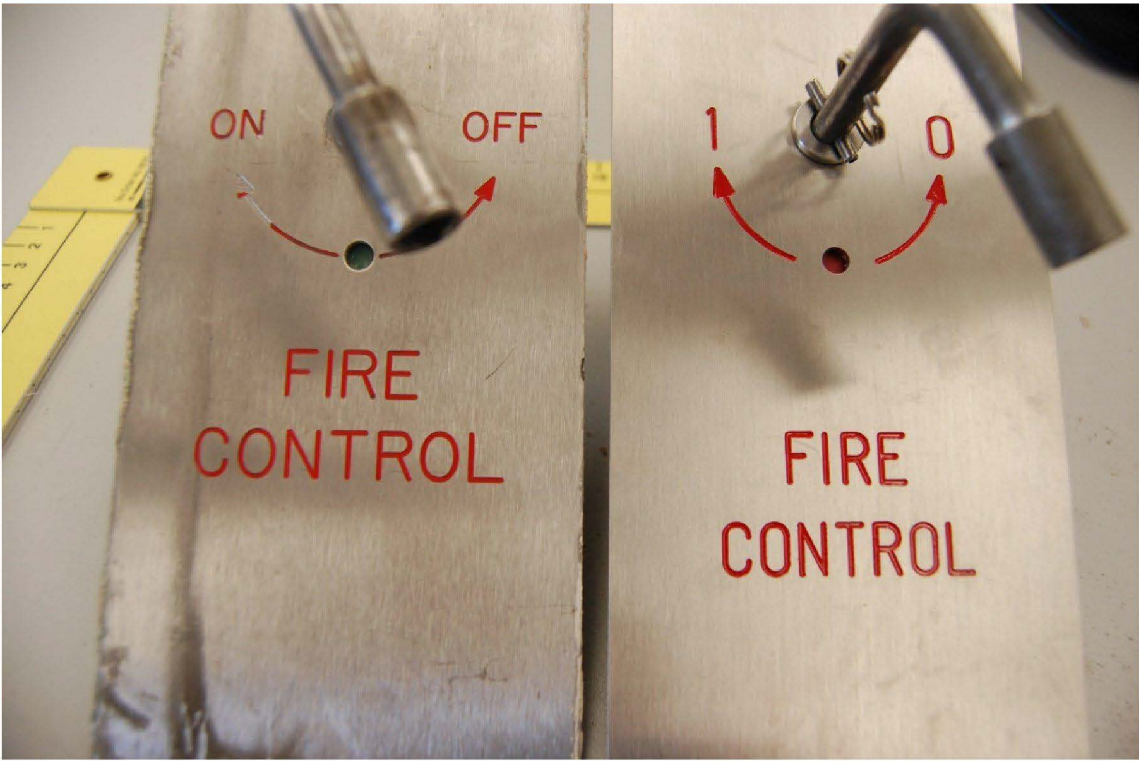


Photo 23 Different engraving (ON/OFF–1/0) and status colours BJG/74 (left) is green and ER/2 (right) is red

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BJG/74 the mechanical switch during the examination was found to be stuck in the 'OFF' position, indicating the electrical circuit was open.

The coloured indicator was showing 'GREEN', indicating the electrical circuit was open. This is the opposite of ER/2.

In my opinion, this could cause confusion on the night of the fire.

Damage to 'side wards' BJG/74

The 'side wards' to BJG/74 deformed due to most, probably, by an incorrect drop key being used or an 'express' drop key being inserted too far in the barrel and a high twisted force damaged the 'side wards'.

This deformation was not due to vandalism or mis-use. It is not known when the 'side wards' were deformed.

It was noted that the 'express' drop key ER/1 and the drop key used by Jeff Turner (JT) have slightly differing dimensions and one would operate the fire control switch and the other 'express' drop key would not operate the fire control switch. In my opinion, this indicates a lack of constancy in manufacturing tolerances of the switch or drop key.

It was recommended by the MPS that the Fire Service 'express' drop key used on the night of the fire is to be obtained for comparison purposes with the 'express' drop key used during this witnessing inspection.



Photo 24 'Express' drop key inserted into BJG/74 barrel

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Photo 25 ‘Express’ drop key in barrel and micro switch BJG/74

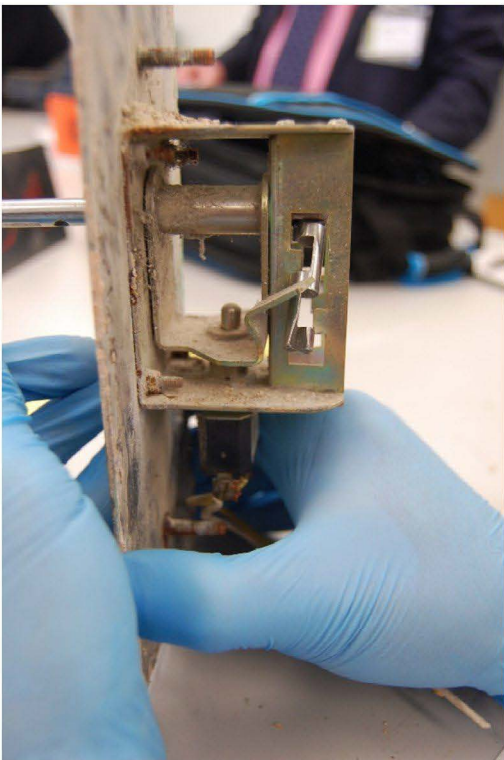


Photo 26 ‘Express’ drop key inserted into the BJG/74

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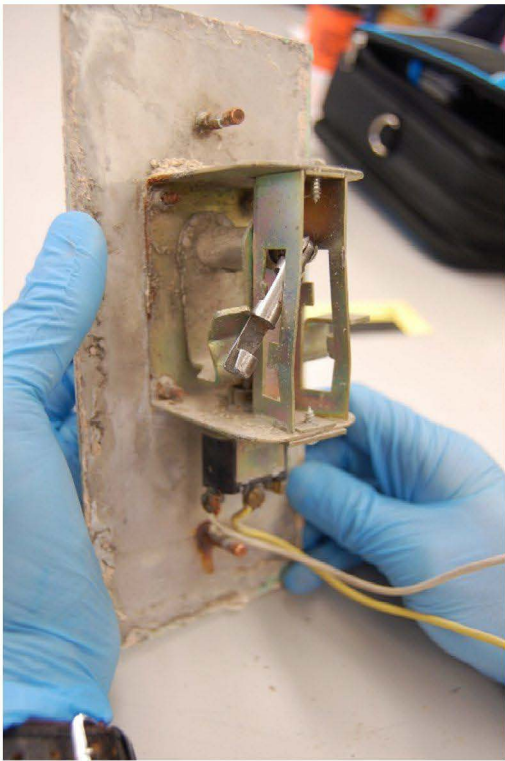


Photo 27 Comparison of ‘express’ drop release key in barrel of BJG/74 (key to left)

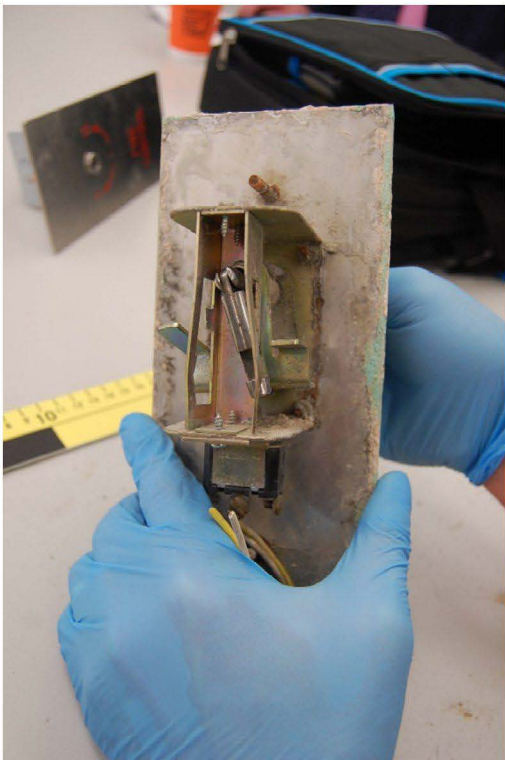


Photo 28 Comparison of ‘express’ drop release key. BJG/74 (key to right)

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Exhibit BJG/75

It was verbally agreed by all parties during the inspection that this fire control switch was not electrically connected and therefore would not be examined.

There was no photographic evidence that the switch was exactly connected when it was removed.

Note: good workmanship would have removed this fire control switch before the fire occurs to save any confusion.

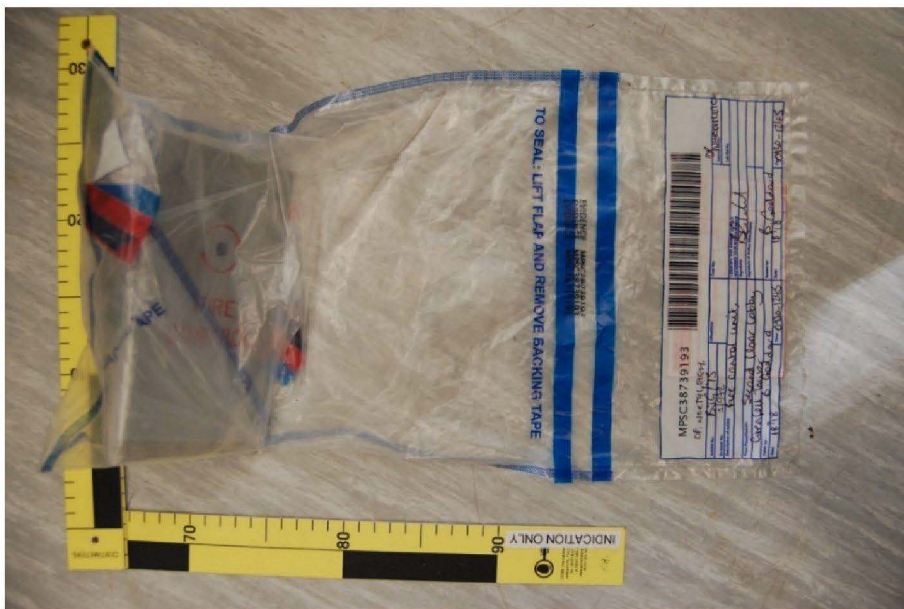


Photo 29 Evidence bag BJG/75



Photo 30 Evidence bag BJG/75

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Recommendations

MPS are to obtain the 'express' drop key used on the night of the fire by the Fire Service. Those attending the examination on the 15th February 2019 would be invited back to BRE for an examination of the original 'express' drop key which was used on the night of the fire to confirm it would operate the switch with damaged 'side wards'.

The major reasons for the fire control switch malfunction are factory fault, components fatigue and misuse. Arup shall investigate all the possibilities:

1. An identical fire control switch and 'express' drop key will be obtained for testing and examination purposes.
 - The minimum twisting force required to damage the switch needs to be determined. The twisting force tests need to be carried out in laboratory conditions with specialised measuring equipment.
 - The minimum bending force required to permanently deform the pressed steel 'side wards' needs to be determined. The force tests need to be carried out in laboratory conditions with specialised measuring equipment.
 - The operation of micro switch needs to be analysed to evaluate any probabilities of its malfunction.
 - Different designs of drop keys will be used to test if they can be inserted into the fire control switch barrel and damage the 'side wards' or micro switch.
2. The components specification needs to be analysed to evaluate any probabilities of components design issues. Study will be focused on materials used, dimensions and the fabrication of the fire control switches.
3. The original factory drawing of the fire control switch shall be analysed to evaluate any probabilities of components design issues.
4. The 'express' drop key used to operate the fire control switch will be analysed to evaluate if the type of key is as per fire control switch manufacturer recommendation.
5. Fire Control switch design life and fatigue subject need to be analysed.