Witness Name : James Harrison

Statement No : First

Exhibits: JAH1-JAH18

Dated : 14th October 2018

Witness Statement of James Harrison

I, James Harrison, will say as follows:-

1. I am the Head of Operations for the North London Emergency Response and Repair ("ER&R") network which is one of the four gas networks operated by Cadent Gas Ltd ("Cadent").

2. I have previously made two witness statements to the Metropolitan Police Service in relation to the Grenfell Tower fire which took place on 14 June 2017. I provided my consent to those witness statements being shared with the Grenfell Tower Public Inquiry ("the Inquiry"). I make this statement in response to the Inquiry's formal request for evidence from Cadent pursuant to Rule 9 of the Inquiry Rules 2006. This is my first statement to the Inquiry.

3. I have used the statement I provided to the MPS on 29 June 2018 as the basis of this statement for the Inquiry and have elaborated on that statement where necessary to address queries raised by the Inquiry. I have sought to cover all relevant issues in this one statement, for the Inquiry's ease of reference.

4. The statement I provided to the MPS on 30 January 2018 (MET00012831) deals solely with Cadent's response to the fire on 14 June 2017.

Background to Cadent

5. By way of background to Cadent, prior to 1 October 2016, National Grid Gas plc owned and operated four of the eight UK gas distribution networks. By an agreement dated 30 September 2016, all assets and liabilities (as defined) relating to National Grid Gas plc's gas distribution business were transferred to a new company, National Grid Gas Distribution Limited. On 1 May 2017, National Grid Gas Distribution Limited changed its name to Cadent Gas Limited.

6. I have held the position of North London ER&R Head of Operations since 1 April 2017. I therefore make this statement from my own knowledge as of that date, and analysis of historic documents prior to my appointment as Head of Operations, and prior to the agreement dated 30 September 2016. Cadent acquired responsibility for the gas supply on 30 September 2016 and in so doing inherited historical plans in relation to gas services across its distribution networks dating back many decades. There are no plans in that historical bundle that Cadent holds which show the exact detail of the two original gas supply pipes to the Grenfell Tower. Cadent does however have plans dating from 2008 to which I refer below.

7. Cadent is a gas transporter, which means that it owns and operates the pipes and associated apparatus which supply natural gas to commercial and domestic properties within the geographic footprint of its distribution networks. Cadent owns and operates 4 of the 8 regulated gas distribution networks in the UK, namely the East of England, the North West, the West Midlands and North London, where Grenfell Tower ("the Tower") is located. Cadent manages its networks including connecting new customers and responding to reported gas escapes. It also manages the National Gas Emergency Service number on behalf of all gas distribution networks.

8. For the purpose of providing this statement I will categorise relevant Cadent employees (who all form part of the Cadent Operations team) into four groups:

    a. Field Force (which includes the Emergency Lead Engineers who are the frontline responders to gas escapes and the Repair Engineers who

respond to gas escapes and carry out work on gas mains, services and riser systems);

b. Staff (which includes office based support staff and operational Supervisors and Engineers);
c. Managers; and
d. Directors.

9. Within each group there are a number of grades depending on the activities and responsibilities of the role. The Staff roles increase from Level 1 to Level 7 and the Manager roles increase from Band D to Band A.

10. The Operations teams in Cadent all work on the gas distribution network, either responding to gas emergencies or carrying out maintenance on the network. Each network has an operational department, known as Operate and Maintain ("O&M") which operates and maintains the gas apparatus via local teams of specialist engineers. In addition, each network has an ER&R capability which deals with reports of gas escapes and other emergencies across the networks alongside a planned workload. I manage the ER&R capability for Cadent across the North London Network. I report to Ed Syson who is the Director of Operations for Cadent.

11. As the Head of Operations, I am a Band B manager. At the time of the fire, I had one Emergency Network Manager who is Nicola Wilkinson working as part of my team and two Repair Network Managers; Tony Day who covered the West of North London and Tony Smith who covered the East of North London. They were all Band C managers.

Background - the supply of gas into the Tower

12. Based on my research of the historic position, it is my understanding that when the Tower was constructed in 1974, gas was supplied from the gas distribution main on the east side of the Tower via pipes referred to as "Service Pipe(s)". Gas would then be delivered to residents on different floors via vertical and horizontal gas pipes (referred to respectively as risers and laterals). From each of the vertical gas risers a lateral gas pipe would branch off providing an individual gas supply to each flat. The lateral supply pipe would terminate with an Emergency Control Valve ("ECV") within

each flat at the gas meter. Cadent is responsible for the gas pipes up to and including the ECV prior to the customers' gas meters, but not the meter or the pipe after it. The outlet connection of the ECV is defined as the end of Cadent's gas distribution network.

13. The Tower originally had two supplies of gas. The first, a 10" steel service, supplied a communal heating and hot water system into the basement of the Tower. The second, a 4" steel service, supplied gas for cooking in residential flats on the 4th to 23rd floors via four gas vertical riser pipes, two of which divided making a total of six vertical riser pipes.

14. Between October 2016 and June 2017, a new 90mm Polyethylene / 3" steel service pipe and 2" steel gas riser system was installed in the Tower. This third gas supply service and riser system was installed to replace one of the existing risers in the Tower as is described in greater detail in my colleague, Stephen Mason's witness statement. This new service pipe was also supplied from the gas distribution main on the east side of the Tower.

15. The map at **Exhibit JAH1** is a drawing showing all of the mains and supply pipes in the vicinity of the Tower as at 14 June 2017. The drawing was specifically prepared for the purpose of my statement to the MPS on 29 June 2018. The three supplies are shown entering the Tower on the East. The three supplies are labelled "4in ST", "90mm PE" and "10in ST". The map at **Exhibit JAH2** shows the map of the gas supplies as they currently appear on our system. This shows that there are no longer any gas supplies to the Tower.

Surveys of the Tower by Cadent

16. In order to comply with relevant regulations, the gas risers within the Tower were subject to periodic inspections in line with Cadent engineering procedures, principally T/PM/LC/21 'Management Procedure for the Asset Management of Gas Supplies to Multi Occupancy High and Medium Rise Building', a copy of which is attached as my **Exhibit JAH3**.

17. The last periodic inspection of the Tower was completed on 30 September 2016 which was coincidentally Cadent's date of acquisition of the gas distribution business. The results of that LC/21 survey are recorded in a survey report, a copy of which I attach as my **Exhibit JAH4.** The issues identified during this routine survey can be summarised as follows:

    a. A small gas leak was identified on one of the risers due to corrosion in the concrete screed between flats 22 and 23;
    b. Corrosion was identified on one of the laterals connected to another riser within the Tower; and
    c. The engineers recorded on the survey that they could not visually locate the Pipeline Isolation Valves ("PIVs"), also known as Service Isolation Valves ("SIVs") for the two existing service pipelines outside the Tower – these being the 10" and the 4" steel services.

The LC/21 survey process

18. Before I address the results of the survey of 30 September 2016, it may be helpful for me to set out how the high rise survey process works in practice.

19. Cadent has a duty to ensure that all of its assets are in a safe and reliable condition. Specifically, Regulation 13 of The Pipeline Safety Regulations 1996 states: "*The operator shall ensure that a pipeline is maintained in an efficient state, in efficient working order and in good repair*". To satisfy its legislative requirements, Cadent carries out periodic surveys of its assets within high rise buildings on a rolling survey programme. T/PL/LC/20 is Cadent's Policy for Inspection, Maintenance and Monitoring of Supplies to High and Medium Rise Buildings, a copy of which I attach as my **Exhibit JAH5.** It states that all high-rise buildings (a building having at least six storeys above ground level) that contain an up-stream pipe-work system, shall be subject to inspections (surveys). The survey of each high-rise building generates a "building priority score" which is used to determine when the building will next be surveyed. This is calculated from information provided on the condition of the riser system (supply pipe, risers and laterals) and other building related factors where relevant.

20. Each building then has a "high", "medium" or "low" prioritisation score which determines whether the next survey will be either 1 year, 5 years or 10 years respectively. This is sometimes called a risk score, although it does not signal that "high" represents a higher risk of asset failure, instead it means that a building identified as being "high risk" will be surveyed on a more frequent basis. The default survey frequency is 10 years.

21. Compliance with the LC/20 policy is achieved through the application of Cadent's LC/21 Management Procedure. The LC/21 documents set the requirements and processes for leakage survey, data gathering and visual condition assessments to establish the conditions of the gas network pipework in high-rise and medium-rise buildings.

22. In order to carry out the surveys of our assets, the engineers must have access to the building. Prior to the surveys taking place therefore, the Customer Specialist for each network will liaise with the building owners to try and ensure the necessary arrangements are in place to carry out the surveys.

23. The surveys are all allocated to competent engineers who will carry out the survey in accordance with Cadent's Work Procedure for High Rise Building Surveys and Risk Assessment T/PR/LC/34, a copy of which I attach as my **Exhibit JAH6**. In order to complete the LC/21 survey, the surveyors will have some information about the building available to them, which includes details and contact information for the building owner, a map of the gas supplies into the building and a survey spreadsheet which they must complete by entering the building and carrying out a visual assessment of the gas assets.

24. Using the information captured during the survey, a score for the building is automatically calculated using a survey spreadsheet with multiple background formulas. As is set out in paragraph 7.2 of the LC/21 policy; "*The building priority score is a combination of site specific threats associated with supply pipes, risers and laterals. The scoring system is based on the surveyor's subjective judgement of the condition of our assets and the likelihood of a safety incident occurring*". A

priority score is quantitative and is used as a consistent methodology to enable buildings to be compared with each other. It is not qualitative, that is to say, a building with twice the priority score does not represent twice the level of risk. The priority score dictates what further action needs to be taken as well as the frequency of future inspections. The Network Supervisor is responsible for reviewing the survey report and for confirming and authorising the priority score generated by the reporting spreadsheet.

The leak identified during the LC/21 survey

25. In February 2016, a list of buildings to be surveyed that year was sent to the Multi Occupancy Buildings (MOBs) Supervisor for North London, Mark Petty. The Tower was included on this list and the routine survey of the Tower was completed on 30 September 2016 by two engineers who both work in the North London Operations ER&R team.

26. The engineers spent one day surveying the gas assets at the Tower. They conducted an external sweep of the building to check for presence of gas, entered and inspected the basement where the two existing gas supplies enter the Tower and also gained access and inspected 51 of the 120 flats within the Tower.

27. It was during this inspection that the small leak was detected. The engineers reported the leak to the emergency gas leak team and requested the attendance of a repair team to isolate the riser. In accordance with Cadent's procedures, the riser where the gas leak was identified was isolated - the gas supply it provided was cut off. One of the engineers stayed on site until Cadent's repair team arrived and isolated the riser; this was achieved by closing the branch isolation valve which is located in the basement of the Tower and cutting and capping the riser to stop the flow of gas. This was done in the early hours of 1st October 2016. The other risers within the Tower were unaffected.

28. Whilst the 'emergency' work in isolating the riser was completed by Cadent's engineers, the subsequent remediation work required was carried out by Cadent's Gas Distribution Strategic Partner, tRIIO, who designed and installed a new vertical gas pipe and new horizontal gas pipes. My colleague Stephen Mason

deals in greater detail with the contractual arrangements underpinning the riser replacement work in his statement to the Inquiry.

The corrosion identified during the LC/21 survey

29. In addition to the small gas leak, the surveyors also identified "moderate" and "severe" corrosion on the pipework within the Tower. Cadent's policies and procedures define the different categories of corrosion as follows:

    a. Moderate corrosion – Does not significantly affect the integrity of the pipe;
    b. Severe – has the potential to affect the integrity of the pipe (note: but does not necessarily do so);
    c. Extreme – Constitutes significant damage that directly affects the integrity of the pipe, requirement additional impact resistance as part of a repair or replacement.

30. Using the information collated during their inspections, the surveyors populated the survey spreadsheet for the Tower and a priority score was automatically calculated. The priority score for the supply pipes at the Tower was 103,680; the calculated priority score for the laterals was 397,604 and the calculated priority score for the risers was 94,743. This made a total priority score of 596,026 for the Tower.

31. A combination of factors contributed to this priority score including, and most significantly, the small gas leak that was identified in the concrete screed between flats 22 and 23, the inability to visually identify PIVs on the supply pipes and the corrosion identified on the laterals. As explained above, as a result of the gas leak, the riser was isolated on 1 October 2016. Had another LC/21 survey been undertaken on 1 October 2016 therefore, the priority score would have been significantly reduced in light of the fact that the riser had been isolated.

32. As explained, the priority score dictates what action must be taken in response to the survey. The LC/21 policy states that where a survey has a priority score of more than 210,000 specific action must be taken. The requirements are set out in

section 7.3 of the policy, but include the requirement for the building to be surveyed again the following year. If the priority score is greater than 210,000, the policy also requires a HAZOP (hazard and operability study) risk assessment meeting to be arranged within 3 months of the survey being completed. A HAZOP meeting is a risk mitigation meeting. It is designed to ensure that appropriate risk mitigation measures are being taken.

33. In accordance with the LC/21 policy, and given that the calculated priority score on 30 September 2016 was greater than 210,000, a HAZOP risk assessment meeting was held on 5 December 2016 to discuss the LC/21 survey result of the Tower. I attach a copy of the action points arising from that meeting as my **Exhibit JAH7**. I was not present during the meeting. The reference to a LC/33 survey in the action point (which notes that such a survey was to be arranged at the Tower if not already completed) makes clear that the fact that severe corrosion had been identified on one of the risers was discussed during the HAZOP meeting.

34. When severe corrosion is detected during a survey of a building, the surveyor shall contact the MOBs Network Lead who shall arrange for a more detailed corrosion assessment to be undertaken within 14 calendar days. The more detailed corrosion assessment is known as the LC/33 survey, and the process for this survey is set out in a separate Cadent Management Procedure, namely T/PM/LC/33 "Management Procedure Assessment of Corrosion Damage on Steel Pipework Supplying Multi-Occupancy High and Medium Rise Building", a copy of which I attach as my **Exhibit JAH8**.

35. The LC/21 survey is a visual inspection whereas the LC/33 survey is a more detailed inspection of the risers to determine their integrity and continued fitness. During a LC/33 survey, the surveyor will inspect the riser surface, determine the category of corrosion before taking any remedial action required. The remedial action ensures the integrity of the riser is satisfactory to allow for a minimum 5 year inspection frequency. Again, in order to inspect the pipework, the surveyor must have access to the building and to the pipework where corrosion was identified. When undertaking the LC/33 survey, the surveyor will have a copy of the LC/21 survey result and photographs showing the location of the corrosion

identified during the LC/21 survey. The surveyor will inspect the pipework and if the wall thickness of the pipework is within the permitted parameters, as defined in the LC/33 Management Procedure, the surveyor will paint the pipework with specialised paint which will remedy the issue of corrosion. If the corrosion has penetrated the pipework so that it is too thin to be repaired, the condition of the pipework will be rechecked until the pipe is cut out or the whole riser is replaced.

36. At the date of the first HAZOP meeting held on 5 December 2016, a LC/33 assessment had not yet been completed. At the meeting it was agreed that Mark Petty, the MOBs Supervisor for North London, would arrange for a LC/33 survey to be undertaken if such a survey had not already taken place. For the avoidance of doubt, the LC/33 survey was to be undertaken to inspect the severe corrosion which had been identified on one location on one of the risers; Cadent's policies and procedures does not require immediate action to be undertaken in respect of the moderate corrosion that had been identified. However, the assets would continue to be surveyed as part of the rolling survey process; in the case of the Tower, the following year.

37. Following the HAZOP meeting on 5 December 2016, Mark Petty allocated the LC/33 survey to one of his First Call Operative engineers whose role it is to carry out LC/33 surveys. We have spoken with the engineer and he recalls attempting to complete the LC/33 survey on at least two separate occasions. However, he was unable to gain access to inspect the relevant pipework. On the first occasion, he was not able to enter the Tower itself as a security fob was required to enter the Tower. On the second occasion, a caretaker allowed him access into the Tower. However, the surveyor was unable to gain access to the individual flat where the corrosion had been identified in order to carry out his more detailed inspection of the pipework. He sought assistance from the Tenant Management Organisation office located under the railway arches near the Tower, but they were not able to facilitate access. On that second occasion, when the surveyor was able to gain entry into the Tower itself, the surveyor undertook a "letterbox check" which is when a probe is inserted through a letterbox to test for any gas leaks; no gas leaks were detected.

38. Where a surveyor is having difficulty in accessing a building or individual flats to complete a survey, three attempts to gain access should be made on separate days over a two week period. Following the three attempts, the surveyor records the details (dates, times, addresses, etc.) on the survey form and flags "no access" to the Customer Specialist.

39. The Tower was discussed at a second HAZOP meeting on 23 February 2017. A copy of the action points arising from that meeting is also contained within Exhibit JAH7. At that meeting it was noted that the LC/33 surveyor had been unable to gain access to the Tower. It was agreed that the surveyor should attempt access again in order to complete the LC/33 survey.

40. In order to provide as much detail as we can about the attempted LC/33 surveys at the Tower, we instructed our cyber security team to carry out an electronic search of the emails of the surveyor who attended the Tower for any relevant communications. Unfortunately, the electronic searches did not return any readable data and we are therefore unable to be more specific about his visits to the Tower beyond the recollections of our engineer.

41. At the time of the fire, the surveyor had still not been able to gain access to the Tower in order to complete the LC/33 survey, and the survey was still outstanding. Unfortunately, difficulties with access, particularly individual flats within MOBs, is not unusual. Without access to a flat or building our engineers are unable to complete the necessary physical inspections, as was the case with the Tower.

42. Whilst the surveyor had not been able to complete the corrosion assessment, no further gas leak had been identified in the Tower. The LC/33 survey is a process for inspecting and repairing non-leaking risers. Had a gas leak been identified on any previous visits, including by the use of the probe through the letterbox, the pipe would have been either repaired or isolated immediately in accordance with Cadent's policies and procedures, but no such actions were identified as being required.

43. In addition to the reactive work being undertaken at the Tower, as a result of the gas leak identified on one of the risers, proactive work was also planned for the remaining gas risers. This was to isolate the remaining risers and extend the new lateral pipework to serve the remaining flats in the Tower which ended in the numbers 1, 3, 4, 5 and 6. The risers where the corrosion was identified would therefore have been isolated as part of the proactive work. At the time of the fire, the design for the proactive work was awaiting approval.

44. Our surveys are designed to ensure we understand how our assets are performing in their operational environment and identify a potential risk of failure decades before it actually occurs. The existing gas risers within the Tower were made of steel which are designed to have a very long operational life.

45. There is no evidence to suggest that the condition of the pipework deteriorated further or that the corrosion identified during the LC/21 survey resulted in a leak; when the surveyor gained access to the Tower itself and undertook a letterbox check, no leak was detected.

46. Moreover, when a Cadent team was recently permitted access to the Tower in order to inspect the condition of our assets and installations, our engineers found that the pipes in the areas where severe corrosion had been identified remained intact.

The Pipeline Isolation Valves

47. As explained above, during the LC/21 survey, the engineers undertook a sweep of the exterior of the Tower and recorded on the survey that they could not visually locate PIVs for the two service pipelines outside the Tower. I have been asked to provide more information as to:

    a. Where the isolation valves at the Tower should have been;
    b. Where the isolation valves at the Tower were; and
    c. The location of any other isolation valves in the vicinity of the Tower.

Where should the isolation valves have been located

48. The relevant guidance that would have been applicable at the time the Tower was constructed and which sets out where the valves at the Tower should have been located, was (a) the guidance published by the Institution of Gas Engineers in 1968, Recommendations for the Laying of Steel Gas Service Pipes ("the 1968 Guidance"); (b) the Gas Safety Regulations 1972 which came into force on 1 December 1972; and (c) IGE/TD/4 Communication No.879 – Recommendations on Transmission and Distribution Practice Laying of Steel and Ductile Iron Gas Service Pipes (1973).

49. The 1968 Guidance included provision for valves at various points to facilitate isolation for maintenance purposes, network extension(s), or in the event of an emergency, these being:

    a. A consumer control (now known as an emergency control valve) within each individual flat: "*Every service pipe should terminate at the meter position with a consumer control of the standard type normally used by the Gas Undertaking.*";
    b. A facility provided for the disconnection of each branch pipe (now known as a branch isolation valve): "*Facilities should be provided for the diconnexion [sic] of each branch pipe at a position adjacent to the rising service pipe, such position to be readily accessible to the Gas Undertaking's personnel.*" ; and
    c. 'Service Cock' or 'Valve' (now known as a pipeline isolation valve or service isolation valve): "*when, by reason of special circumstances (e.g. in blocks of flats or buildings with a large forecourt), a service cock or valves is fixed within the property boundary, it should be placed outside the building in a readily accessible position*".

50. For the purpose of my statement to the MPS on 29 June 2018, we created schematic layouts of the gas services within the Tower. **Exhibit JAH9** shows a schematic layout of the gas service pipes and internal gas riser system installation at the Tower as at construction in 1974, together with gas meter installation, customers' installation pipework and appliances. **Exhibit JAH10** shows the same

schematic layout as shown in Exhibit JAH9 but using current terminology for valves.

51. The current guidance which was also applicable at the time the new 90mm supply pipe was installed at the Tower, is IGEM/G/5 – Gas in multi-occupancy buildings. IGEM/G/5 is a technical standard published by the Institution of Gas Engineers and Managers ("IGEM"). IGEM is a chartered professional body, licensed by the Engineering Council, serving a wide range of professionals in the UK and the international gas industry. The current version of IGEM/G/5, Edition 2, was published in September 2012, with the first version being published in 2006.

52. IGEM/G/5 is described as a standard that "*summarises best practice for the design, installation, operation and maintenance of gas installations for multi-occupancy buildings. It combines well established practices with new advice on aspects of design and construction of such installations. The Standard consolidates best practice and guidance from legislation, and existing gas industry standards and procedures, with the aim of helping to achieve safe designs and installations for gas in the buildings concerned*". The legislation and existing gas industry standards and procedures referred to within IGEM/G/5 are listed in Appendix 2 of the document.

53. According to IGEM/G/5, isolation valves shall be provided to permit the following to be achieved:

    a. "*stopping of existing gas escapes, thus minimising the possibility of explosion and fire (or further explosion and fire);*
    b. *removal of the possibility of gas escapes in circumstances where conditions are unknown;*
    c. *removal of the possibility of other gas-related emergencies, for example carbon monoxide poisoning;*
    d. *removal of the possibility of gas escapes when a building, or a part of it, is unoccupied or ceases to use gas;*
    e. *carrying out of alterations and maintenance in gas-free conditions*".

54. IGEM/G/5 provides for the following isolation valves to be installed when designing and constructing a gas supply for a MOB. The guidelines of IGEM/G/5 are not retrospective in effect. To assist, an illustration of these valves as referred to in IGEM/G/5 can be found at **Exhibit JAH11.**

    a. Pipeline Isolation Valve ("PIV"): installed below ground outside the building on the service pipe(s). The location of a PIV is usually marked by a small size valve chamber box, with either 'Gas' or 'G' indicated on it;
    b. Inlet Isolation Valve ("IIV"): the IIV shall be located near to the point of entry of a network pipeline into a MOB and shall enable that part of a building complex being fed by an internal pipeline to be isolated for maintenance or safety reasons;
    c. Branch Isolation Valve ("BIV"): where there are multiple vertical or horizontal gas risers off a single service pipe (as was the case in the Tower) each riser should have a BIV located as close to the junction with the incoming service pipe as practicable to facilitate maintenance;
    d. Lateral Isolation Valve ("LIV"): where a lateral supplies an individual dwelling a LIV is installed before the supply enters the flat, for isolation or maintenance purposes; and
    e. Emergency Control Valve: these are generally located inside each dwelling within a MOB and are used by the consumer or gas engineer to isolate the gas supply within their dwelling for the purposes of maintenance, installation, extension, repair of installation pipework, the fitting or replacement of an appliance, or to isolate a gas escape.

55. In terms of where these isolation valves should be located, sections 7.4 to 7.7 of IGEM/G/5 set out the preferred locations of IIVs, BIVs, LIVs and ECVs.

56. Section 7.3.1 deals with the location of PIVs, and states: "*where a network pipeline supplies a multi-occupancy building, a PIV shall be installed outside the building to enable isolation of the building complex*". Section 7.3.3 states that "*any PIV shall be protected with a valve cover and shall be permanently identified*".

57. In selecting the location of the PIV (section 7.3.4):

    a. *"it shall be sited as near as is practicable to the boundary of the property;*
    b. *the effect of a building fire on its operability shall be considered;*
    c. *it shall not be positioned where vehicles are likely to stop or park*".

58. IGEM/G/5 further states (section 7.3.5) that "*the PIV should be located in the following order of priority*:

    a. *in, or in line with, the footway nearest the building*;
    b. *inside the property boundary, but not in planted areas such as borders or hedges*;
    c. *elsewhere within the property boundary, preferably at least 5m from the building*;
    d. *where the section of pipeline is long and has been laid in a non-standard orientation, in the two most appropriate positions (using the guidelines above) at both ends of the section of pipeline, so as to indicate the line of the pipeline*".

59. The operation of valves poses a number of risks including effects on the wider gas network and the potential to cause an explosive mixture of gas and air in an unexpected location. As a result, PIVs are designed to be operated by the gas transporter, in this case Cadent, rather than the occupiers of the building or the emergency services, e.g. Fire and Rescue Service. IGEM/G/5 states that "*any PIV shall be of a type that can be operated by a key held by the gas transporter/gas conveyor and the ESP (emergency service providers). The design or position of the valve shall resist efforts by persons who are not competent to restore gas supplied, such as building occupants or members of the public to operate it with standard tools*". The ESP in this context is the gas emergency service provider, a role normally undertaken by the gas distribution networks.

60. Fire services are reminded not to operate external mains or service isolation valves. I attach as my **Exhibit JAH12** a Safety Advice for Emergency Services

Attending Gas Escapes leaflet which was created prior to 14 June 2017 under the auspices of Gas Transporters' Incident Review Panel, a group comprising representatives of all Gas Distribution Networks in the UK. The leaflet makes it clear to all fire services that they should not operate the external mains or service isolation valves.

Where the isolation valves were located at the Tower

Isolation valves inside the flats

61. Each individual flat with a gas supply would have had an ECV. A customer can isolate their own supply of gas by closing the ECV. If a customer reports a smell of gas to the National Gas Emergency Centre, they will be advised to turn off the gas to their property at the meter by operating the ECV. However, the only isolation valves that were capable of isolating the supply of gas to the whole Tower on 14 June 2017 were situated in the basement and outside in the perimeter of the Tower.

The isolation valves inside the basement

62. A number of isolation valves were located inside the basement of the Tower and these can be seen in the photographs at **Exhibit JAH13.**

63. Each of the four gas vertical riser pipes in the basement, which were supplied by the original 4" supply, had its own BIV. A photograph of each of these BIVs can be seen at Exhibit JAH13. One of these BIV had already been isolated on the 30 September 2016 following the survey of the building addressed at paragraphs 25 to 28 above.

64. The original 10" steel gas service pipe (which supplied the boilers located in the basement) had an ECV. The ECV can be seen at Exhibit JAH13.

65. In terms of the new service pipe installed in 2016 / 2017, an IIV was installed on the new 90mm Polyethylene gas service pipe, immediately where the service pipe entered the basement, as can be seen from the photograph at Exhibit JAH13.

66. It should be noted that in order to disconnect the whole supply of gas to the Tower from the valves in the basement, it would have been necessary to isolate all of the isolation valves in the basement being the three BIVs on the vertical risers, the ECV on the 10" supply and the IIV on the new 90mm gas service pipe.

The Pipelines Isolation Valves

67. All three would have been located on the east elevation of the Tower, being the elevation of the Tower where all three supply pipes entered the building. All three would have been within close proximity to the Tower, in order to be compliant with the 1968 Guidance and IGEM/G/5.

68. Each Cadent Repair engineer carries a valve key and is equipped to operate PIVs. Once located, the Repair engineer could remove the valve chamber cover and operate the valve by using their valve key to turn the valve spindle. This would isolate the supply of gas to the building supplied by that gas service pipe.

The operation to isolate the supply of gas on 14 June 2017

69. On the morning of 14 June 2017 following a call made by the London Fire Brigade ("LFB") to the National Gas Emergency Centre at 03:25, Cadent's ER&R team attended the site of the Tower at 03:48 and was requested to standby by the LFB.

70. If Cadent attends an emergency incident at a MOB and it is necessary for it to isolate the supply of gas to the entire building, this can be achieved by either turning off the valves on the internal pipework within the building, or by operating the PIVs outside the building. The preferred option, following a dynamic risk assessment on site, would be to isolate the nearest upstream valve to any gas escape, if there is one, in order to minimise disruption to other customers within the MOB. However, if it is not possible to isolate by using valves, isolation can be achieved by carrying out isolation on the network. Our engineers' training and experience provides them with the necessary understanding of the gas networks and the practical considerations which must be taken into account when responding to an incident on the gas network. This enables them to respond to

dynamic incidents and to identify and implement the most effective response, including the appropriate method of isolation.

71. The operation of isolating the supply of gas commenced at around 07:45 on the morning of 14 June 2017 immediately following the LFB's confirmation to Cadent that it wanted Cadent to isolate the supply of gas to the building. Cadent engineers had been on site since 03:48 and had been formulating a plan to turn off the gas whilst awaiting instructions from the LFB. This operation was successfully completed at 23:30 on the evening of 14 June 2017 when the gas supply to the Tower was completely disconnected.

72. Isolation of the supply of gas to the Tower on 14 June 2017 was achieved by carrying out three physical isolations to the mains network outside the Tower. This was done by excavating the mains feeding gas into the Tower at three separate locations and stopping the flow of gas by cutting the mains at each of these points. These isolation points are identified at **Exhibit JAH14.** It will be seen from this exhibit that these locations were nevertheless still close to the Tower and our engineers were operating within dangerous and unsafe conditions. It was clear to our engineers that isolation of gas to the Tower could only be achieved by this methodology in the circumstances of this fire.

73. In making their decisions as to how to isolate the supply of gas to the Tower as quickly as possible on 14 June 2017, our engineers who were on site had the following information available to them:

    a. Many of the engineers who attended are experienced engineers who have been working on the North London network for a number of years. Some of the engineers had been carrying out unrelated repair works in one of the neighbouring streets to the Tower during the weeks leading up to the fire and therefore understood how the gas network worked in the vicinity of the Tower.
    b. Cadent, through its contractors tRIIO, had been undertaking riser replacement works at the Tower and accordingly a number of colleagues had a general understanding of the gas supply into and within the Tower. I understand that one of our contract managers who

had been involved in the riser replacement work rang one of the lead engineers who responded to the incident, Jason Allday, when Jason was on his way to the site to tell him what he knew about the gas supply at the Tower.

c. One of the contractors who had been working in the Tower also sent an email at 08:06am on the morning of 14 June 2017 to provide relevant information and a marked up map showing the location of the three gas supplies entering the east side of the building. This e-mail was sent on to the engineers who were on the ground. A copy of this e-mail is attached at **Exhibit JAH15**.

d. The engineers also obtained copies of the maps of the gas network around the Tower to help gain an understanding of where the mains were located. Our Emergency Call Operatives carry Go Books to all incidents which is a portable laptop that can be used to accept jobs, liaise with the Dispatch Centre and request further resources. They also have map applications which can be used to view maps of the gas mains. A copy of the map that our engineers had on 14 June 2017 is attached at **Exhibit JAH16**. Although the engineers who attended on 14 June 2017 would have known from the other sources of information mentioned above that the Tower had three supplies of gas entering the east elevation of the Tower, as is shown in Exhibit JAH1, the map of the gas supplies as it appeared on our system on 14 June 2017 only shows the 10" supply and the location of the PIV on the 10" supply.

74. Notwithstanding the different sources of information available, the decisions that our engineers had to make on 14 June 2017 were governed by what was possible to do under the conditions at the Tower. Isolating the gas by operating the PIVs was discounted by any of our engineers. It was plain to our engineers as soon as they arrived on site that disconnecting the supply of gas would have to be achieved by physically isolating the local gas distribution mains in the network and away from the immediate vicinity of the Tower.

75. Although I did not attend the Tower until the afternoon of 14 June 2017 (as I describe in my statement MPS00012831), the engineers who were first on site

have described to me how the whole Tower was engulfed in flames. Burning pieces of debris were falling from the Tower, and in large quantities, at the east of the building.

76. The engineers understood that residents were still being rescued and evacuated and that the priority was to get people out of the Tower. There was a real sense amongst everyone on site that the building was at risk of collapse. Members of the public were being kept away and a number of safety cordons were erected to prevent people approaching the Tower. The police had also erected an exclusion zone around the foot of the Tower where huge amounts of burning debris were falling and where our engineers understood victims had tragically perished. Although the Cadent engineers were permitted to pass through some of the safety cordons with the permission of the police, they were not permitted to get close to the Tower and enter the exclusion zone. They were instructed by the LFB to "stand by."

77. No attempt was made by any of our engineers to approach the eastern side of the Tower in an effort to find the exact location of the PIVs with a view to operating them given the nature and intensity of the fire and the debris created. As I understand has been illustrated by the footage of the fire disclosed by the Inquiry, the ground in the immediate vicinity of the foot of the Tower was covered by fallen debris and burning debris continued to fall from the Tower.

78. During the afternoon of 14 June 2017, one of our engineers was asked whether he would be prepared to enter the basement of the Tower and my colleague Jason Allday together with another colleague Patrick Kelly, accompanied by the LFB firefighters, entered the basement of the Tower in an effort to see whether it would be possible to turn off the gas valves located in the basement.

79. As I understand he has described in his statement to the MPS (MET00012710), Jason Allday and Patrick Kelly entered the basement of the Tower at around 15:50 on the afternoon of 14 June 2017. This was the first opportunity to enter the building. Entering the basement of the Tower was difficult and dangerous. They were protected by police riot shields from the falling debris that was continuing to fall as they made their way into the basement. They were instructed to be very

careful where they walked and the firefighters cleared a pathway for them to enter the basement. They understood from what the emergency services told our engineers that the foot of the Tower was a crime scene as victims had perished there under what was a mountain of debris. The entrance to the basement was on the east elevation of the Tower, where the gas supplies entered the Tower.

80. Once inside the basement, Jason Allday could see two of the four risers within the basement. The valves were out of his immediate reach. They would have been accessible to engineers in the ordinary course of their duties. However, shortly after they had entered the basement, everyone within the Tower had to evacuate the building on the instruction of the LFB due to concerns about its stability. The basement was also flooded and when Jason Allday entered the basement he was knee deep in water and noted that there was still a live electricity supply to the basement. The circumstances that prevailed therefore precluded the Cadent team from making arrangements to access the basement valves with a view to their isolation.

81. During a recent site visit to the Tower on 3 September 2018 which was arranged to enable Cadent to inspect our installations within the Tower, we entered the basement which Jason Allday entered on the day of the fire. This confirmed for me that isolating the gas supply by operating the valves in the basement would have been impossible. The basement itself is a rabbit warren of utility apparatus; it is vast and the layout complex. The isolation valves are located at high level (as is permitted by IGEM/G/5) and dispersed geographically far from each other. Jason would have had to install a ladder or scaffolding in the basement to access the valves and would have had to take tools to operate the valves. The task of isolating the gas by operating the valves in the basement could have taken hours. These valves are intended to be used for maintenance and safety; they are not intended to be used in cases of emergency.

The accessibility of PIVs

82. It is a common occurrence for PIVs to be covered over or otherwise rendered inaccessible by building owners or contractors undertaking work on their behalf. This occurs without liaison or notification to the relevant gas distribution network

operators. With this in mind, our surveys require us to state whether PIVs can be visually identified at the premises surveyed.

83. A review of our records has revealed that the last periodic inspection of the gas risers at the Tower prior to 2016 was undertaken in 2008 by National Grid. A copy of that 2008 survey is attached at **Exhibit JAH17.** I note from this survey that only the 10" supply was shown on the maps of the gas assets attached to survey; the 4" service pipeline is not shown on the map, but has been drawn on the map attached to the survey by the engineer who completed the survey. Based on this information, it is likely that both PIVs were then present and accessible. The engineer who completed this survey has passed away and we have therefore been unable to clarify this further.

84. We are aware from the September 2016 survey that PIVs could not be seen. In order to understand more about this, we have checked with our two engineers who visited the Tower in 2016. Unfortunately they are unable to recall the specifics of this routine visit. We do however know that the survey took place after the refurbishment work had been completed. I understand from Cadent's legal advisors that there is mention in the contract documentation for the refurbishment work to external landscaping work. It seems that paving work to the exterior of the Tower was part of the package of works envisaged and it is likely therefore that the PIVs on the original two gas supplies to the Tower were paved over[1].

85. The new 90mm gas supply, installed in 2016-2017, post-dated the refurbishment works and so its PIV would not have been paved over in this way. I attach as my Exhibit **JAH18** an "as laid" map dated 6 February 2017 which tRIIO created following a site visit to the Tower. This map shows the location of the PIV on the new 90mm gas supply. In our recent inspection of the Tower we established that the PIV for the new supply is currently buried under a concrete plinth that has been erected since the fire to allow lift access to the Tower from the exterior of the building. We were therefore unable to verify the exact location and accessibility of the PIV on the new supply. The other two PIVs would have been located either side of that 90mm PIV but these were not visible on the site visit (consistent with

1 Inquiry documents RYD00092648; RBK00018809; and RBK00018810

the 2016 survey). There is much equipment still being used on the site which may also explain this, but, as indicated in the contract documentation for the refurbishment works, it appeared that the whole area around the perimeter of the building on all elevations has been paved over rendering these two PIVs inaccessible.

Reflections

86. I have reflected on whether there was anything I personally, or the operational team could have done differently, or would have done differently to isolate the gas supply to the Tower had we known everything that we know today. I do not think that we could have done anything differently faced with the intensity of the Tower fire. Isolating the gas by cutting and capping the gas mains at the three identified points was the only viable option available to the Cadent team. Under the circumstances, it was the most effective way of isolating the gas supply to the Tower.

Statement of Truth

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

Signed: JAMES HARRISON

Dated: 19th October 2018