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BRE Client Report

GT site report

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Executive Summary

The Metropolitan Police Service (MPS) requested BRE to investigate the operation of the smoke detection system. This led to the work program which included the review of various documentation and visits to Grenfell Tower by the BRE team during December and February 2019.

The aim of the visit was to determine the as-built installation of the smoke detection system, locating the various control panels and devices and tracing the connections between them before labelling and removing key items from site.

The ultimate objective was to gain a greater awareness of the operation of the smoke detection system and answer specific questions raised by the MPS.

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1 Introduction

This report summarises the work done, and observations made on site by BRE in February 2019 in relation to the fire detection system installed in Grenfell Tower.

The work was undertaken at the request of Mr Martin Tucker, Forensic Manager, Operation Northleigh (Grenfell Tower Fire), Metropolitan Police Service (MPS).

The overall objective of this work was to gain a greater awareness of the operation of the smoke detection system; determine why the lift did not return to the ground floor upon activation of the smoke detection system; and determine why the smoke vent opened on the 11th floor.

This report summarises the work undertaken by BRE on site during February 2019 to identify relevant components and wiring associated with the Master Panel and Outstations of the smoke detection system in the building, and the labelling of these components before their removal by MPS officers.

The report is not intended to provide any expert opinion on the possible operation of the system or provide any wiring diagrams. All photographs shown in this report were taken by BRE staff.

BRE's site inspection undertaken in February 2019 was led by Eman Mattie-Suleiman (Technical Development Director) and David Butler (Principal HVAC Consultant).

2 Identification of smoke detection system components

2.1 Overview of smoke detection system components

The smoke detection system was manufactured by PSB-UK Ltd. A schematic of the system is shown in PSB Drawing 800 and the accompanying PSB Wiring Tables (not reproduced in this report).

BRE visually inspected the system panels, and where accessible the interconnection between the panels and their wiring to the other system components including fans, dampers, detectors, fireman's override switches and pressure transducers.

The system panels comprise:

- Master Panel containing PLC (PLC was removed) and one Modbus I/O board, located in ground floor Hub Room
- Inverter Panel 1 containing one Modbus I/O board and inverters for ground floor fans, located in ground floor Hub Room
- HMI Panel incorporating a touch screen and Fireman's Override Switch, located on wall in ground floor lobby
- Inverter Panel 2 containing one Modbus I/O board and inverters for roof level smoke extract fans, located in Roof Plant Room
- 9 Battery Back-up Panels (located on approximately every other floor)
- 22 Outstation panels located on floors 2 to 23, each containing one Modbus I/O board with exception of Outstation O/S 1 contained three Modbus I/O boards.

All of the panels, except the Battery Back-up Panels, were connected to the PLC within the Master Panel by RS-485 MODBUS™ digital communication.

The Modbus I/O boards in the Master Panel and Outstation Panels provided digital inputs and outputs to the smoke dampers, smoke detectors, detector relay, pressure switches and Fireman's Override Switches. The Inverter Panels provided speed control of the smoke extract and environmental supply and extract fans and control of the fan dampers.

A list of the system panels and connected devices, confirmed by BRE visual inspection, is shown in **Table 1**.

Note that the Boxing Club smoke detector (underside of ceiling in Boxing Club lobby) was covered with a red plastic cover (usually used to prevent false alarms during building maintenance related works).

Table 1: List of system panels and connected devices confirmed by BRE visual inspection

System Panel	Location	Connected devices (external to panel)
Master Panel	Hub room on ground floor	MODBUS link to Inverter Panel 1 MODBUS link to HMI Panel Fireman's switch at HMI Panel

		24 volt supply to HMI MODBUS to all Outstations Multi-core cable to BMS in basement providing: • Outputs (volt-free relay contacts) to signal critical fault, system fault, battery fault and fire detected • Input from BMS for environmental temperature Ground floor lift lobby smoke dampers (24volt outputs) Ground floor lift lobby smoke detector, Fireman's switch and pressure switch (inputs) 1st floor lift lobby smoke dampers (24volt outputs) 1st floor lift lobby smoke detector, Fireman's switch and pressure switch (inputs) Note: smoke detector cables include 24 volt supply to the detector
Inverter Panel 1	Hub room on ground floor	MODBUS to Master Panel 3-phase power input 3-phase power output from inverter to main smoke extract fan 3-phase power output from inverter to back-up smoke extract fan 3-phase power output to environmental fan Ground floor entrance lobby smoke extract fan inlet and outlet dampers (single 24 volt output) Ground floor entrance lobby environmental fan inlet and outlet dampers (single 24 volt output)
HMI	Ground floor lobby	MODBUS to Master Panel* *same cable Fireman's override switch to Master Panel* 24volt supply from Master Panel
Outstation Panel (O/S) 1	Service riser on 2nd floor lift lobby	MODBUS input from Master Panel MODBUS output to O/S 2 24volt supply input from battery backup panel 24volt supply output

		2nd floor lift lobby smoke dampers (24 volt outputs) 2nd floor lift lobby smoke detector, Fireman's switch and pressure switch (inputs) Ground floor Community Room AOV (window opening actuator) (24volt output) Ground floor Community Room smoke detector and Fireman's switch 2nd floor lift lobby smoke dampers (24volt outputs) 2nd floor lift lobby smoke detector, Fireman's switch and pressure switch (inputs) 2nd floor boxing club lobby AOV (window opening actuator) (24volt output) 2nd floor boxing club lobby smoke detector and Fireman's switch Note: smoke detector cables include 24 volt supply to the detector
Outstation Panels (O/S) 2 to 22	In lift lobby pipe riser cupboard (O/S2 in dry riser behind MDF wall panel)	MODBUS input MODBUS output 24volt supply input 24volt supply output Lift lobby smoke dampers (24 volt outputs) Lift lobby smoke detector, Fireman's switch and pressure switch (inputs) Notes: 1. Lift lobby smoke dampers are connected to same O/S terminals and therefore operate simultaneously 2. Smoke detector cable includes 24 volt supply to the detector
Inverter Panel 2	Roof plant room	MODBUS output 24volt supply output 3-phase power input 3-phase power output from inverter to main extract fan 3-phase power output from inverter to backup extract fan Note: The PSB Wiring Table for Inverter Panel 2 showed wiring connections to several external devices that BRE

		visual inspection showed had not been installed. These were: 3-wire Changeover Damper, 2-wire Changeover Damper and Environmental Fan.

2.2 PSB Modbus I/O board addresses (slave nos.)

Each of the smoke extract system panels (Master Panel, Outstations, Inverter Panels) had one PSB MODBUS™ I/0 board which provided digital inputs and outputs and RS-485 MODBUS™ communications with other boards in the Smoke Detection System.

Outstation 1 (2nd floor) was the exception in that it had three individually addressed Modbus I/O boards, stacked on top of each other.

Each PSB MODBUS™ I/O board had a unique address determined by the switch settings on an 8-way DIP switch on the board. The board address was also handwritten on most boards. The DIP switches are binary coded such that when an individual switch way is ON it represents a numeric value and the sum of these values is the address setting of the board, see

Table 22.

The majority of the PSB Modbus I/O boards were MK1 versions although there were three MK2 boards, see

Table 2.

The PSB Wiring Tables refer to the Modbus I/O board address as “Slave No.”

Table 2: I/O board address code

SW way	1	2	3	4	5	6	7	8
Value when ON	1	2	4	8	16	32	64	128

In the following example the address is 46:

SW way	1	2	3	4	5	6	7	8
SW setting	OFF	ON	ON	ON	OFF	ON	OFF	OFF
Value	0	2	4	8	0	32	0	0

Table 3: Modbus I/O board addresses visually confirmed by BRE

Floor	System Panel	MK of board	Handwritten address	DIP SW
Roof	Inverter Panel 2	2	11	11
23	O/S 22	1	94	94
22	O/S 21	1	91	91
21	O/S 20	1	88	88
20	O/S 19	1	85	85
19	O/S 18	1	82	82
18	O/S 17	1	79	79
17	O/S 16	2	Blank	76
16	O/S 15	2	Blank	73
15	O/S 14	1	70	70
14	O/S 13	1	67	67
13	O/S 12	1	64	64
12	O/S 11	1	61	61
11	O/S 10	1	58	58
10	O/S 9	1	55	55
9	O/S 8	1	52	52
8	O/S 7	1	49	49
7	O/S 6	1	46	46
6	O/S 5	1	43	43
5	O/S 4	1	40	40
4	O/S 3	1	37	37
3	O/S 2	1	34	34
2	O/S 1	1	33*	33*
2	O/S 1	1	32*	32*
2	O/S 1	1	31*	31*
Ground	Master Panel	1	1	1
Ground	Inverter Panel 1	1	6	6

* Outstation O/S 1 has three stacked Modbus I/O boards. Addresses of the lower two boards were not confirmed visually since it would have required some dismantling. Board addresses have been assumed to be as indicated in the PSB Wiring Tables that accompany PSB Drawing 800.

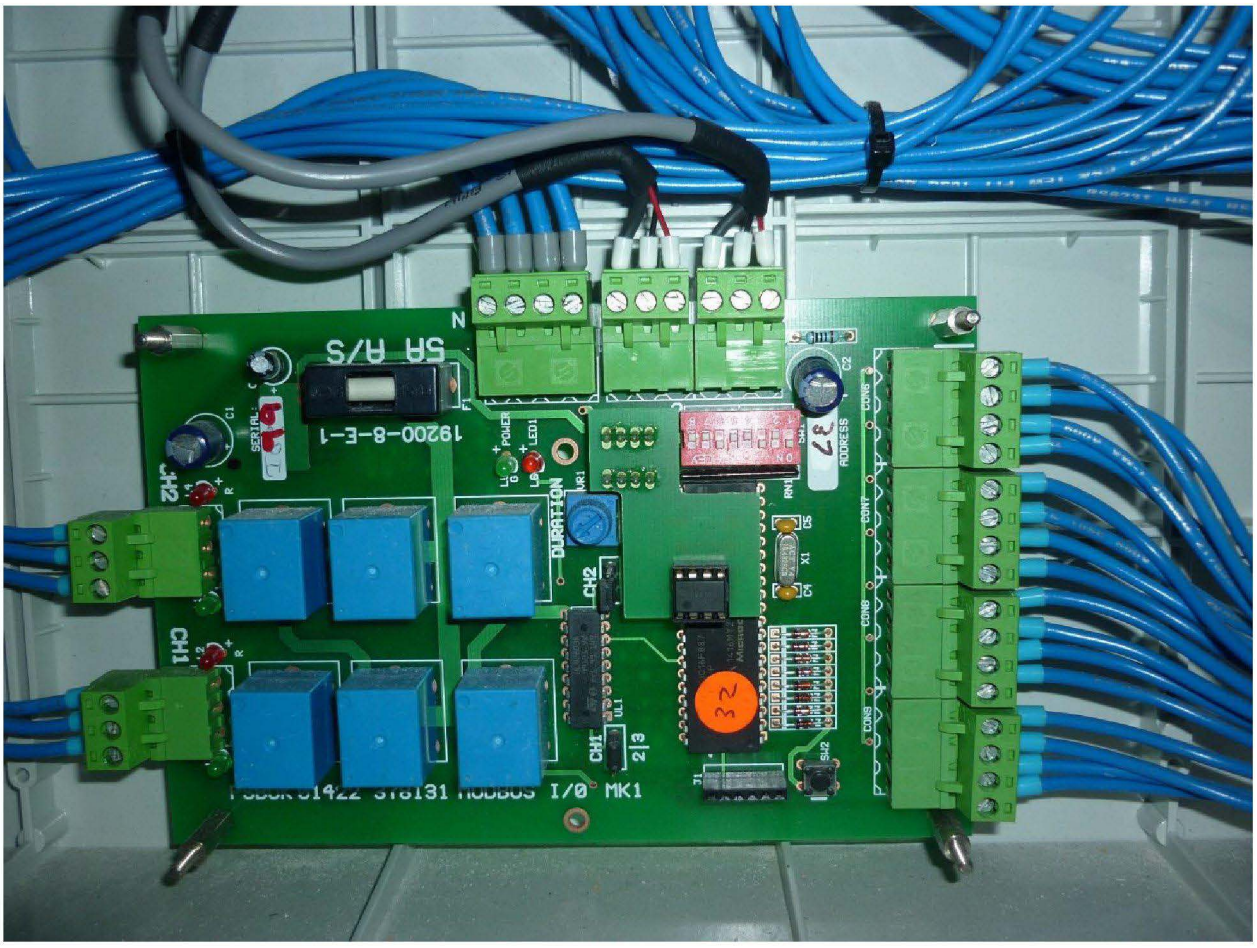

Figure 1: Example MK1 Modbus I/O board in Outstation O/S 3, 4th floor (address = 37)

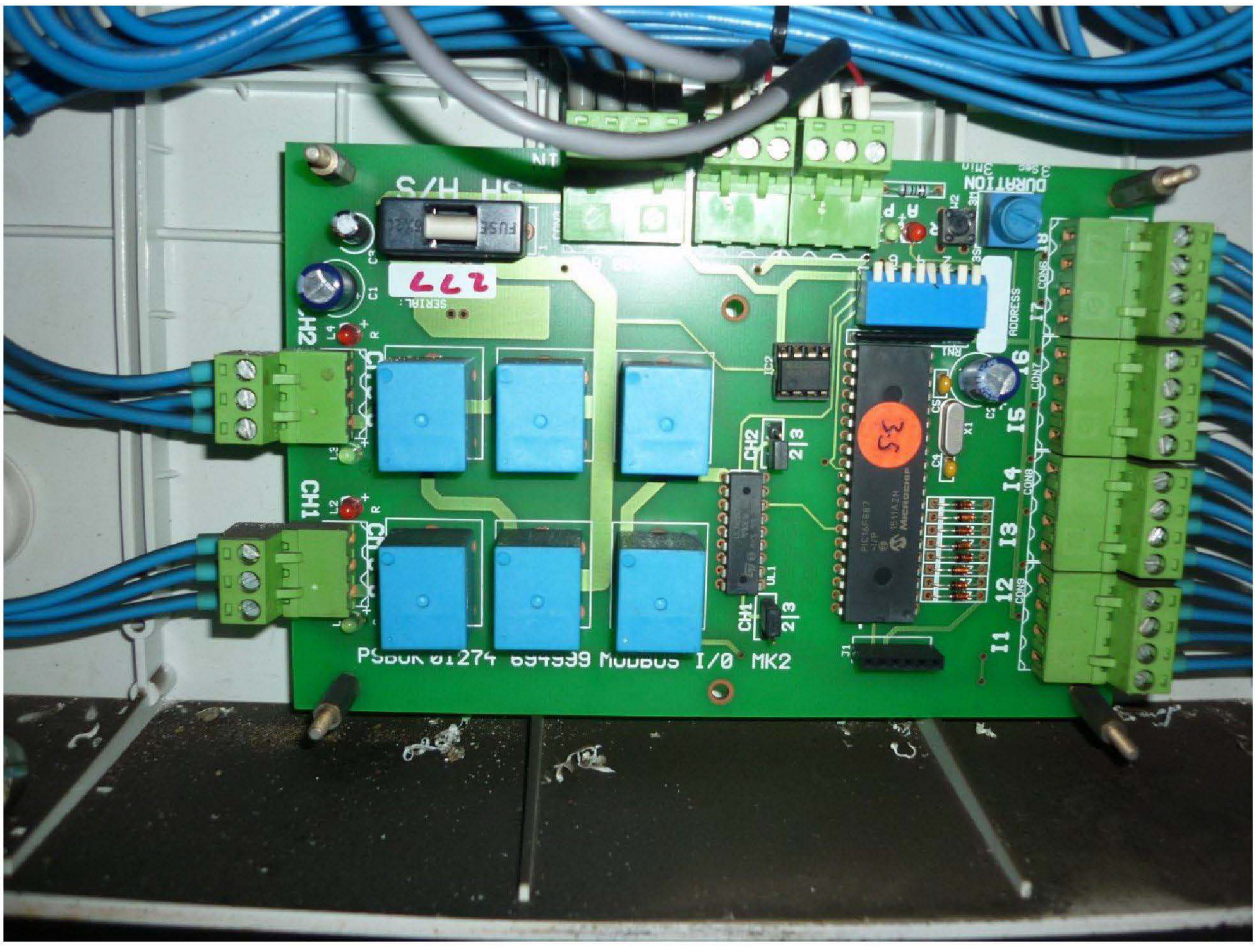

Figure 2: Example MK2 Modbus I/O board in Outstation O/S 16, 17th floor (address = 76)

Note: No handwritten address on this particular board

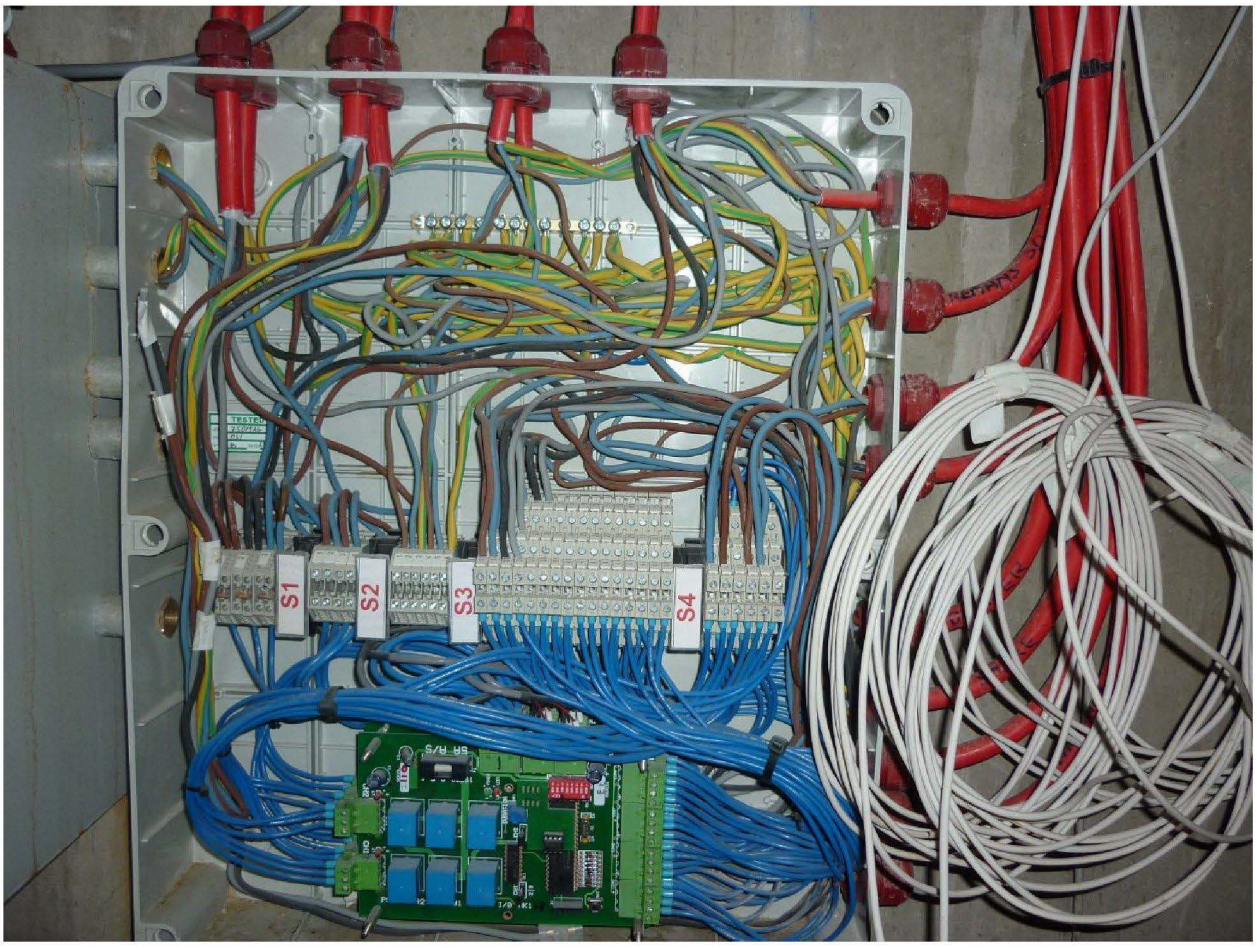

Figure 3: Outstation O/S 1 (2nd floor), exceptionally had three stacked Modbus I/O boards

2.3 Preparation and labelling of System Panels

Prior to removal of the System Panels BRE visually identified and confirmed the presence of all external devices connected to the panels by external cables. The cables wherever possible were labelled by writing on the them and then a coloured cable tie was attached to the cable either side of where the cable was subsequently cut.

The cable tie colours followed a colour scheme according to the type of device connected to the cable, as shown in **Table 4**. If there was more than one device of the same type then additional cable ties were attached, for example, the first damper cable had one cable tie either side of the cut, the second damper cable had two cables ties either side of the cut, and so on.

Each panel was photographed as-found and after cable ties had been attached, and finally the space left was photographed to show the remaining cables.

Table 4: Colours of cable ties used to identify the function of external cables to the System Panels

Cable tie colour	Device connected to cable
White	MODBUS Output
Black	MODBUS Input
Yellow	Smoke detector
Green	Pressure switch
Purple	Fireman's override switch
Blue	Damper north
Red	Damper south
Grey	24volt power
Light orange	used for other cables as required
Dark orange	used for other cables as required

2.4 Master Panel external wiring connections

The connections from the master panel were checked and each cable was tagged according to the cable tie colour code in **Table 4**. Each external cable from the Master Panel was traced visually, and when possible confirmed using an electrical continuity test, to identify the Master Panel cable connections, as detailed in Table 5**.**

Table 5 is based on the PSB Wiring Tables but with confirmation and additional information from BRE's visual inspection.

Several photographs were taken in relation with the Master controller to demonstrate the overall cabinet with cable ties, detail of the cable ties, lower section cables, and when the Master controller was removed. (see Figure 5, Figure 6, Figure 7and Figure 8).

It should be noted that while checking the connection from Terminal X3/7 to the 1st floor lift lobby pressure switch continuity testing showed no electrical continuity. Inspection showed that the wire was lose in the terminal due to the terminal screw not having been tightened, as shown by the exposed copper core having no marks, see Figure 9.

***NOTE: An error was made when reinstating two cables after an electrical continuity test by BRE. Brown wire in X8/4 should go to X8/7, and blue wire in X8/5 should go to X8/8, see* Figure 10.**

Table 5: Cable connections to Master Panel

Terminal	Function	Comments
X3/1	Ground floor lift lobby pressure SW	
X3/2		
X3/3	Ground floor lift lobby Fireman's SW	
X3/4		
X3/5	Ground floor lift lobby smoke detector	
X3/6		
X3/7	1st floor lift lobby pressure SW	
X3/8		
X3/9	1st floor lift lobby Fireman's SW	
X3/10		
X3/11	1st floor lift lobby smoke detector	
X3/12		
X3/13	Temperature signal from BMS	Part of multi-core core cable to BMS (see below)
X3/14		
X3/15 to X3/22	nc	
X4/1	Ground floor lift lobby lower smoke damper in wall	
X4/2		
X4/3		
X4/4	Ground floor lift lobby upper smoke damper in riser ceiling	
X4/5		
X4/6		
X4/7	1st floor lift lobby upper smoke damper	
X4/8		
X4/9		
X4/10	1st floor lift lobby lower smoke damper	
X4/11		
X4/12		
X4/13 to X4/20	nc	
X5/1	Outputs to BMS	Multi-core cable to the BMS
X5/2		
X5/3		
X5/4		
X5/5		
X5/6		

Terminal	Function	Comments
X5/7		
X5/8		
X5/9		
X5/10		
X5/11		
X5/12		
X7/1	Ground	
X7/2	24v to HMI	
X7/3		
X7/4	COMMS to HMI	1 cable
X7/5		
X7/6	SG	
X7/7	Fireman's Override Switch at HMI	
X7/8		
X8/1	Inverter Panel1 X8/1	
X8/2	Inverter Panel1 X8/2	
X8/3	Inverter Panel1 X8/3	
X8/4	nc	
X8/5	nc	
X8/6	nc	
X8/7	O/S 1 S2/1	MODBUS to O/S 1
X8/8	O/S 1 S2/2	
X8/9	O/S 1 S2/3	
X8/10	Internally linked to X8/7	MODBUS to Inverter Panel1
X8/11	Internally linked to X8/8	
X8/12		
S4/1	Ground floor lift lobby smoke detector 24V supply	Same 4-core cable as detector
S4/2		
S4/3	nc	
S4/4	1st floor lift lobby smoke detector 24V supply	Same 4-core cable as detector
S4/5		
S4/6	nc	
Note: The fireman's override switch is labelled Auto / ON on the front panel of the HMI unit to the right of the touch screen. The HMI unit had been removed from its panel prior to BRE's site visit but a photograph of the unit before it was removed is shown in Figure 4.		

nc = no wire connected

Figure 4: HMI panel, incorporating touch screen and Fireman's Override Switch

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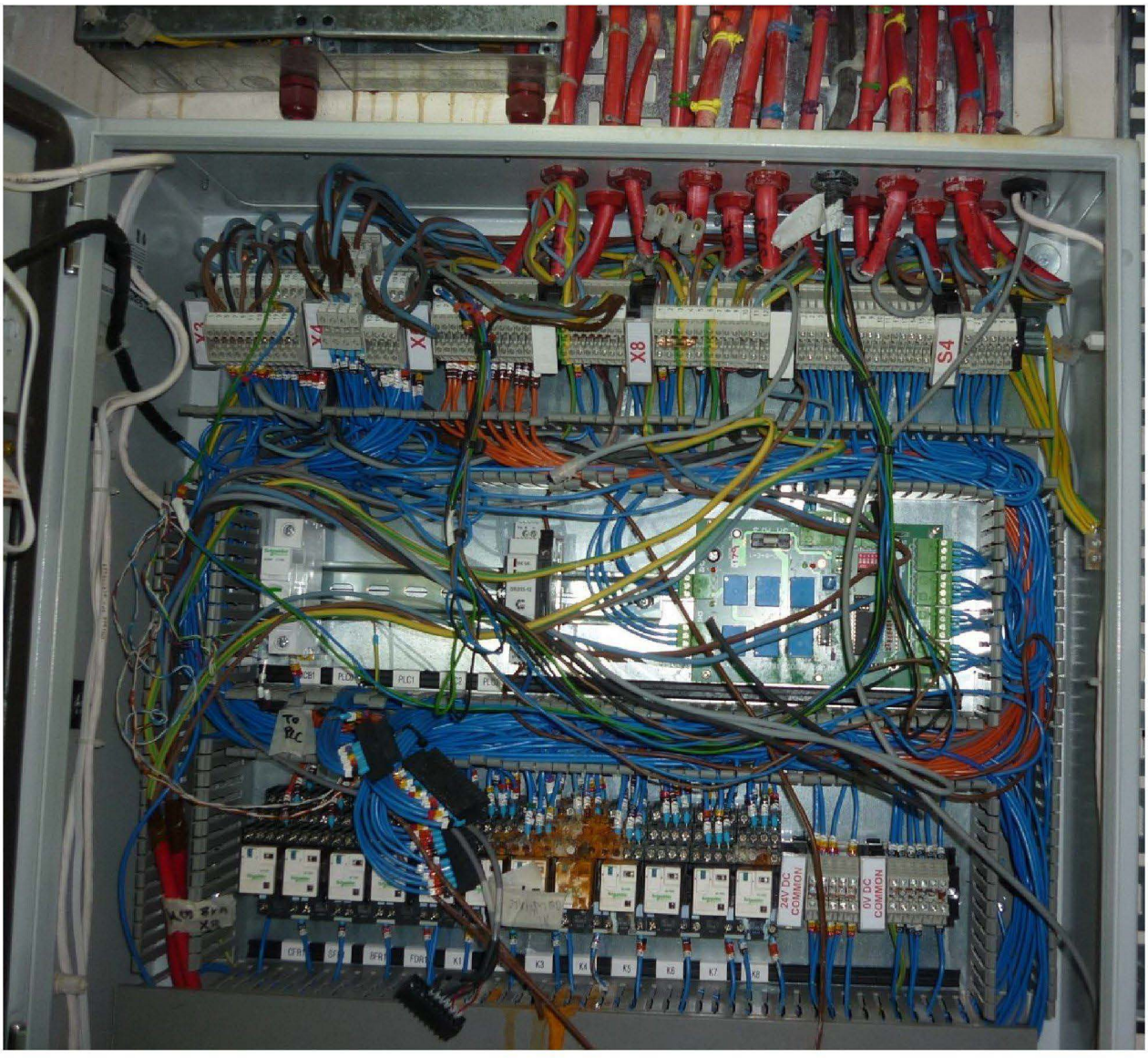

Figure 5: Master Panel with cable ties attached with PLC removed

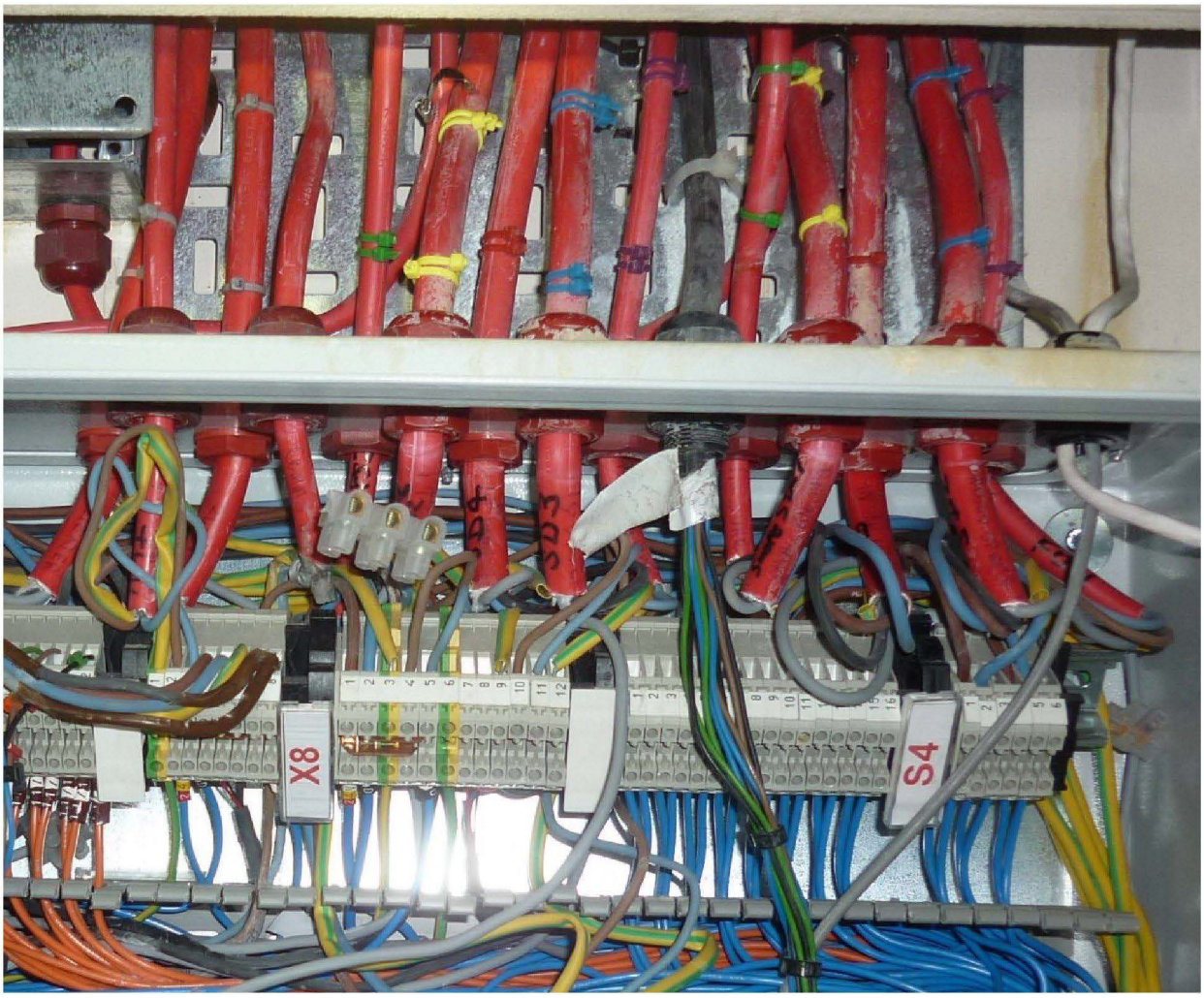

Figure 6: Master Panel – detail of top right cables

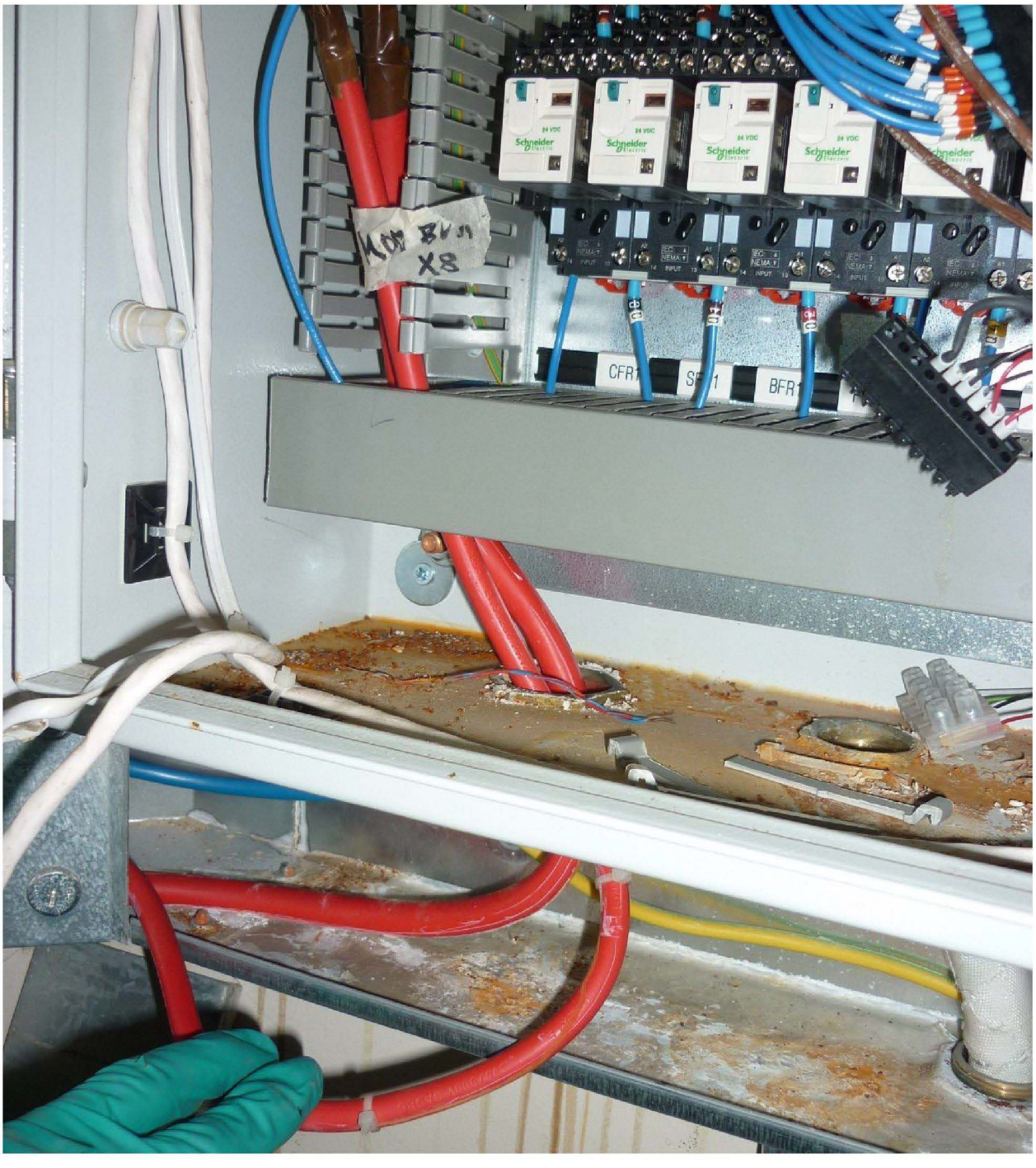

Figure 7: Master Panel – detail of bottom left cables

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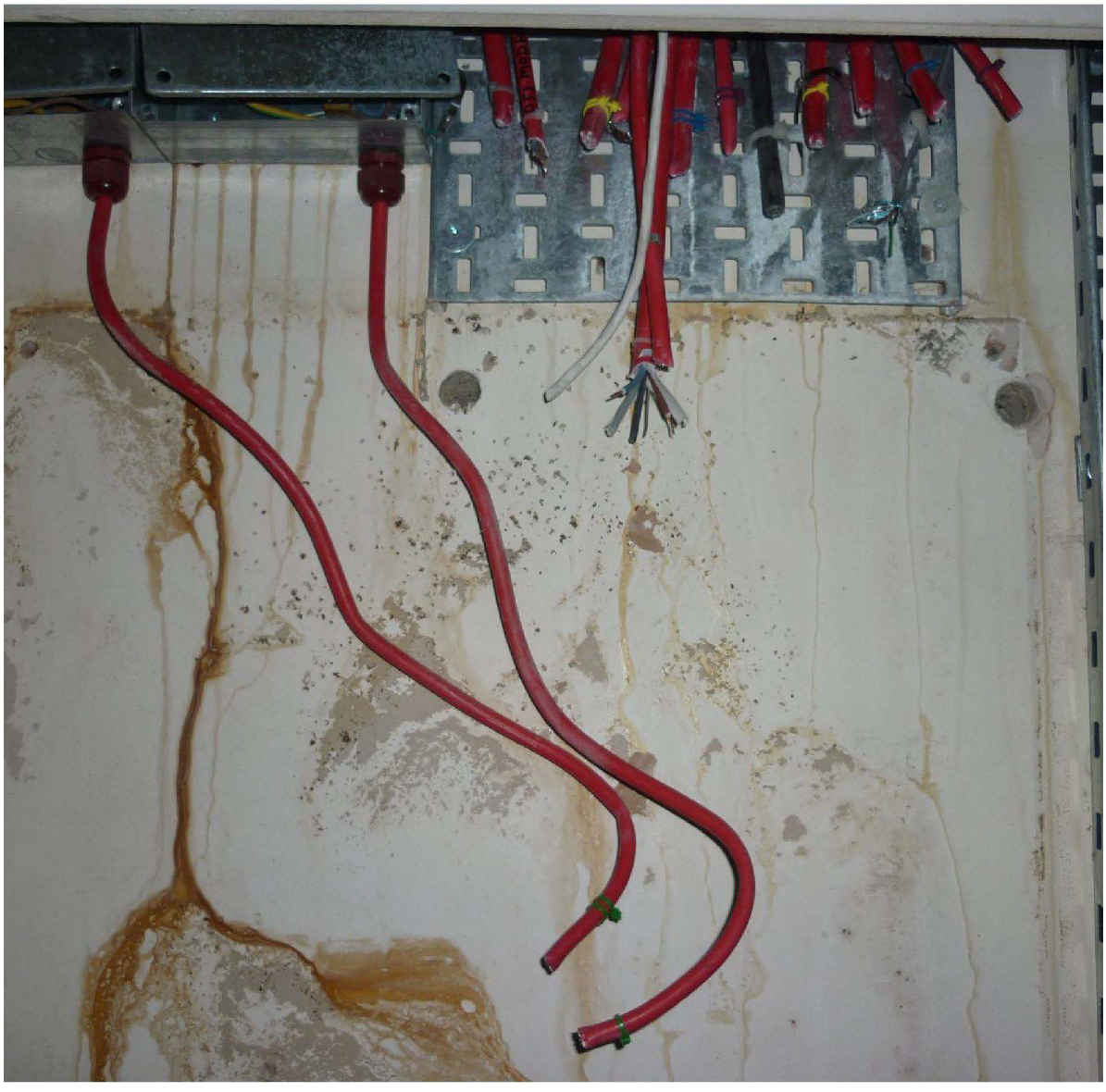

Figure 8: Master Panel cables after panel removed

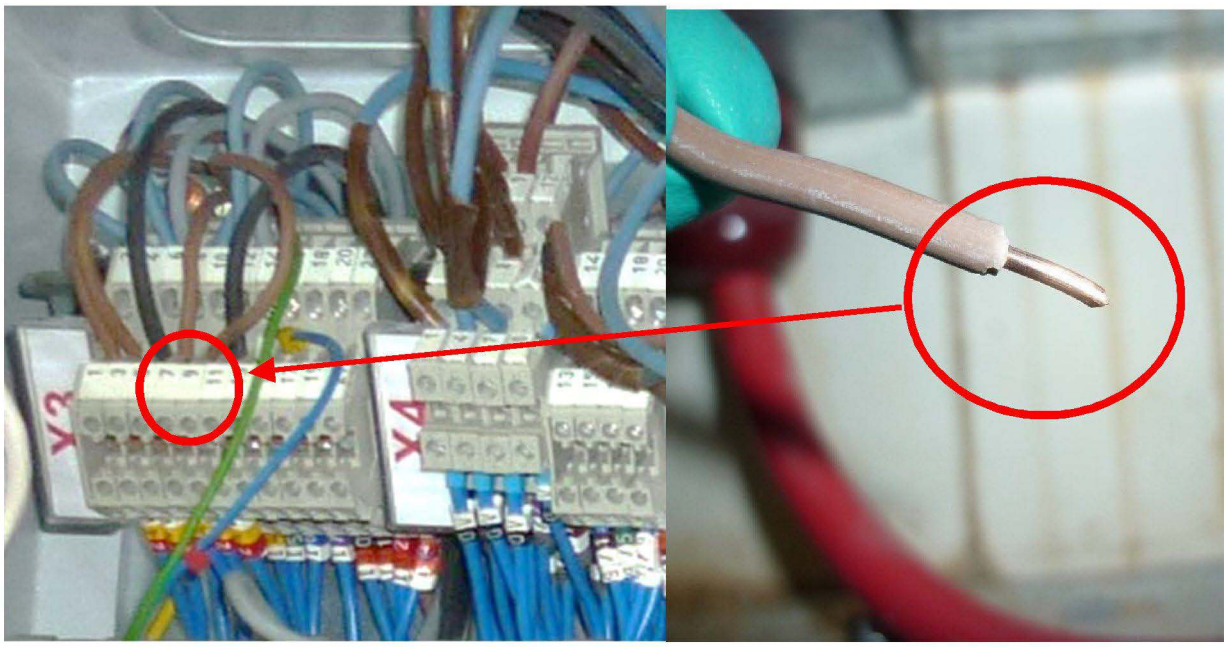

Figure 9: Master Panel - Unsecured wire in Terminal X3/7 failed continuity test

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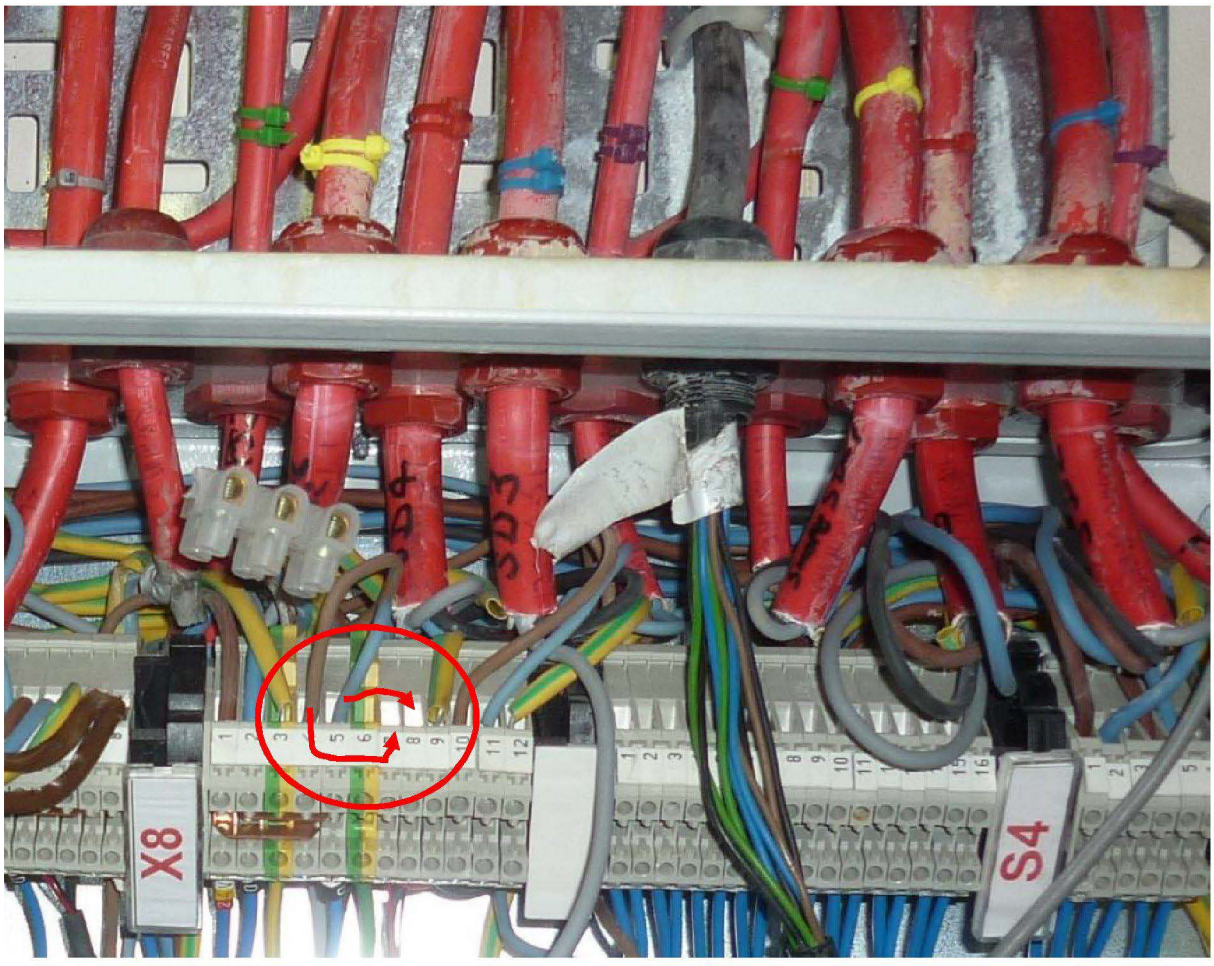

Figure 10: Master Panel - Details of error made when reinstating wires after continuity test

2.5 Outstation external wiring connections

The external cables from each outstation (O/S) were tagged according to the cable tie colour code in **Table 4**.

Outstation 1 (O/S 1) has more connected devices than all of the other outstations since it also controls the window smoke vents (AOVs) in the Boxing Club and Community Room as well as the 2nd floor lift lobby smoke extract dampers. Table 6 shows the function of the devices connected to the wiring terminals in Outstation O/S 1. A photograph of Outstation O/S 1 is also shown in Figure 11. Note that the lift lobby smoke dampers are 3-wire devices whereas the window smoke AOVs in the Community Room and Boxing Club are 2-wire devices. Table 6 is based on the PSB Wiring Tables but with confirmation and additional information from BRE's visual inspection.

Table 7 shows the function of the devices connected to the wiring terminals in Outstation O/S 8 which is similar to all outstations O/S 2 to O/S 22. Basically, each outstation is connected to components within its floor such as detector, fireman's switch, pressure switch, etc. The Modbus RS-485 is connected to the outstation of the floor below and the outstation at the floor above. Table 7 is based on the PSB Wiring Tables but with confirmation and additional information from BRE's visual inspection.

The wires to the two sets of lift lobby smoke extract dampers are connected to the same O/S terminals (S4/1, S4/2 and S4/3) and therefore both dampers (north and south) operate simultaneously.

The cable to each detector is a 4 core cable, 2 cores supply 24Volts to the detector, and the other 2 cores are for the signal from the detector relay base when the detector is activated, see Figure 12.

The following photos (Figure 13, Figure 14 and Figure 15) show the sequence of steps in the removal of O/S 8 on the 7th floor and its accompanying battery backup panel.

Table 6: Cable connections to Outstation O/S 1

Terminal	Function of connected devices	Comments
S1/1	24v from Battery backup	
S1/2		
S1/3	'Network Output' cable	
S1/4		
S2/1	MODBUS from Master panel	
S2/2		
S2/3		
S2/4	MODBUS to OS2	
S2/5		
S2/6		
S3/1	2nd floor lobby PS	
S3/2		
S3/3	2nd floor lobby Fireman's SW	
S3/4		
S3/5	2nd floor lobby smoke detector	Same cable as detector 24V supply at S4/4, 5
S3/6		
S3/7 to S3/16	nc	
S3/17	Community lobby Firemans SW	
S3/18		
S3/19	Community lobby smoke detector	Same cable as detector 24V supply at S4/10, 11
S3/20		
S3/21 to S3/32	nc	
S3/33	Boxing club Fireman's SW	
S3/34		
S3/35	Boxing club smoke detector	Same cable as detector 24V supply at S4/16, 17
S3/36		
S3/37 to S3/48	nc	
S4/1	2nd floor lobby dampers	3 wire cable Both dampers operate simultaneously
S4/2		
S4/3		
S4/4	2nd floor lobby smoke detector	Same cable as detector to S3/5, 6

Terminal	Function of connected devices	Comments
S4/5		
S4/6	nc	
S4/7	Community room window AOV	
S4/8		
S4/9	nc	
S4/10	Community room smoke detector	Same cable as detector to S3/19, 20
S4/11		
S4/12	nc	
S4/13	Boxing club lobby window AOV	
S4/14		
S4/15	nc	
S4/16	Boxing lobby smoke detector	Same cable as detector to S3/35, 36
S4/17		
S4/18	nc	

nc = no wire connected to terminal

Table 7: Cable connections to Outstation O/S 8 (similar to Outstations O/S 2 to O/S 22)

Terminal	Function	Comments
S1/1	24v from Battery backup	
S1/2		
S1/3	'Network Output' cable	
S1/4		
S2/1	MODBUS from O/S 7	
S2/2		
S2/3		
S2/4	MODBUS to O/S 9	
S2/5		
S2/6		
S3/1	Lift lobby PS	
S3/2		
S3/3	Lift lobby Fireman's SW	
S3/4		
S3/5	Lift lobby smoke detector	Same cable as detector 24V supply at S4/4, 5
S3/6		
S3/7	Signal from Battery Backup Panel	Only used in O/S panels with adjacent Battery Backup Panel
S3/8		
S3/9 to S3/16	nc	
S4/1	2nd floor lobby dampers	3 wire cable Both dampers operate simultaneously
S4/2		
S4/3		
S4/4	2nd floor lobby smoke detector	Same cable as detector to S3/5, 6
S4/5		
S4/6	nc	

nc = no wire connected

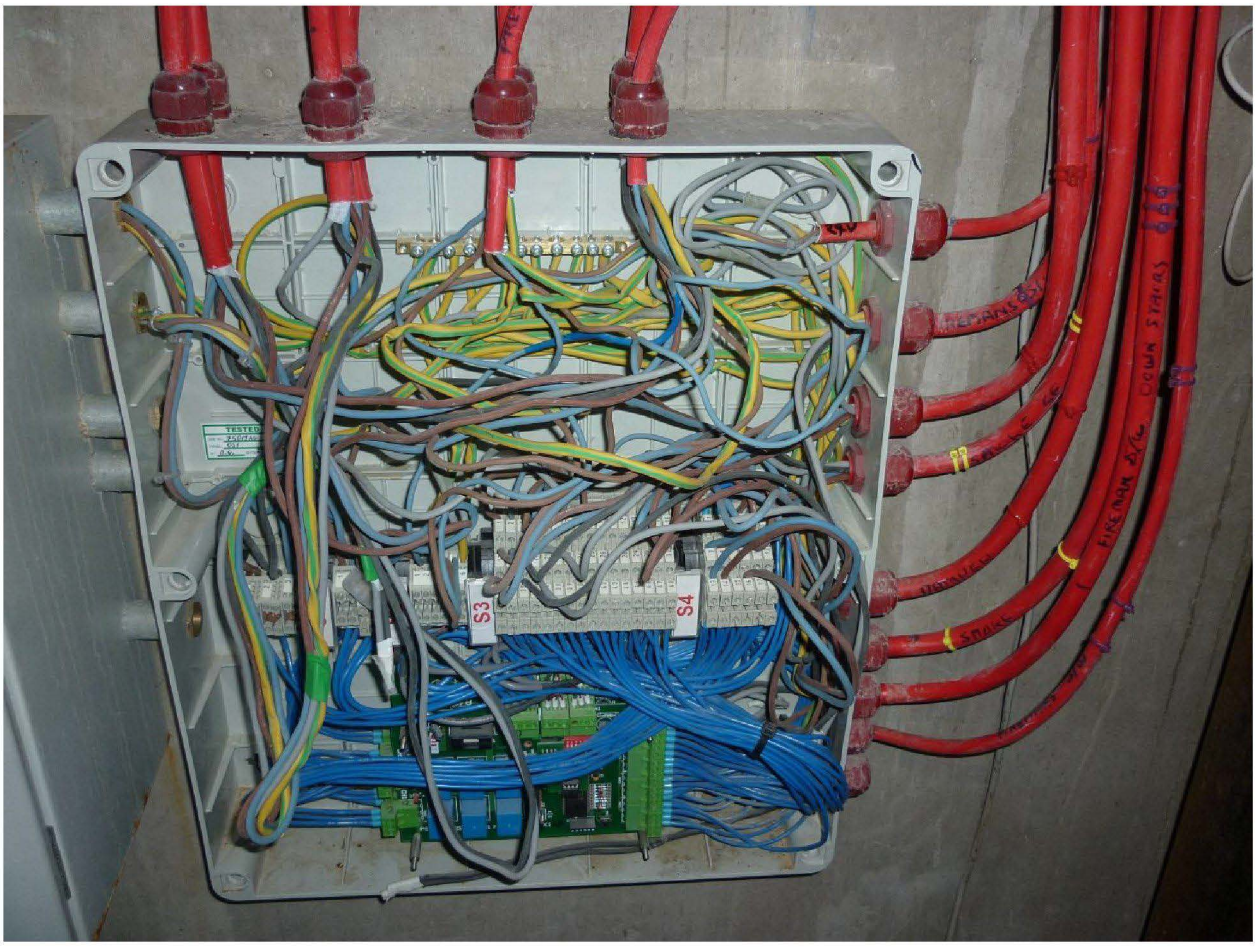

Figure 11: Outstation O/S 1

Figure 12: Typical smoke detector and relay base

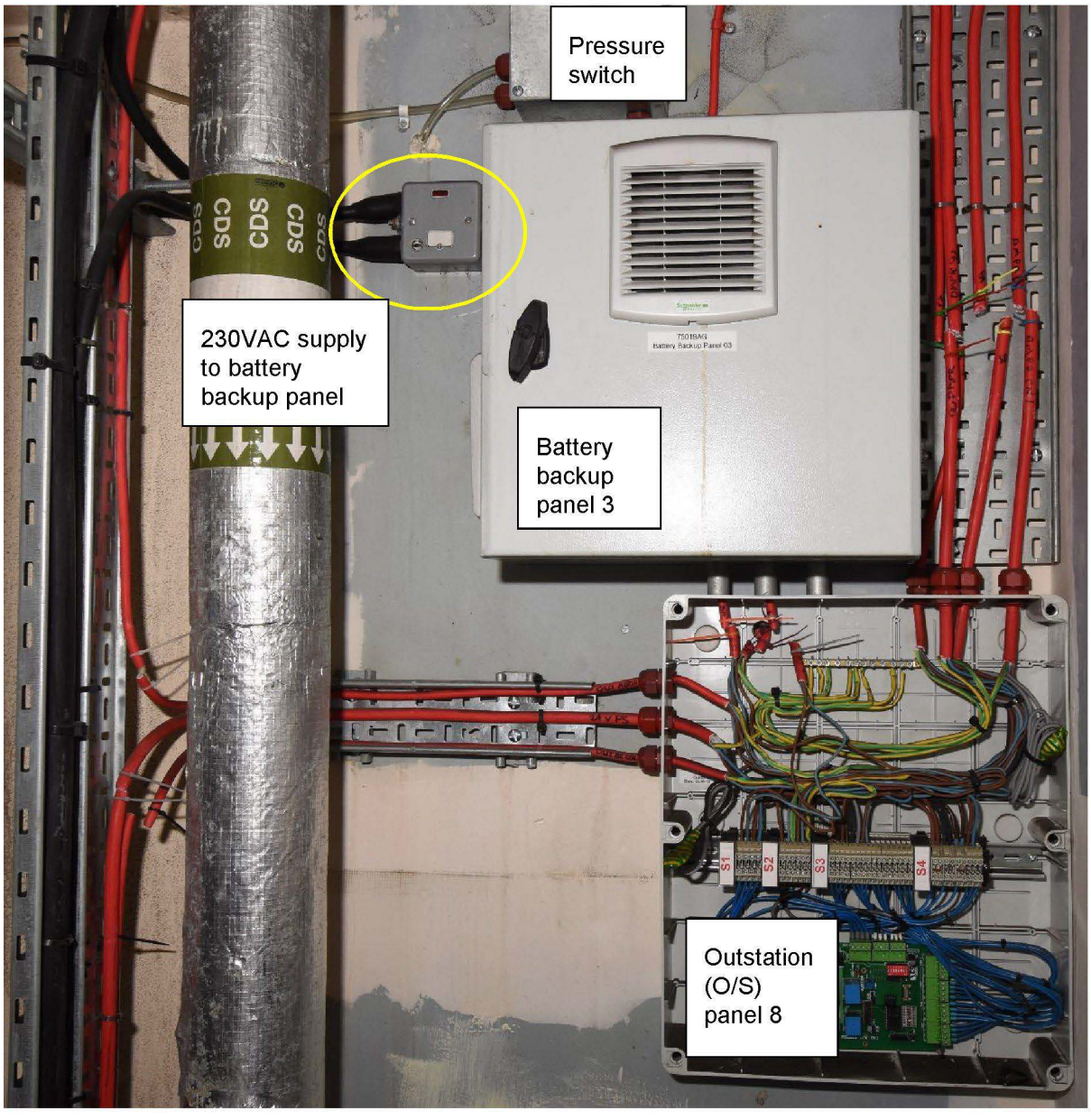

Figure 13: Cables to external devices from Outstation O/S 8 tagged and cut prior to removal of Outstation O/S panel

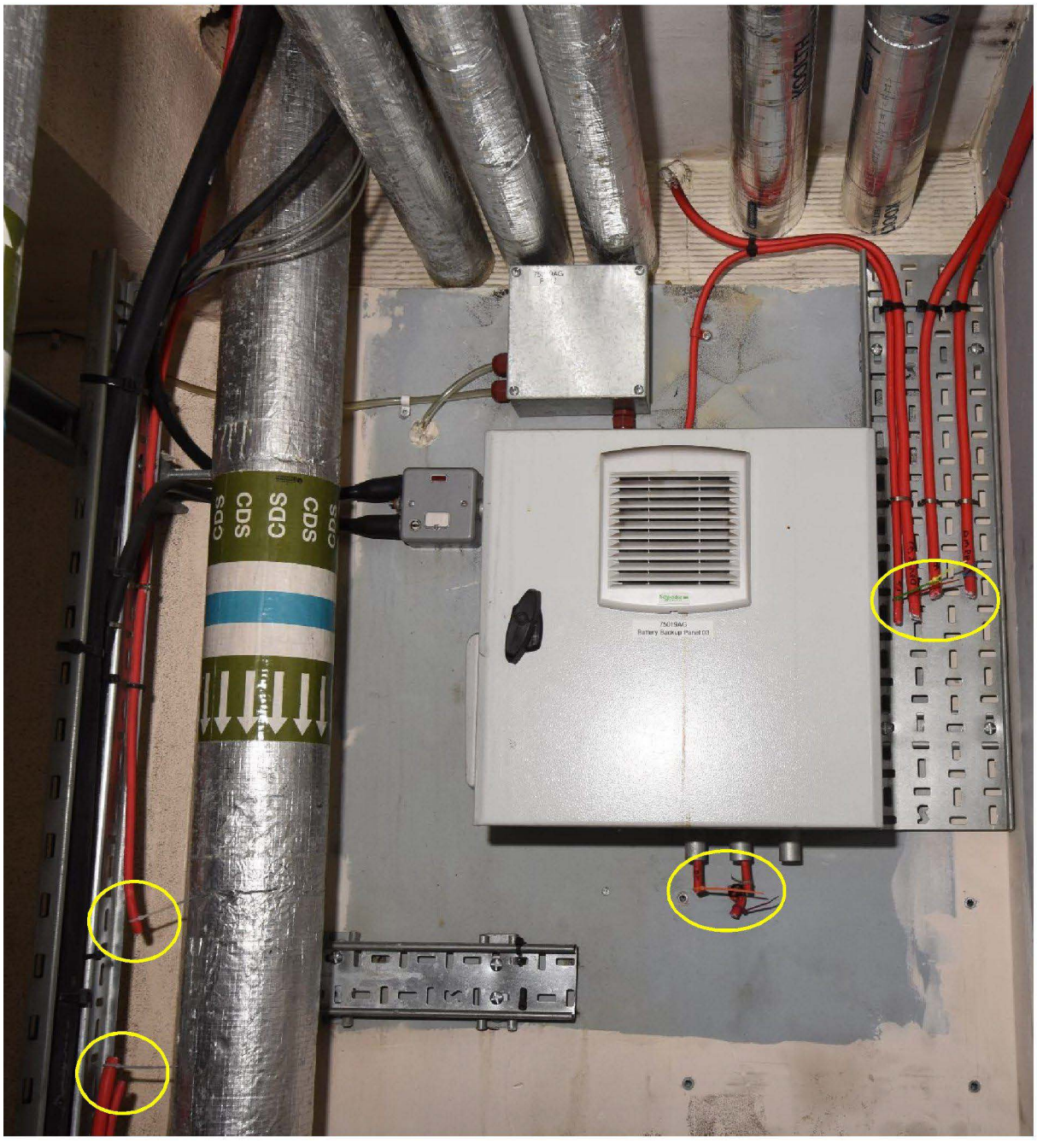

Figure 14: Outstation O/S 8 removed leaving behind cut cables to external devices

Figure 15: Outstation O/S 8 panel and Battery Backup Panel 03 removed

2.6 Connection between lift controller and smoke detection system

BRE was specifically requested to investigate whether there was a connection between the smoke detection system and the lift controller.

The lift controller had been installed in the lift motor room and had been removed prior to BRE's site inspections in February 2019. However, the metal trunking that contained cables and individual wires to this controller was still in place.

The lift motor room had a fire detector attached to the ceiling, a manual call point close to the entrance door and a sounder/beacon on the wall close to the location of an 'Auxillary Relay Unit' mounting back box (see Figure 16 and Figure 17). The Auxillary Relay Unit had been removed as a Police Exhibit but its

mounting back box and fixed wiring was still in place. A photograph of the Auxillary Relay Unit (inspected by BRE at MPS Wimbledon) is shown in Figure 18.

Figure 18 shows a black wire and a brown wire connected to the 1NO and 1C relay contacts. These wires were traced visually and by an electrical continuity tester from the auxiliary relay mounting back box (auxiliary unit removed) to the black and brown wires in the metal trunking cut close to where the trunking would have met the lift controller panel (See Figure 19).

Figure 18 shows 2 pairs of wires (24V DC+ brown and grey / 24V DC - black and blue) connected to the 24V coil of the Auxillary Relay Unit. These wires were part of a 4 core cable which was traced from the Auxillary Relay Unit mounting back box to the sounder/beacon located on the same section of wall. The connections at the base to the sounder/beacon are shown in Figure 20. The brown and blue wires from the Auxillary Relay Unit mounting back box are seen to pass into and out of the sounder / beacon. The brown and blue wires coming out of the sounder / beacon are part of a second 4 core cable that passes through the wall from the lift motor room to the next-door plant room (containing large water tanks). The black and grey wires bypass the sounder / beacon and are joined to the second cable that carries the brown and blue wires from the sounder / beacon. Electrical continuity testing confirmed that the sounder / beacon was connected to the to the Auxillary Relay Unit coil (brown and blue wires). Therefore, energisation of the Auxillary Relay Unit would also cause the sounder / beacon to operate.

The 3 cables from the lift motor room sounder / beacon, detector and manual call point passed through the wall to the next-door plant room containing large water tanks (see Figure 21). Tracing these cables to the adjoining plant room showed one cable descended down the wall and 2 of 2-core cables entered a wiring junction box mounted on the wall. A 2-core cable exited the bottom of the wiring junction box and ran down the wall alongside a second cable that ran directly from the lift motor room. Electrical continuity testing confirmed that the cable running directly from the lift motor room was the 4-core cable that was connected to the Auxillary Relay Unit and the sounder / beacon in the lift motor room.

The two cables (one 2-core cable from the junction box, one 4-core cable from Auxillary Relay Unit via sounder/beacon) (See Figure 21 and Figure 22) were traced visually and appeared to pass through the floor to the 23rd floor below. The cables were traced visually from the 23rd floor down each floor until the ground floor riser (see Figure 23). These cables were traced physically from the ground floor riser to the plant room by physically pulling them upwards and removing in sections on a floor by floor basis.

Both these cables terminated unconnected inside the ground floor riser, with straight cut ends (no protection from unintended electrical connection), see SOCO photographs. There was also a third unconnected cable. None of these cables were labelled.

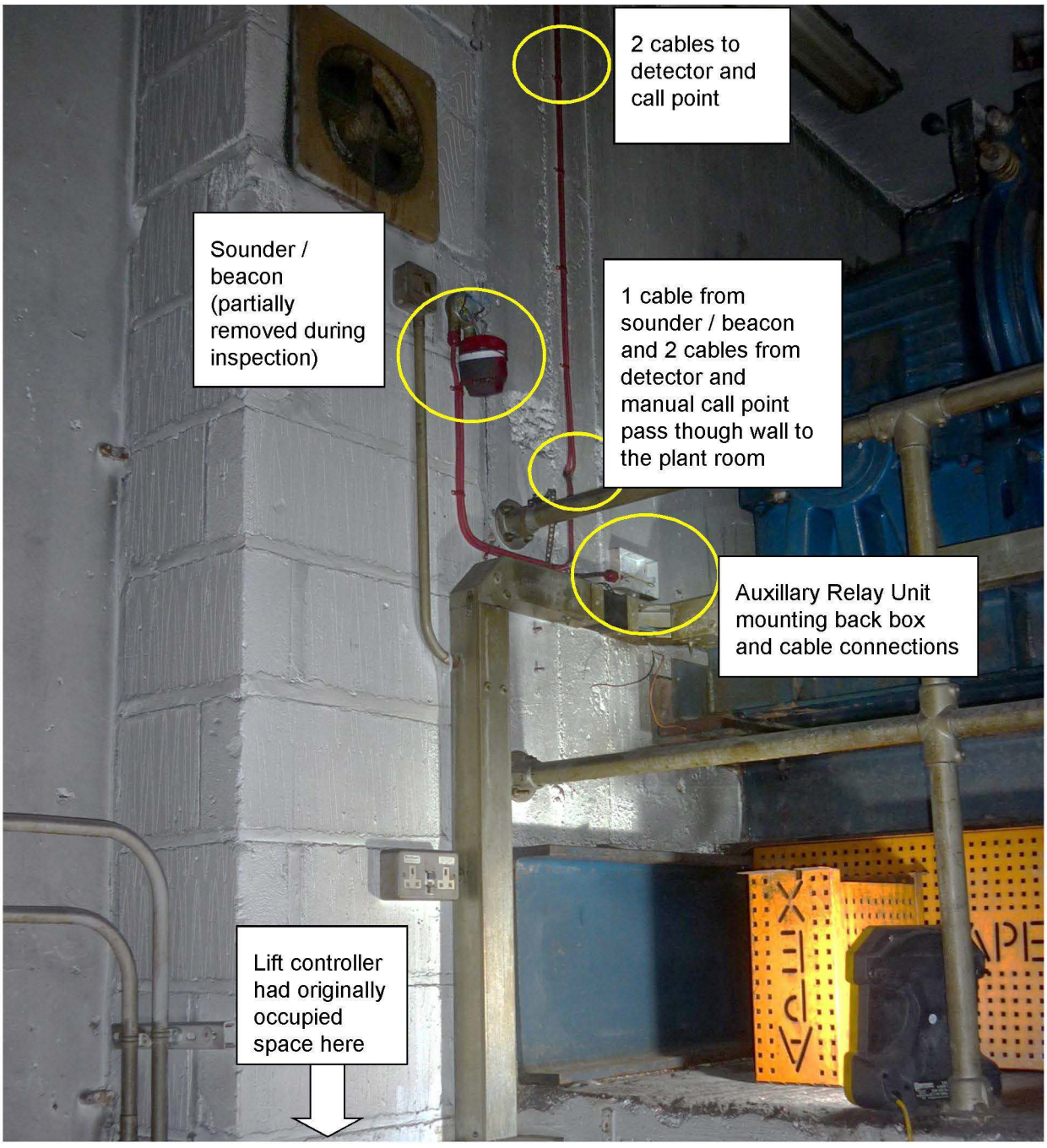

Figure 16: Cables, sounder / beacon and Auxillary Relay Unit mounting back box adjacent to position of lift controller

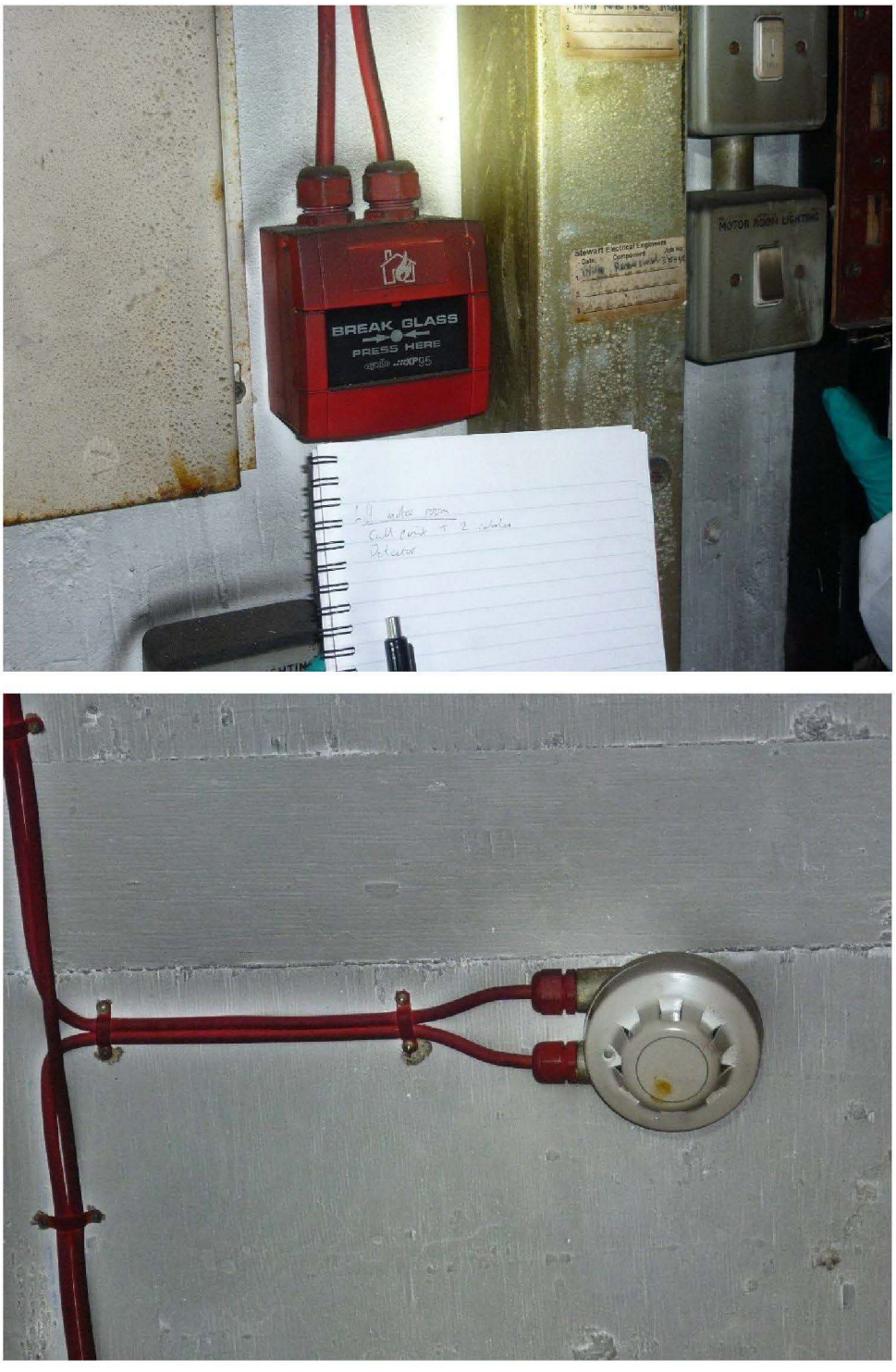

Figure 17: Manual call point and smoke detector in lift motor room

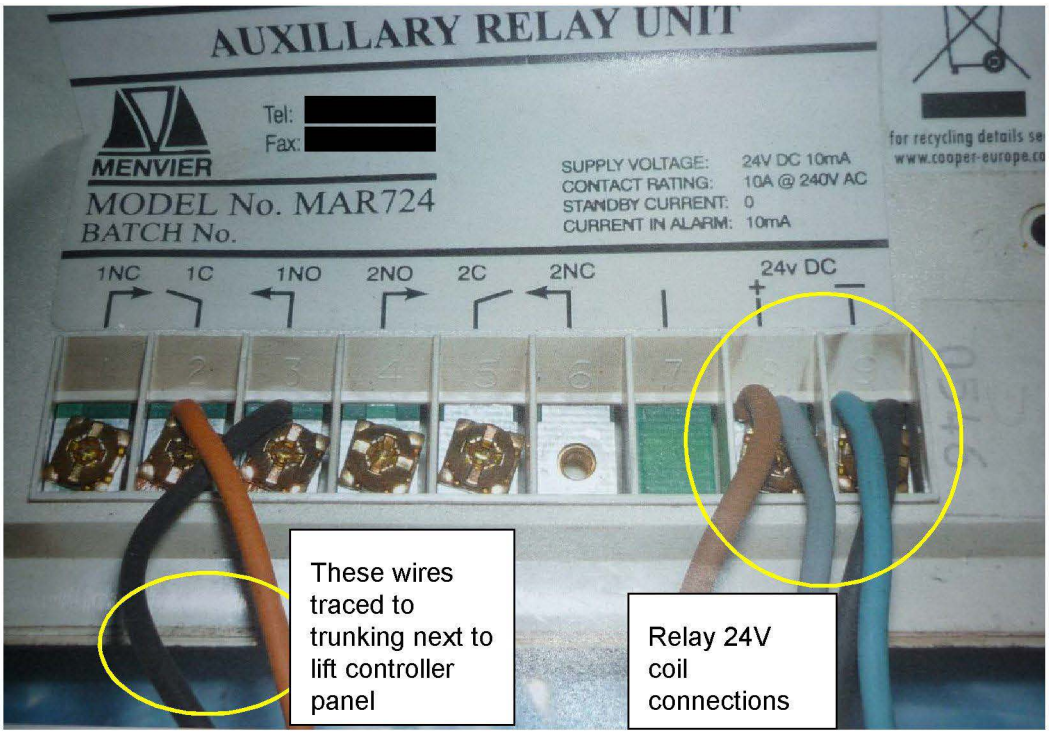

Figure 18: Auxillary Relay Unit

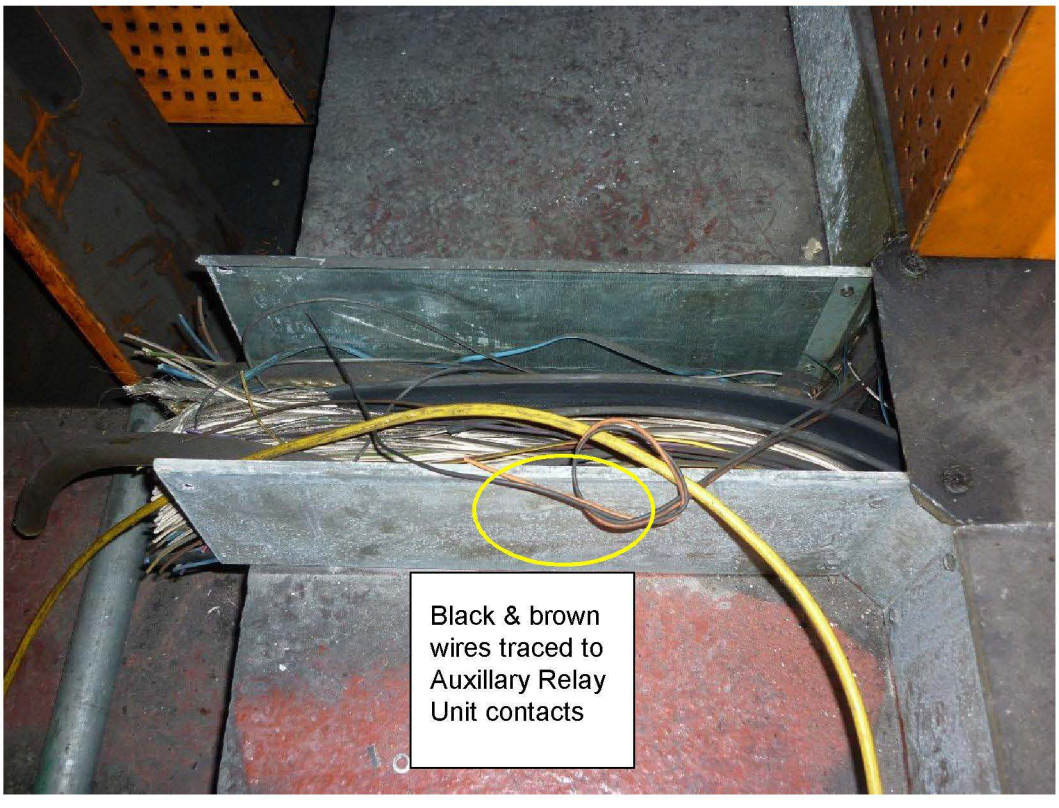

Figure 19: Metal trunking containing cables and wires to lift controller

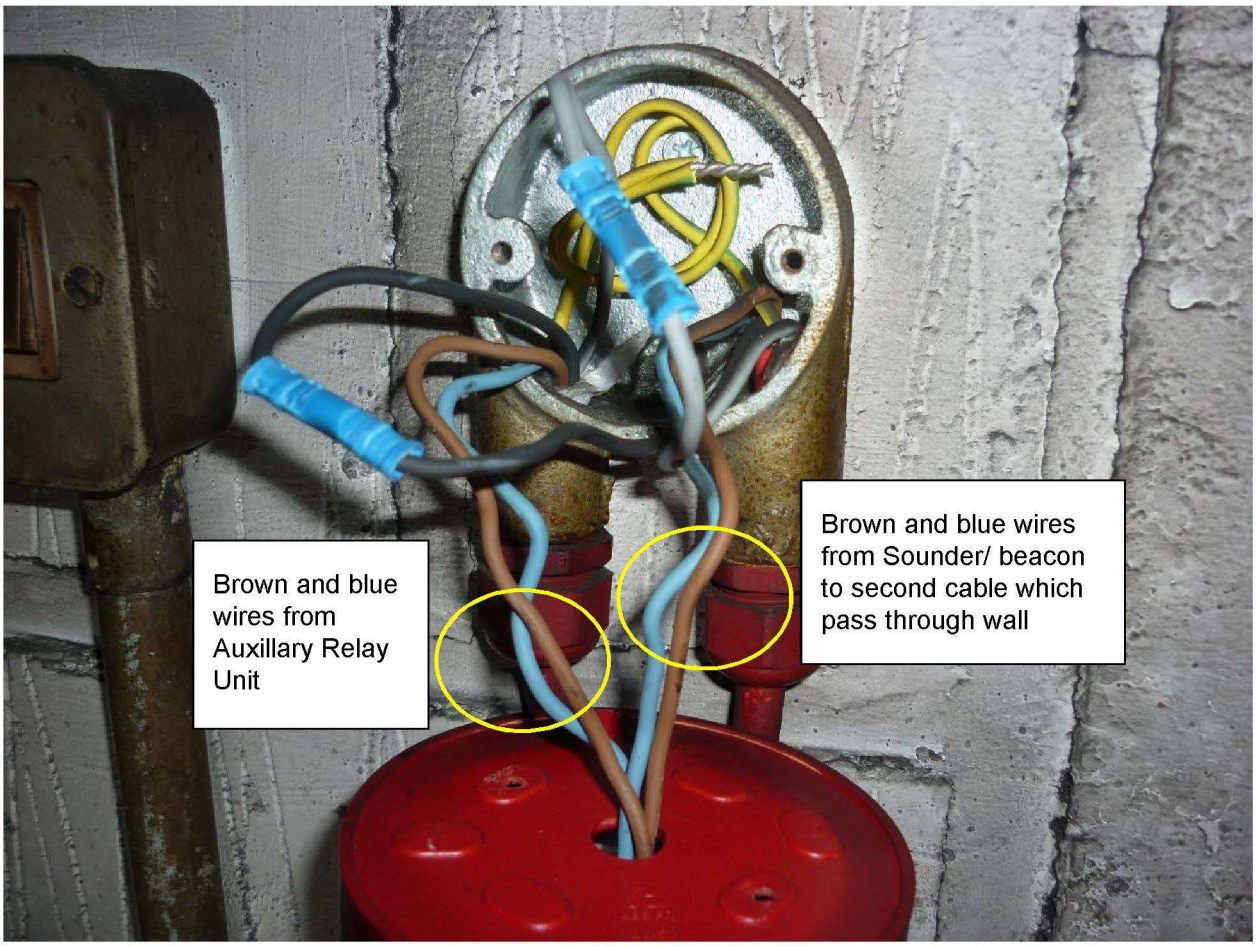

Figure 20: Cable connections at base of sounder / beacon in lift motor room

Note: Left hand side, 4-core cable from Auxillary Relay Unit. Right hand side, 4-core cable passes through wall to next-door plant room

Figure 21: Wiring junction box on wall in water tank room next to lift motor room, showing 3 cables from lift motor room

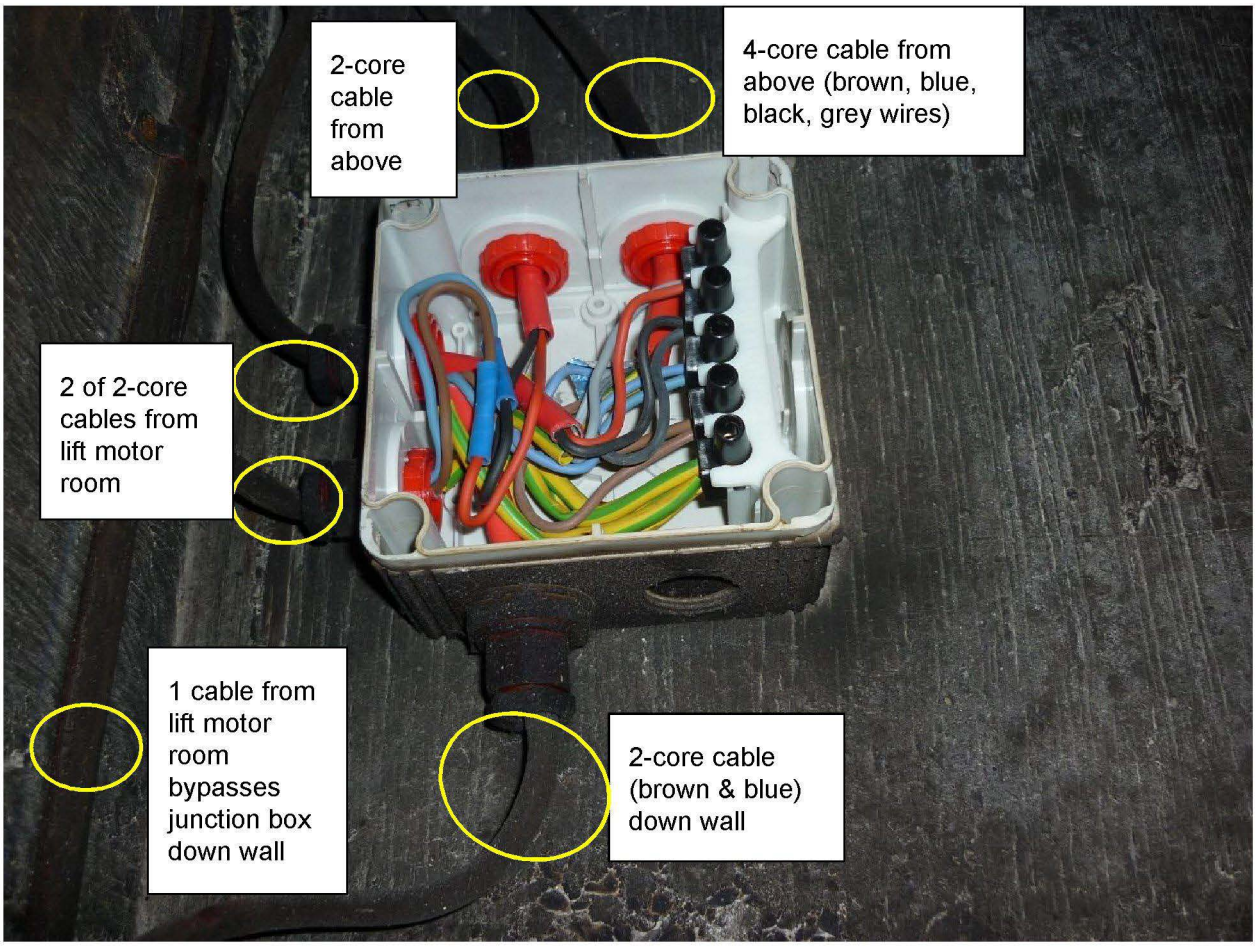

Figure 22: Wiring junction box

Figure 23: Cables from Lift Motor Room descended the building floor, labelled Relay Coil and Detector

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2.7 Smoke extract and environmental fan dampers above entrance lobby

There were four dampers in the smoke extract and environmental supply ductwork in the ceiling above the entrance lobby as listed below and shown in **Figure 24**. All of the dampers were three wire devices. 24Volts powered to open and 24Volts powered to close.

- Ground floor entrance lobby smoke extract fan inlet and outlet dampers (one 3-wire 24volt output)
- Ground floor entrance lobby environmental fan inlet and outlet dampers (one 3-wire 24volt output)

The 24volt damper control cables from Inverter Panel 1 to the smoke extract and environmental fresh air supply fan dampers were traced.

It was confirmed that the Environmental Fan inlet and outlet dampers were both connected by cable to a single set of terminals in a wiring junction box to a cable from Inverter Panel 1. This confirms that the intended operation was for both dampers to operate simultaneously.

The Smoke Extract Fan inlet damper was confirmed to be connected to a cable from Inverter Panel 1 but the Smoke Extract Fan outlet damper was NOT connected inside the wiring junction box (see SOCO photographs). It was therefore presumed that it was intended for the Smoke Extract Fan outlet damper to be permanently open. Note that the Smoke Extract Fan outlet damper was open but the other three dampers were closed, when inspected by BRE in July 2017

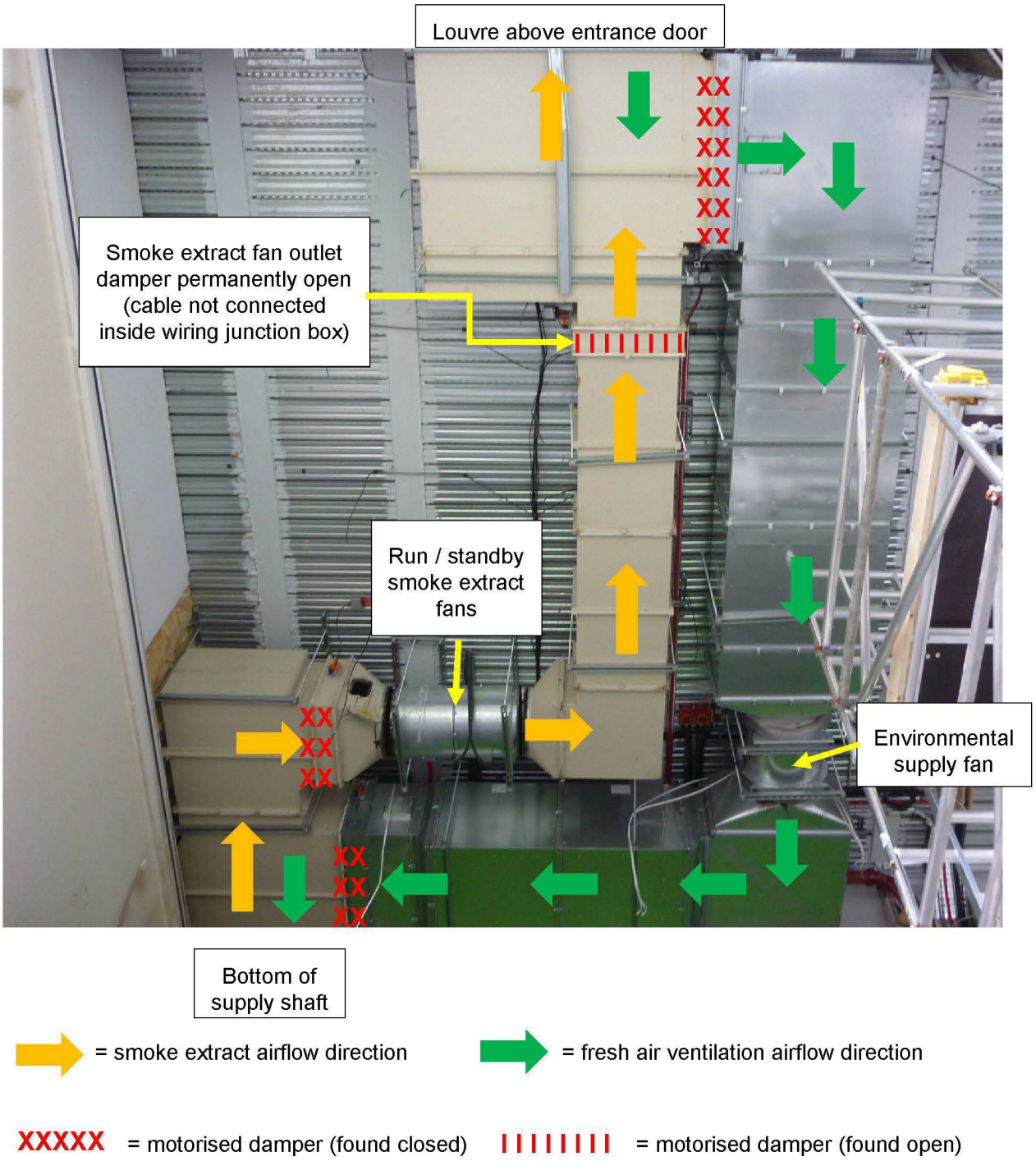

Figure 24: Smoke extract and environmental supply ductwork above entrance lobby

(As found damper (July 2017) open/close status indicated)

Conclusion and recommendations

The work to meet the Metropolitan police objectives was stopped, therefore no results or conclusion can be reported. However, this report could assist in the reconstruction of the smoke detection system in order to meet the Metropolitan police objectives.

References

Documents referred to the report

‘75019AG Boards Assignment rev02.pdf’ (file dated 12/2/16) – this file contains the PSB Wiring Tables

PSB Smoke Ventilation System Electric Schematic, Contract 75015, Drawing 800, Revision E

Glossary of Terms used in report

AOV – Automatic Opening Vent

BMS – Building Management System

I/O _ Input/Output

MPS – Metropolitan Police Services

SOCO – Scenes Of Crime Officer

SW – Switch