IN THE GRENFELL TOWER PUBLIC INQUIRY
THE INQUIRY RULES 2006, RULE 9

WITNESS STATEMENT OF
GRANVILLE PARTLOW

I, **GRANVILLE PARTLOW** will say as follows:

1. My name is Granville Partlow. I am now the Commissioning and Sales Manager at PSB UK Limited ("PSB"), a Core Participant at the Public Inquiry ("the Inquiry"). I make this statement in that capacity. I am authorised by PSB to do so. This statement is provided in response to a Rule 9 letter from the Inquiry directed to PSB, dated 5 June 2018. The matters contained in this statement are from my own knowledge or are matters of information or belief. The source of any matter of information or belief is identified where relevant.

2. PSB is one of the companies in the Witt UK Group. PSB is based at Witt House, Shelf Mills, Wade House Road, Shelf, Halifax, West Yorkshire, HX3 7BJ.

3. PSB designed and, after its installation by others, subsequently commissioned, the Smoke Control System (the "System") at Grenfell Tower as part of the re-generation works.

4. I commissioned the System at Grenfell Tower between February and April 2016. In 2016 I was the Group Service and Engineering Manager at PSB and was employed in that role at the time of the Grenfell Tower fire on 14th June 2017.

5. The purpose of this statement is to explain the involvement that PSB had in commissioning the System installed at Grenfell Tower and to assist the investigation being undertaken by the Inquiry.

Background and Qualifications

6. I am a qualified Electrician and Electrical Engineer. Over the last forty years, I have worked in various industries including mines and quarries, metal fabrication, plastics and the chemicals industry. I have held positions as an Electrical Engineer and Commissioning Engineer (both electrical and mechanical) as well as several managerial roles.

7. I hold the following qualifications:
   - City and Guilds Electrician's Certificate from Doncaster Technology College
   - City and Guilds Certificated in the Requirements for Electrical Installations (17th Edition) from Doncaster Technology College
   - City and Guilds Diploma in Advanced Pneumatic Systems from Doncaster Technology College
   - City and Guilds Diploma in Advanced Hydraulic Systems from Doncaster Technology College
   - IIM Certificate and NVQ Level 4 in Operations and Production Management from Doncaster Technology College
   - IIM Certificate and NVQ Level 5 in Operations and Production Management from Doncaster Technology College

8. I also have experience of using AutoCAD and PLC Ladder programming. Over the years I have attended extended courses on MRP Manufacturing Software, Five S (Workplace Organisation), Investors in People and team building. I hold various safety cards including CSCS, Skills and SSCS. I am also a member of the British Institute of Managers.

9. I started working for what is now the Witt UK Group in 2005. Witt UK Group is made up of four companies; PSB, Witt and Son UK Ltd., Witt & Son Properties Ltd., and Witt and Son UK Holdings Ltd. Initially, I was employed as a Works Engineer. I have been commissioning and servicing Smoke Control Systems since about 2006.

10. Prior to working for Witt UK Group (between 2001 and 2005), I was an Industrial Engineer for Bradbury Group where I was responsible for, amongst other things, modernizing production lines in their factories. Before that I spent 14 years in the plastics industry working in a variety of roles including an Electrical Engineer, Maintenance Manager and Production Manager.

My Role as Group Service and Engineering Manager

11. In my role as Group Service and Engineering Manager (my position in 2016 when I commissioned the System) I was responsible for the day to day running of the service department for all of the companies within the Witt UK Group. Typically, my role involved commissioning and servicing a variety of products that were designed and installed by one of the companies in the Witt UK Group or by another company. The products I commissioned and serviced included all forms of smoke ventilation, extraction and control systems.

My Role as Commissioning and Sales Manager

12. More recently, my role has changed slightly and I am now more involved in sales of Witt UK Group products, although I still oversee commissioning and servicing and regularly carry out commissioning and servicing of systems.

Commissioning the Smoke Control System at Grenfell Tower

When Commissioning Took Place and Who Attended

13. I attended Grenfell Tower on the following dates to commission the System:

- Wednesday 3rd to Friday 5th February 2016 [3 days]
- Monday 8th to Friday 12th February 2016 [5 days]
- Monday 15th to Thursday 18th February 2016 [4 days]
- Monday 14th to Thursday 17th March 2016 [4 days]
- Tuesday 26th to Thursday 28th April 2016 [3 days]

14. Commissioning a smoke control system in a high rise building is a two person job. This is because there are a lot of system components to check and at some stages one person needs to check the system is working on each level of the building while the other is checking that the Human Machine Interface ("HMI") panel (the touch screen panel which allows a

responsible person to monitor, maintain, or override a system) or panels (if the system has more than one), which is in a different location, is functioning as it should. At Grenfell Tower Gary Doyle, a self-employed electrician whom PSB had used for a number of years, helped me with the commissioning of the System.

15. On the last of the above visits, final checks were carried out on the System. Also, at the request of PSB's client, J S Wright, I was asked to be involved in a demonstration of the System conducted in the presence of a number of other persons. To the best of my recollection this included Alan Whyte (J S Wright), representatives of Rydon, two people from the London Fire Brigade, someone from the management company and at least one Building Control Officer.

16. I cannot recall exactly what I did during each visit to Grenfell Tower, but I used the same essential step by step process I always use when commissioning a smoke control system.

Preparations for Commissioning – Documentation and Equipment

17. PSB was instructed to provide commissioning services to J S Wright by way of Purchase Orders dated 21st January 2016 (GP/1: PSB00000140) and 26th January 2016 (GP/2: PSB00000144). I was directed to undertake the commissioning exercise in relation to the System.

18. Before I attended Grenfell Tower the following principal documents were provided to me:

19. A copy of the "PSB Commissioning Method Statement and Risk Assessment 75019AG" dated February 2016 and provided to Alan Whyte of J S Wright on 1st February 2016 (GP/3: PSB00000941).

20. The "PSB E-800 Electrical Schematic Rev. E" which showed where each of the components of the System were located and how they were to be wired together. I would have needed this to help me locate the electrical components of the System which I needed to test when I commissioned the System. The document was used in the first stages of the commissioning process. The "PSB E-800 Electrical Schematic Rev. E" document has been disclosed to the Public Inquiry (GP/4: PSB00000429).

21. The "Panel and Outstation Data for Job Number 75019AG Rev. 02" (GP/5: PSB00001256). The document, which I refer to as the Board Assignment Sheets, explained how the electronic components of the System were designed to work and how they linked together. I used the document to check that the System was installed and wired correctly. The document was used in the first stages of the commissioning process.

22. The "PSB Fans and Damper Operation Cause and Effect Chart" (GP/6: PSB00000232). This document is a spreadsheet which shows how the fans and dampers should operate on each floor when the System is working in smoke control mode and environmental mode. It was used to set up the HMI matrix which determined what happened within the System when smoke was detected on a certain level or the System received a signal from the Building Management System ("BMS") to operate in environmental mode. It follows that the document was used towards the end of the commissioning process.

23. The "Technical Submission" for the Lobby Smoke Control System at Grenfell Tower. Revision 6 of that document was finalised during the commissioning process (GP/7: PSB00000214).

24. I take the following equipment with me when commissioning a system:

    1) A multimeter, used for measuring basic electrical tests, voltage, current, etc.
    2) A calibrated anemometer, used for measuring airflow speed
    3) Basic electrical tools – screwdrivers, pliers, etc.
    4) A set of two way radios, to enable me to communicate with other individual(s) involved in the commissioning process.

Initial Attendance at Grenfell Tower

25. When I got to Grenfell Tower on 3rd February 2016 there were still builders working on the area from ground level to the third level.

26. In particular I remember that the builders were still working on the level where the community room was located. It was around 85-90% complete and that the builders were

doing the final fixes. At walkway level (level 2), the building was more or less finished. Rydon's site office was located there. The lift lobby on ground level was also more or less finished.

27. In relation to work which affected the System, I remember that the builders were in the process of sealing the shafts which had been extended down from level 4 to ground level. Cables were hanging down from the shafts ready to connect the dampers on levels 1 and 3. There were no smoke detectors or fireman's override switches fitted on these levels.

28. The Master Control Panel was wired and finished and the inverter panels for the smoke control fans located in the hub room at ground level and in the roof plant room were complete. All of the fans were installed and the ductwork on level 2 was complete.

29. Levels 4 upwards were completely finished. All of the cupboards built in the lobby areas which housed the outstations, battery backup panels and pressure switches were complete. I remember that all of the painting and finishes were complete on these floors.

30. I recall that the outstation on the original walkway level (level 2) was not finished when I first visited Grenfell Tower, but was completed during my first or second visit. Similarly, I recall that the inverter panel for the environmental fan, which was located in the hub room at ground level was not installed when I first visited Grenfell Tower.

31. Despite the ongoing building work on ground level to level 3 I was able to test all of the smoke control system equipment on levels 4 to 23 and the main controls equipment during the first couple of visits I made to Grenfell Tower.

32. I remember that by the time of my third visit to Grenfell Tower (15th-18th February) the works were complete and I was able to carry out the tests explained below at steps 1, 2 and 3 on the equipment located at ground level up to level 3 but not on level 2, as this was finished later.

33. I will now explain the step by step process that I used to commission the System.

The Commissioning Process – Step by Step

Step 1 – Dead testing of the electrical cabling

34. First, I carried out dead testing of the electrical cabling connected to the outstations and the components themselves (the pressure switches, fireman's override switches, battery backup panels, etc.) on each floor to make sure there were no electrical faults. I used a multimeter to do this.

35. At Grenfell Tower I recall that I tested that the two cables that ran to the next floor were the correct cables. One cable was to provide the 24v power supply and one was the communications cable which required a Modbus power supply. Modbus is the electronic communication system used in the System. I checked to make sure the correct cables were making the correct connections. To carry out the test I stayed on one level and Gary Doyle would go up or down one level so that we could check the connections between the two levels. We worked our way up the building, checking each level.

Step 2 – Identification of each component and checking it was wired correctly

36. The next step was to identify each piece of equipment, on each level and check that it was wired correctly. I used the Board Assignment Sheets (GP/5: PSB00001256) to check what would be connected to what. The aim of the exercise was to check, for example, that if I activated the output on the outstation for the dampers, the dampers actually activated.

37. At this stage, at Grenfell Tower, I carried out the following tests on the equipment:

Fireman's Override Switch

38. I operated the fireman's override switch using the key to check that it would work mechanically. I also checked to make sure it was connected into the correct connector on the outstation.

Pressure Switch

39. I checked that the pressure switch was mounted in the correct area in the staircase and lobby and that it activated if the air resistance changed (I did this by sucking air through a piece of plastic pipe which I attached to the static tube which formed part of the pressure switch). I checked to make sure it was connected into the correct connector on the outstation. I also set the pressure switch to 25 Pa at this stage.

40. This would be revisited when the system was powered up and I was looking to ensure the primary performance criteria for the System were met as per the design. Essentially this means ensuring that affected doors could be opened easily when the System was operating (a door opening force of less than 100N), and that air flow from the protected stair to the common lobby on the floor where the System activated would be enough to control smoke in the common lobby and so protect the common stairs when the common lobby door was opened (an open door air flow rate of a minimum of 2.0 m/s). I did this by turning a dial (marked 0-130 Pa) located in the pressure switch using a screwdriver.

Smoke Detector

41. I checked the smoke detectors were fitted correctly and were connected into the correct connector on the outstation. The smoke detectors were located in the common lobby of each floor.

Dampers

42. Grilles were fastened on to the front of the shafts where the dampers were located so it was not possible to see the dampers and actuators (the motors that drove the dampers) that clearly. However, I did check that the dampers were fitted correctly and that the actuators were connected into the correct connector on the outstation. I know that I checked each damper individually because I specifically recall that there were 2 or 3 dampers that did not work so R J Electrics, who installed the dampers, were called back to put the installation faults right.

Outstations

43. Each floor in Grenfell Tower was installed with its own outstation. On levels 4 to 23 these were located inside the cupboard in each lobby. I checked that each connection into the circuit board in each outstation was coming in in the right place and going out to the correct piece of equipment.

44. I refer to the circuit boards in each outstation in the sections of my statement below as "Modbus Outstation Cards". In order to assist the Inquiry, I produce a document entitled "Modbus Outstation Card" (GP/8:). I was shown a photograph taken after the fire of a Modbus Outstation Card in the outstation on floor 13. I have annotated the photograph and provided a key to explain the component parts.

45. I did not keep a record of how long each step in the process took, but Steps 1 and 2 would have taken approximately 2-3 days to complete. As I would have undertaken site and System familiarisation during my first visit to the site, I believe these steps would have run into my second visit to the Tower.

Step 3 – Applying power to the System and checking the power supply to the outstations

46. The next step was to get a power supply (of 24v) to the Master Control Panel (located in the Hub Room off the main entrance lobby) and start the system operating up through the outstations.

47. As described above, there was one Modbus Outstation Card in each outstation from levels 4-23.

48. In the outstation on level 2 (the cupboard containing the dry riser) there were 3 Modbus Outstation Cards which controlled the system on level 2 and the AOVs in the community room and boxing club.

49. The Master Control Panel contained the Modbus Outstation Cards for the dampers, smoke detectors, pressure switches and fireman's override switches on ground level and level 1.

50. Initially during my first visits to Grenfell Tower the bottom three levels of the building were not completed, therefore, to the best of my recollection, I believe I took the following steps:

51. I isolated the equipment for those lower levels.

52. I either unplugged the relays on the Modbus Outstation Cards in the outstations servicing levels ground to 3 or disconnected the wires to all of the equipment for those levels except in relation to the communications and 24v supply (I would have needed this to enable the system to be powered up).

53. To make sure the PLC unit didn't send any signals which might cause the system to operate in smoke control mode, I would not have powered up the PLC or HMI panel at this stage.

54. I turned off the circuit breakers so that the fans were not running whilst I performed the test for this step.

55. I also powered up the inverter panels in the hub room and roof plant room.

56. I then went to level 4 and undertook the following processes:

57. I checked that the Modbus Outstation Card on that level was receiving the 24v power supply. If the Modbus Outstation Card was receiving power a green light located near the Modbus communications ports would be lit (see number 2 on the photograph in GP/8:). I would then have tested the cables supplying the power to the Modbus Outstation Card with the multimeter.

58. I tested channels 1 and 2 (the outputs) on the Modbus Outstation Card to make sure that they were driving the correct pieces of equipment (see numbers 6 and 7 on the photograph in GP/8:). I did this by pushing down the toggle which corresponded with the correct channel (see number 4 on the photograph in GP/8:). At Grenfell Tower, channel 1 was the output for the dampers and channel 2 was the power supply to the smoke detector.

59. Next I would check the inputs to make sure they were connected to the correct component and activating the correct pieces of equipment. I did this by testing the wire which receives the 24 v supply to check that it recorded 24 v using the multimeter. At Grenfell Tower the inputs (see number 3 on the photograph in GP/8:) were the smoke detector contact to say that the System had detected smoke, the fireman's override switch, the pressure switch and the battery backup panel (there was one of these on every other level at Grenfell Tower).

60. To make sure the Modbus Outstation Card would be able to communicate with the PLC later on, I would have reset the toggle. This had the effect of giving the Modbus Outstation Card a slave address (the way in which the PLC would identify and communicate with a particular Modbus Outstation Card). The Board Assignment Sheets (GP/5: PSB00001256) stated what the address should be for a particular Modbus Outstation Card. I would check to make sure the correct address had been allocated to the board. When setting the board address I would press the reset switch after the address was set to make sure that the card registered the information.

61. Having carried out the above processes on level 4, I proceeded to do the same on levels 5 to 23. I cannot now recall the detail of what I found on each floor. However, this part of the process follows very much a set pattern and I know that each floor was subjected to the same process.

Step 4 – Applying power to the System and checking the inverter panel and fans at roof level

62. The next step was to check the connections to the inverter panels (which controlled the speed of the fans) to make sure that they were receiving the correct power supply.

63. At Grenfell Tower I would have gone up to the roof plant room and plugged in the power supply coming into the inverter panel and down into the other Modbus Outstation Cards. Each inverter pack would have been powered up separately. I would then have carried out the same process in relation to the inverter panels in the hub room at ground level.

64. Next, I would have connected the power supply to each of the fans located in the roof plant room. The fans would be run separately, using the manual mode, to check they were running the right way. I would have done this by going up on to roof to check that they were discharging correctly. I would then have switched the fans off.

Step 5 – Connecting the Master Control Panel

65. The next step would be to go to the Master Control Panel and connect communications in and out for the outstations for the other levels (ground level to level 3). At this stage there would still be no power supply to those levels.

66. I would have then have plugged in the power supply coming into the inverter panels in the ground level hub room. Each inverter pack would have been powered up separately. I would then have connected the power supply to each of the fans located at level 2 (the smoke exhaust fans and the environmental fan). I would run the fans separately, using the manual mode, to check they were running the right way. To do this I would check that they were discharging correctly at the louvered façade above the entrance at ground level. I would then have switched the fans off.

Step 6 – Connecting and applying power to the PLC Unit, HMI Panel

67. I would have then connected the PLC unit and HMI panel.

68. I am sure that I undertook this step, but I am not sure exactly when this happened.

69. If this step was completed before the works on the ground level – level 3 were complete I would have placed wires between the connectors on the Modbus Outstation Cards to bypass the components that may have provided fire signals, i.e. the smoke detectors and fireman's override switch.

70. Once connected the PLC, the HMI panel would have displayed the message "System Healthy".

71. If the HMI displayed the message "Fire Detected on Floor X" I would go to the relevant level and identify what was causing a fire signal to be sent/received. At this stage I would power up the PLC.

Step 7 – Connecting the fans to the Master Control Panel

72. I would then connect the fans to the Master Control Panel. I would also set the fan speed at a standard setting at this point. This is usually around 25% in low speed setting and 100% in high speed setting.

73. At Grenfell Tower, the environmental fan speed was set at 25% for the fan at roof level which serviced the north shaft and 35% for the fan at level 2 which serviced the south shaft. I would set the fan speed from the relevant screen on the HMI panel.

Step 8 – Setting the Damper timer function

74. At this point I would check and set the damper timer function on each level.

75. I would do this by checking that all the dampers opened and closed correctly and setting the timer slightly longer than the slowest damper took to fully open and close by adding 5 to 10 seconds.

76. The timer is a small dial on the circuit board which allows a timed function to be set of between 3 seconds and 3 minutes (see number 5 on the photograph in GP/8:

). I would then have pressed the re-set button on the Modbus Outstation Card so that it knew to accept the changes.

77. Again, I cannot recall the detail of each floor, but I do remember undertaking this step at Grenfell Tower.

Step 9 – System testing

Testing and commissioning the System on levels 4 to 23

78. I would then have carried out system testing to check that the System responded correctly when it detected smoke.

79. At Grenfell Tower Gary Doyle and I tested levels 4-23 first. I was located at the HMI panel at ground level whilst Gary Doyle went up to each level to activate each smoke detector.

80. The detector was activated using a can of artificial smoke to spray the smoke head. This is the only way to activate the system when it is set to run.

81. Gary Doyle checked to make sure that the dampers on that level opened by checking that the red led light on the smoke detector was lit and that the LED near the output on the relevant Modbus Outstation card was lit (which showed that the correct signals were being sent and received and the dampers were activated). Gary Doyle also carried out a visual check that the dampers were working. I also asked him to open and close the door to the stair to check that the fan speed increased when the door was open. I was positioned at the HMI panel. I checked that the HMI panel displayed a message stating that the fans were running and on which level smoke had been detected.

82. Gary Doyle also checked that the fireman's override switch was working on each level. Once the system was running in smoke control mode, I turned the override switch on the HMI panel from "auto" to "on" and radioed up to Gary Doyle to tell him that he could turn the key in the fireman's override switch to "on". Gary Doyle had his own set of keys for the fireman's override switch.

83. When working together like this on different floors to test the System, we communicated via two way radios. We did not have any issues communicating in this way using the equipment we brought with us.

Testing and commissioning the System on level 3

84. I recall that by the time we had completed the above steps in relation to the majority of the Tower, the dampers were fitted on level 3, so Gary Doyle and I carried out all of the checks and tests detailed above, on the equipment located on level 3.

85. I remember this because it was obvious that the layout of this level was not the same as those we had been working on previously, so it was a change to the routine we had been following on the levels above.

Testing and commissioning the System on ground level and level 1

86. After we had completed level 3 we turned our attention to the ground and level 1.

87. I recall that Gary Doyle and I then carried out all of the steps on the equipment located on ground level and level 1.

88. The dampers for these floors were controlled from the Master Control Panel. During the earlier tests I had unplugged the relays for these dampers, so I now plugged them in one at a time to provide the 24v power supply to them. This enabled me and Gary Doyle to check that they were working.

89. I then carried out the same tests with the smoke detector on the ground floor lobby and floor 1.

90. I recall that it was not possible to test the system on level 2 at this stage as it was missing a smoke detector and a battery panel.

Testing and commissioning the System on level 2, the Community Room and Boxing Club

91. Once the remaining battery panel and smoke detector had been fitted on level 2, Gary Doyle and I carried out all of the steps detailed above, on the equipment located on level 2 including the AOVs (windows fitted to actuators) in the community room and boxing club.

92. Again, I do remember this because it involved moving into different areas and the arrangements in relation to the AOVs were unique to the Community Room and Boxing Club.

Step 10 – Cause and Effect check

Testing the System in smoke control mode

93. I then checked to make sure the whole system was functioning as intended with reference to the cause and effect document.

94. I activated the system on each floor and checked to make sure the system operated correctly in smoke control mode.

95. In doing this I would have checked that all of the smoke detectors operated correctly and checked that the dampers would be closing /opening on the correct levels, namely opening on the floor where the system activated and closing on all others.

96. I would then have checked the override facility on the HMI panel and that the fireman's override switches operated and locked out the system on the other levels.

97. In relation to the community room and boxing club fireman's override switches, I would have checked them to make sure that by operating the switches the fans stopped and caused the actuators to open the windows.

Testing the System in environmental mode

98. Gary Doyle and I also checked that the System worked correctly when activated in environmental mode.

99. The System was programmed to open the dampers on a 15 minute cycle on four levels at a time in the following rotation when the System was operating in environmental mode:
G,6,12,18
1,7,13,19

2,8,14,20

3,9,15,21

4,10,16,22

5,11,17,23

100. We tested the System in environmental mode by simulating the input from the Building Management System (which operated the heating systems for the building) and triggering a signal at the Main Control Panel. We then carried out the same checks as those carried out for the System when it was running in smoke control mode.

Activating the System in smoke control mode when operating in environmental mode

101. Gary Doyle and I also checked that the System worked correctly when it detected smoke whilst it was running in environmental mode and switched over to smoke control mode. We did this by activating the smoke detectors on each floor by spraying them with artificial smoke and carrying out the same checks as those carried out for the System when it was running in smoke control and environmental mode.

102. In relation to the last of these two checks, testing the system in environmental mode and activating the system when running in environmental mode, I believe this was done during my last visit after the works on level 2 had been completed.

Taking readings – March and April 2016

I attended site between 14th -17th March 2016. Again, I believe that Gary Doyle and I would have been taking readings of the air flows etc. and carrying out final testing of the System in smoke control mode during these visits whilst we waited for the demonstration and handover to be arranged. I recall that I took a set of readings from the System in smoke control mode in March but was not able to take a full set of readings as the works on level 2 were not complete. I took further readings from the System in smoke control mode in April. I recorded the readings in a test reading sheet ("Grenfell Tower Environmental Mode and Normal mode readings" GP/9: PSB00000234).

103. Air flow readings were also taken when the System was operating in environmental mode. I believe that these readings were taken during my last visit to the Tower in April. I recorded the readings in the test reading sheet (GP/9: PSB00000234).

104. As to the open door airflow readings, a primary performance criteria for the System as defined in the design, is that when the common lobby door is opened, on the floor where the system has activated, a minimum air velocity through that open common lobby door of 2.0 m/s must be achieved. That air flow rate, from the protected stair to the common lobby, is intended to be enough to control smoke in the common lobby and so protect the stair.

105. I also need to be sure that the affected doors can be opened easily when the System is operating; this means a door opening force that does not exceed 100N, which is another primary performance criteria.

106. I took airflow readings using an anemometer from the top, middle and bottom of each door on each level when the System was operating in smoke control mode. The readings I recorded were an average figure of the readings taken from around the door.

107. I also took the following readings at the grille covering each damper on each floor:

1) When the system was operating in smoke control mode and the fans were operating at low speed (the door to the stair was closed).
2) When the system was operating in smoke control mode and the fans were operating at high speed (the door to the stair was open).
3) When the system was operating in environmental mode.

108. In undertaking this phase of testing and taking readings, it would have been necessary to make adjustments to the speed of one or more of the fans and or the settings on the pressure switches on particular floors in order the ensure that the primary performance criteria for the System as per the design were being achieved.

109. I recall that, at Grenfell Tower, the pressure settings on the floors were all between 18 and 25 Pa. I thought that the reduced fan rates (System activated, but with the common lobby door closed) were all the same, around 50%, although I cannot remember precisely.

110. In making these adjustments and at these pressure settings, I was satisfied that on each and every floor the primary performance criteria were achieved: a minimum air velocity through an open lobby door of 2.0 m/s, and a door opening force not exceeding 100N.

111. It would have taken approximately 3-4 days to obtain all of the readings.

Hand Over and Demonstration – April 2016

112. I recall that I attended Grenfell Tower on 26th-28th April 2016 to carry out final checks of the System and to formally hand over the System to Alan Whyte of J S Wright.

113. On the 28th April 2016 I was asked to attend a demonstration of the System. This was organised at the request of J S Wright. So far as I was concerned this was an opportunity to demonstrate the System to PSB's client, J S Wright. PSB was also informed that representatives from Building Control would be present. In the event, a number of other persons were also present. To the best of my recollection this demonstration included Alan Whyte (J S Wright), representatives of Rydon, two people from the London Fire Brigade, someone from the management company and at least one Building Control Officer. I cannot recall the names or job titles of these individuals.

Explanation of the System

114. The design basis for smoke control systems is well known and long standing, namely a fire starting in a single location and being contained within a single compartment. However, some smoke will get into a common lobby from a fire in a flat, so the System was intended to ventilate the common lobby in order to control that smoke and so protect the common stairs. In doing so some protection to that common lobby would also be provided. This was explained during the demonstration.

115. The System was introduced to those at the demonstration. It was a detailed demonstration taking some time. Questions were asked by those present and I was happy to answer them and illustrate how the system was intended to function.

116. It was made clear that it was a depressurisation system which achieved smoke control using depressurisation principles achieved by mechanical extraction.

117. It was made clear that in smoke control mode the System was only designed to operate on one floor.

Smoke control mode, floor level demonstration

118. To show how the System was activated, cold smoke from a can was sprayed onto the smoke detector head in a common lobby. Those present were then able to see the System engage with the common lobby door closed. That door was then opened so I could demonstrate how the fans would ramp up at that point to ensure an airflow from the stair to the common lobby, which would continue to prevent smoke exiting the common lobby even when the door was open. I cannot remember precisely now, but I believe we demonstrated the system on a number of levels in this way.

119. It was explained that the system was automatic and would activate on the level where smoke was first detected, but was also capable of being manually overridden. To that end the HMI panel and the fireman override switches were also explained and demonstrated.

The HMI panel demonstration

120. The HMI panel which was located in the entrance lobby at ground floor level, had a touch screen which could be both activated and operated by simply touching it, including through gloves.

121. In the event that the system did detect smoke on a particular floor causing it to activate in smoke control mode, messages would appear in the system status box on the main home page confirming that the system was operating in smoke control mode and that the override facility could now be enabled – rather than displaying the "System Healthy" message, scrolling messages stating "Fire Detected on Level [X]" and "Fireman's Override Key Available" would be displayed.

122. This was demonstrated.

123. Once the system had been activated in smoke control mode and the message "Fireman's Override Key Available" was displayed on the HMI screen home page, the override switch mounted on the HMI panel would be capable of being activated. This switch had two positions, "auto" and "on".

124. This override switch on the HMI panel was the primary switch for enabling the operation of the manual override facility and needed to be switched to the "on" position before any manual override could take place. This would not manually override the system in itself; instead, activating this switch enabled the manual override facility to be operated by taking further action from the HMI touch screen or individual fireman's override switches on each level.

125. Until such further action was taken, the system (having been prompted by the initial detection of smoke on a particular level) would continue to operate automatically in smoke control mode as normal. Similarly, the system would continue to operate automatically where this switch was left in the "auto" position.

126. Successfully activating the override switch mounted on the HMI panel enabled the activation of the manual override facility from both the HMI panel touch screen and from the fireman's override switches on the individual floors.

127. As regards the HMI touch screen, successfully activating the override switch mounted on the HMI panel enabled the operator to "go to individual floor control screen" (this would allow you to direct the system to operate in smoke control mode on a particular level) or "turn system off" (this would power the system off by turning off the fans and closing all dampers and the system would remain deactivated until restarted).

128. This was demonstrated.

The fireman override switches demonstration

129. As regards the individual floor level fireman override switches, these yellow box switches were located just inside each lobby next to the door to the stairwell on each level.

130. As with the HMI screen these fireman's override switches could only be activated once both (1) the system had automatically detected smoke and was operating in smoke control mode and (2) the main override switch mounted on the HMI panel had already been turned to the "on" position.

131. Each fireman's override switch was operated by a key. The same key could be used to operate any of the individual floor level switches. Once these switches were enabled as described above, any one of the switches could be activated by using the key to turn it to the "on" position.

132. Once the key was turned to the "on" position in one of these switches, it would remain there and could not be removed until it was turned back to the off position (in the same way as the switch mounted on the HMI panel).

133. Once one floor level override switch had been activated in this way, it would "lock out" any other manual override operation. In other words, until the switch was turned back off, it would not be possible to direct the system to operate on a different level either from the HMI panel touch screen or from another individual fireman's override switch on a different floor level.

134. Successfully activating the fireman's override switch on a level would direct the system to operate in smoke control mode on that floor.

135. This was demonstrated.

136. I have commissioned countless Systems over the years and such override features as those present in the System at Grenfell Tower are not unusual; the functionality of the System was relatively basic and intuitive.

137. During the demonstration, operation of the System in environmental mode was also demonstrated and explained.

138. I was happy with the demonstration. The System worked well at every stage. I had no concerns about the System. No concerns were expressed to me by anybody present at the demonstration. At the time and from what was said to me at the demonstration, I remember that everyone present was impressed with the System and welcomed the demonstration.

Commissioning Reports

139. At PSB we use a standard "Above Ground Commissioning Report" which is completed once the commissioning process is complete. The document is PSB's record of the commissioning process which they provide to the client and which we hold on file. I use the standard "Above Ground Commissioning Report" to record the commissioning process and take out any sections that are not relevant to the project I am working on.

140. In relation to the System at Grenfell Tower, I completed two commissioning reports; "PSB Above Ground Commissioning Report 76005 (dated 26th February 2016)" (GP/10: PSB00001257) and "PSB Above Ground Commissioning Report 76005 (dated 28th April 2016)" (GP/11: PSB00000224). An explanation of the information contained in the two reports is provided below.

"PSB Above Ground Commissioning Report 76005 (26th February 2016)"- (GP/10: PSB00001257)

141. I completed the report dated 26th February 2016 following the three visits I made to Grenfell Tower in February 2016. I would not normally complete a commissioning report for a system that was not fully operational, but the client was keen to have a document that evidenced that the System installed on floors 4-23 had been commissioned. The report states on page 2 that "*I was unable to commission fully system due to install and builders works being incomplete.*" As the system was not fully operational I did not ask the client to sign the report. For the same reason, I did not issue a completion certificate.

142. Page 3 of the report details the component parts of the system I tested when I was on site. The following is of note:

143. The "SD" numbers relate to the dampers; "SD09" was the first damper on floor four and "SD48" the last damper on floor 23.

144. The references to "CD01" and "CD02" relate to the shut off dampers which enabled the system to switch from environmental mode to smoke control mode. The dampers were numbered in the same way on the cause and effect spreadsheet.

145. The references to "FOS" relate to the fireman's override switches. There were 24 override switches, one on each floor of Grenfell Tower (including the ground floor).

"Above Ground Commissioning Report 76005 (28th April 2016)" – (GP/11: PSB00000224)

146. The report dated 28th April 2016 demonstrates that the whole System (including ground level to floor 3) had been tested and commissioned. The document was signed, on page 6 of the document, by Alan Whyte of J S Wright. I am aware that the document was included in the "PSB UK Operating and Maintenance Instructions for the Above Ground Smoke Ventilation System" which was provided to J S Wright (GP/12: PSB00000225).

"PSB UK Completion Certificate (Signed). Project Ref DP.29111.9497 and 75019 (03.05.16)" - (GP/13: PSB00001258)

147. Alan Whyte of JS Wright confirmed to me on the 28th April that he was happy that the System was working and "signed it off". I signed a completion certificate on 3rd May 2016 - "PSB UK Completion Certificate (Signed). Project Ref DP.29111.9497 and 75019 (03.05.16) (GP/13: PSB00001258).

Other matters

148. PSB ensured that when the System was handed over to J S Wright that multiple sets of all necessary keys were provided. Written instructions for the System and recommendations as to necessary care, maintenance and servicing were provided by PSB to J S Wright in the Operating and Maintenance Manual (GP/12: PSB00000225).

149. Care, maintenance and servicing requirements in relation to systems such as that installed at Grenfell Tower are well known and long established. We include reference to these in our documentation. We did so in relation to this project. For example, section 4 of the Technical Submission (GP/6: PSB00000214) sets out a "Testing and Maintenance Schedule".

150. I also recall returning to Grenfell Tower in May 2016 to provide training on the operation of the System, but I cannot now recall precisely when that was.

151. From records shown to me and provided to the Public Inquiry, I am aware that on or about 5th May 2016, the contract servicing arm of the Witt UK Group sent a proposal to J S Wright for a maintenance contract in respect of the System at Grenfell Tower. That proposal was not taken up by the end user.

152. From records shown to me and provided to the Public Inquiry, I am aware that PSB was next contacted in relation to the System on or about 6 June 2017 by J S Wright with a report of a potential fault in relation to the AOVs at Grenfell Tower (GP/14: PSB00000474). On 12th June 2017, J S Wright requested a quote for one service visit in relation to the potential fault report (GP/15: PSB00000479). That quote was provided on the same day. There was no response to that quote and no instructions were received by PSB to attend Grenfell Tower.

Conclusion

153. This ends my statement about the commissioning of the System at Grenfell Tower.

154. I understand that this statement will form part of the evidence before the Public Inquiry and will be published on the Inquiry's website.

STATEMENT OF TRUTH

I believe that the facts stated in this witness statement are true.

Granville PARTLOW .....

Dated ...28th September 2018