Inspection of the North Wales Fire and Rescue Service to consider the effectiveness of its response to domestic dwelling fires

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Contents

Executive summary

1. This report sets out the findings of an inspection of the North Wales Fire and Rescue Service undertaken in January and February 2025 using the same methodology as that for the 2024 inspections of South and Mid & West Wales Fire and Rescue Services.

2. The purpose of the inspection was to assess the operational effectiveness of the Service when responding to domestic dwelling fire incidents.

3. The incident type selected for analysis was dwelling fires where fire and heat damage was recorded beyond the room within which the fire had started. These incidents present significant risk to Firefighters, trapped occupants and to the dwelling itself.

4. A total of 139 incidents occurring between 1 April 2021 – 31 March 2023 were analysed in detail.

5. The findings of the incident analysis are consistent with that of the South Wales and Mid & West Wales inspections, set out within the reports published on 9 October 2024 and 15 January 2025 respectively.

6. Given the weight of evidence available to me I consider that the operational tactics employed by the Service, at a substantial number of incidents, have placed Firefighters at unnecessary risk and/or resulted in avoidable damage to properties.

7. The underlying reason for this is that much of the content of the structural firefighting training delivered by the Service reflects tactics partially introduced in the late 1990s, several of which were not scientifically proven at the time or designed for use within the UK.

8. The position in North Wales is compounded by the withdrawal of legacy Service Operational Policy and Procedure Orders and their replacement with Aide Memoirs. This creates a significant gap in operational guidance. It also leaves the Service exposed through the absence of suitable and sufficient Operational Risk Assessments for all incident types, including dwelling fires, which is a legal requirement.

9. Of significant concern is the lack of resourcing available to the Service in respect of its managerial and wholetime operational response capacity. The number of Middle Managers is largely predicated on that required for operational cover purposes. This is not the same as the minimum number required to adequately resource all essential functional roles. The same is true of Supervisory Manager numbers in functional roles.

10. Substantial capacity exists within the station work routine for wholetime Firefighters conditioned to the shift and day crewing systems. The recommendations of the 2021 Thematic Review into Fire and Rescue Service capacity should be actioned without any further delay to safely release this capacity to increase the training necessary to address the issues identified through this report and risk

reduction activity. This capacity however cannot realistically be deployed to fill gaps in functional areas. It also does not mean that there are enough wholetime appliances available to the Service to deliver an effective cover model considering the geographical challenges and population distribution.

11. The issue of the resourcing of the Service falls outside the scope of this inspection however it is a cause for concern and one that needs to be addressed.

12. The training facilities available to instructors cannot fully recreate scenarios that are reflective of the modern fire environment. There is an opportunity for the Service to significantly improve training facilities through the development of a new Training Centre. This should be progressed as a priority.

13. Operational assurance is a challenge for the Service particularly in remote rural locations. The operational assurance arrangements within the Service largely reflect the available resourcing. There is no dedicated Operational Assurance Team to attend incidents solely for the purposes of active monitoring and to undertake post incident audit and review. Instead, active incident monitoring is undertaken by duty Officers.

14. There is a well embedded hot debrief process which has the confidence of Firefighters. Access to the outcomes from structured debriefs however is limited to a dedicated Teams channel which restricts visibility for station-based Firefighters.

15. The lack of any available near miss reports from incidents is a concern.

16. It has not been possible to avoid replicating the recommendations within the South and Mid & West Wales reports in this report as the issues identified are identical.

17. The underlying issues highlighted across all the inspections predominantly relate to legacy National Operational Guidance. The publication in October 2024 of the ‘Foundation for firefighting’ and ‘Firefighting’ operational guidance and the relevant recommendations in this and the previous inspection reports should serve as a catalyst for the pan Wales development of operational guidance and training based on the most current research and designed in such a way to be of maximum utility to Firefighters.

18. The recommendations made in this report in relation to the operational assurance process reflect those made to Mid & West Wales Fire and Rescue Service as the geographic challenges are very similar.

19. It is important that I again make the point that the observations made in this report are not intended and nor should they be taken as a criticism of North Wales Firefighters, Officers or their training instructors.

20. The levels of engagement with all staff throughout the inspection were excellent. Firefighters, Officers and training instructors were very receptive to the adoption of evidence-based tactics and enhancements to the operational assurance process.

21. The recommendations in this report should be acted on without delay to ensure they are operating to the safest possible systems of work.

Introduction and background

22. The inspection of North Wales Fire and Rescue Service (NWFRS) during January and February 2025 is the last in a series of three inspections to consider the effectiveness of the Welsh FRS when responding to domestic dwelling fires. There is significant duplication between the three inspection reports. This duplication occurs predominantly with the explanation of how a fire in a room develops, how the tactics employed by the FRS affect the outcomes of the incident and with the description of the background to the development of recent operational guidance in the UK FRS. There is also duplication with the findings and recommendations as many of the issues identified are the same.

23. The incident type presenting greatest risk to Firefighters, members of the public and their homes are fires in domestic dwellings, whether they be started accidentally or deliberately. Information relating to these incidents is captured through the Incident Recording System (IRS) and is published on the Welsh Government StatsWales website[1].

24. To maintain consistency, I analysed the same data set as I had for the South Wales and Mid & West Wales inspections. The figures for NWFRS are as follows:

- 2020/21 (387 incidents);
- 2021/22 (429 incidents); and,
- 2022/23 (380 incidents).

25. I again focused specifically on dwelling fire incidents where fire or heat damage was recorded beyond the room in which the fire started, referred to from here on in as the Room of Origin (ROO). This is because these are the most serious of this incident type.

26. Over the 3-year period this amounted to a total of 139 incidents, although on analysing each incident log in detail I established that 42 incidents had been miscoded leaving an actual total of 97 incidents that met what I considered to be the true definition of fire or heat damage spread beyond the ROO within a domestic dwelling.

27. The definitive point of reference for any incident is the incident log held on the mobilising system. The incident log is a digital record that is generated from the first 999 call to the Service and contains every single transaction relating to the incident including all messages sent from the incident ground. I was given full access to the NWFRS mobilising system (CAD View) by the Chief Fire Officer (CFO). To triangulate the information contained within the incident logs I accessed fire investigation reports where they were available.

28. Prior to undertaking the inspection fieldwork, I reviewed all relevant operational guidance and associated training materials which I accessed live through the NWFRS intranet (Hwb Tân) and pdrPro/Learn Pro Operational Learning System. This

[1] Fires and false alarms (gov.wales)

consisted of Aide Memoirs, which NWFRS have introduced in place of Service Operational Policy and Procedure Orders (SOPPOs), the extant Service Administrative Policy and Procedure Order (SAPPO) for Operational Assurance, the draft Operational Assurance Policy and Procedure along with training materials relevant to the same.

29. The fieldwork included focus groups with Compartment Fire Behaviour Training (CFBT) instructors, Station and Group (Middle) Managers conditioned to the flexible duty system, structured interviews with the Operational Guidance Manager, the Training Programme Development Manager, the Group Manager with responsibility for fire investigation, the Group Manager responsible for operational assurance and station visits at 3 wholetime shift, 3 wholetime day crewed and 3 Retained Duty System (RDS) stations.

30. This report sets out the findings of the inspection and builds on the recommendations made in previous Thematic Review inspection reports.

31. The **first section** of the report contains:

- a review of the data;
- an explanation of how a fire develops within a room;
- how the tactics employed by the FRS affect the outcome of the incident; and,
- what the data shows for NWFRS.

32. The **second section** of the report is aligned to the Health and Safety Executive (HSE) publication HSG 65 Managing for health and safety (pre 2013 version) and considers NWFRS operational policies in so far as they exist through Aide Memoirs, the organisational arrangements to deliver operational policy and how operational performance is monitored, audited and subject to review.

33. The **third section** of the report contains a series of recommendations designed to improve Firefighter safety and the operational effectiveness of NWFRS.

Section 1

A review of the data - Incident Recording System (IRS)

34. In NWFRS Fire Control complete the IRS with information passed to them by the Incident Commander.

35. The IRS records the extent of damage caused by the fire along with details of any injuries or fatalities. It also records where there is no structural damage and no firefighting action. An example would be where residual oil in a grill pan momentarily ignites to generate sufficient smoke to actuate a smoke alarm, resulting in the mobilisation of the FRS. This is the largest single subset of data accounting for between 58 - 65% of all dwelling fire incidents responded to by NWFRS over the reference period and is shown in Table 1 below.

Table 1: No structural damage or firefighting action (overall %)

	2020/21	2021/22	2022/23
Total incidents	387	429	380
No structural damage	227	249	247
No structural damage %	59%	58%	65%

36. The IRS records whether fire or heat damage is contained to the ROO or if it has spread beyond the ROO. It also records the extent of fire or heat damage at the arrival of the FRS. Table 2 below shows the % of dwelling fires confined to the ROO.

Table 2: NWFRS dwelling fires confined to the ROO (overall %)

	2020/21	2021/22	2022/23
Total incidents	387	429	380
Confined to ROO	339	375	330
Spread beyond ROO	48	54	50
Confined to ROO %	88%	87%	87%

37. The subset of incidents where there is fire or heat damage beyond the ROO can be further broken down to incidents where there is (a) no fire or heat damage beyond the ROO on the arrival of the FRS (i.e. the fire is still in the ROO on the arrival of the FRS and then spreads subsequently) or (b) where it is recorded that there is fire and heat damage beyond the ROO on the arrival of the FRS.

38. Table 3 below shows a breakdown of fire and heat damage beyond the ROO broken down into reported as beyond ROO on arrival or fire and heat damage in ROO only on arrival.

Table 3: NWFRS dwelling fires spread beyond ROO

	2020/21	2021/22	2022/23
In ROO on arrival	6	5	3
Beyond ROO on arrival	37	45	43
Total fires spread beyond ROO (IRS)	43	50	46

39. As previously stated, of the 139 incidents in the data set, 42 had been miscoded which left an overall total of 97 incidents that fell within the analysis parameters. A typical example of a miscoded fire from the NWFRS analysis was where the fire occurred within a caravan as opposed to within a house or a flat. Where a fire starting externally had extended into the property to cause fire or heat damage within a room, which then spread beyond the ROO I included these incidents in the analysis.

40. Table 4 shows a breakdown across the 3-year reference period of the 97 incidents that fell within the parameters of the analysis split between in ROO on the arrival of NWFRS or beyond the ROO on the arrival of NWFRS.

Table 4: NWFRS dwelling fires subject to detailed analysis in this report

	2020/21	2021/22	2022/23
In ROO on arrival	5	5	2
Beyond ROO on arrival	25	27	33
Total fires spread beyond ROO (inspection analysis)	30	32	35

An explanation of how a fire develops in a room within a dwelling

41. The following is intended as a simplified explanation of how a fire develops in a room within a dwelling. It duplicates the corresponding section in the South Wales and Mid & West Wales FRS inspection reports published in October 2024 and January 2025 respectively and is provided to set context for the reader without going into excessive detail. It is concerned with a fire that has already ignited in a room within a dwelling and not the mechanisms that cause ignition.

42. For a fire to be sustained it requires heat, fuel, oxygen and an ongoing chemical chain reaction.

43. On the arrival of the FRS a fire in a room within a dwelling will be in one of two states, fuel controlled, or ventilation controlled. The fuel-controlled fire will have sufficient oxygen available such that its growth will be limited only by the item or items (fuel) on fire and their heat release rate (HRR).

44. The HRR is the amount of thermal energy generated by the items (fuel) involved in a fire, measured in Kilowatts (KW) or Megawatts (MW). HRR is not the same as temperature. As an example, a modern single upholstered chair may burn with a flame temperature of 800 degrees centigrade and generate a HRR of 2MW, whereas a modern 3-seater sofa may also burn with a flame temperature of 800 degrees centigrade but generate a HRR of 5MW. Modern, synthetic (plastic) based materials generate a significantly greater HRR than traditional materials. They also consume approximately twice the amount of oxygen than traditional materials to generate the increased HRR.

45. Research demonstrates that an item on fire with a HRR of 2MW (a modern single upholstered chair), can with sufficient available oxygen, cause all the combustible items (fuel) in a room to ignite simultaneously[2]. This transition is called a flashover and will almost certainly result in heat or fire damage beyond the ROO. Suffice to say conditions within a post flashover room are almost certainly unsurvivable for trapped occupants or Firefighters wearing personal protective equipment (PPE) and Breathing Apparatus (BA)[3].

46. In the incipient stages of a fire, the fire is most likely to be fuel controlled.

47. In steady state the concentration of oxygen in air is 21%. A fire becomes ventilation controlled when the oxygen concentration in a room on fire drops from 21%, to below 16%, because of the fire consuming the available oxygen faster than it is replenished by air circulating from outside the room. At this point flaming combustion cannot be sustained and the fire goes into decay.

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[2] Fire Dynamics in Structures| FSRI Safety Academy

[3] Heat Transfer and PPE| FSRI Safety Academy

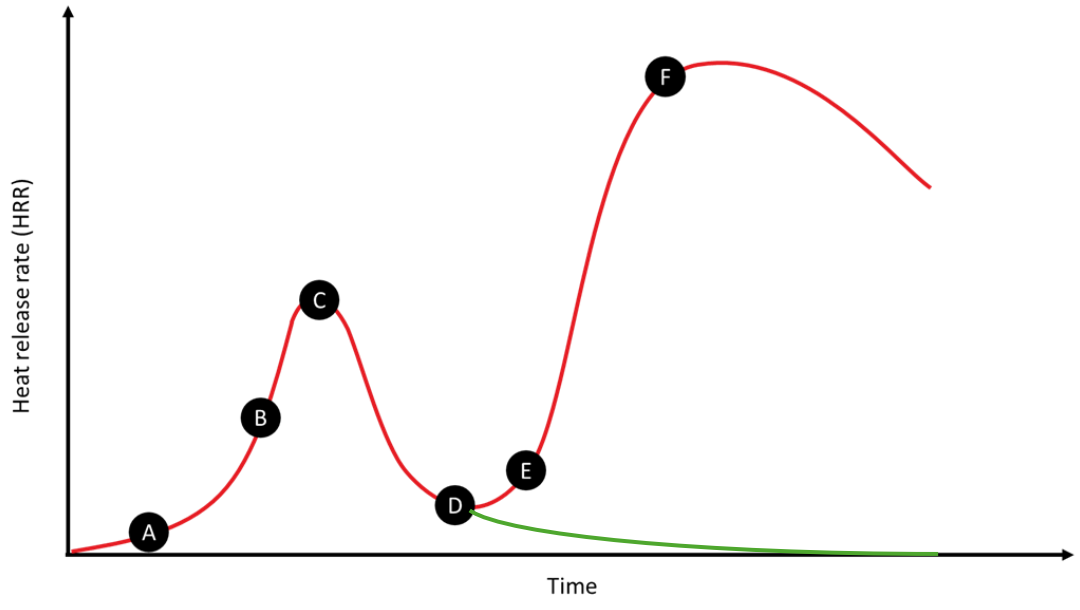
48. The substantial amounts of international research undertaken over the past 10 – 15 years have shown that in rooms furnished with synthetic based materials this occurs within 2-3 minutes, and before a fire in a room transitions to flashover[4]. In essence, this is no different from the science experiment in which a lit candle placed inside an upturned glass jar will burn out after a few minutes, once it has consumed more of the oxygen within the jar than is needed to support combustion.

49. A fire in this state can smoulder for an extended period before eventually it will self-extinguish if there is no change to the supply of oxygen to the fire (the ventilation profile). Such a fire will however generate large volumes of turbulent smoke which is itself combustible, and which will contribute to rapid fire development if there is a change in the ventilation profile.

50. While the fire is stable for as long as the ventilation profile remains unchanged it still presents very significant hazards to trapped occupiers and Firefighters. In all likelihood it will not extend beyond the room of origin without outside intervention (such as Firefighters making entry through an external door and introducing oxygen), nor will it reach flashover.

51. The graph at Figure 1 below shows the typical progression of a fire in a room with a fuel load that has a sufficient HRR to transition the room to flashover (and therefore extend beyond the ROO).

Figure 1: Typical progression of a fire in a room with a fuel load that has a sufficient HRR to transition the room to flashover



[4] 20150116-ba-ul-fsp-it-depends-descriptive-research-into-fire-growth-and-the-chances-of-survival.pdf (nipv.nl) (Dutch research)/All UL FSRI research studies

Points A - C indicate the development of a fire in a closed room from ignition through to the point where the oxygen content in the room drops below 16%.

Point C – D shows a reduction in HRR because of there being insufficient oxygen available within the room to sustain flaming combustion. The fire at this stage is ventilation controlled. If there is no outside intervention, the fire will slowly decay, smoulder and self-extinguish, as shown by the green line.

Point D – F shows a change in the ventilation profile which can occur when Firefighters make an entry into the property to fight the fire. This is because Firefighters often do not close over the door through which they have made entry into the property, to control the inflow of oxygen. At this point the HRR and temperature accelerate rapidly. If air flow into the room isn't controlled or if enough water isn't directed onto the fire or into the room on fire, then the room can transition to flashover in less than a minute.

52. This is an extremely hazardous situation and has resulted in Firefighter injuries and fatalities in the UK and across the world.

53. Science dictates that the high pressure generated by the expansion of gases heated by the fire will move towards the lower pressure at the ventilation opening and that the hot fire gases will move towards the cooler air at the ventilation opening. This can place Firefighters in between the fire and the outlet (exhaust) vent for the fire gases. In the absence of refuge behind a closed door, their only defence in these circumstances is a high flow rate of water directed at the fire.

54. The combination of uncontrolled ventilation and/or the utilisation of ineffective firefighting tactics has been a factor in almost every UK Firefighter fatality occurring within a structure fire in the last 30 years[5].

55. It may be very difficult, if not impossible, for the first attending Crew or Watch Manager to determine the status of the fire on their arrival. Flaming combustion will be evident with a fuel-controlled fire. A ventilation-controlled fire however is likely to generate large volumes of turbulent smoke which would make it very difficult for the first attending Crew or Watch Manager to determine whether there was fire or heat damage beyond the ROO even if they were undertaking thermal scanning using a Thermal Imaging Camera (TIC).

56. As stated previously international scientific research[6] shows that any fire involving an item or items which have a sufficient HRR to transition the compartment to flashover, will become ventilation controlled with 2-3 minutes unless there is an unlimited supply of oxygen available.

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[5] Fatal incident reports – Wealmoor Warehouse fire, Atherstone on Stour/ Balmoral bar fire, Edinburgh/Shirley Towers, Southampton/Bethnal Green Road, London et al

[6] All UL FSRI studies 2010 – present, Brandweeracadamie (2014, 2015, 2016, 2018)

57. Typically, this would require the room door to be open and a door to the property or several large windows to be fully open. In North Wales and across the UK, other than on the warmest of days, this is unlikely. Equations 18 and 19 on p.91 -92 within the Swedish publication entitled 'Enclosure fires' written by Lars-Goran Bengtsson reference Thorntons rule and the calculations for required ventilation openings to generate HRRs *(1m x 1m = 1.5 MW, 2m x 1m = 4.5 MW, 2m x 1m + 1m x 1m = 10.5 MW)*. Similar calculations are referenced within the 2018 Brandweeracadamie publication 'The Renewed View of Firefighting[7]' at p. 13 *('Per square metre (m2) surface area of an opening, 1.5–3 MW of heat release rate can be developed'*).

58. That being so, it is possible that many of the fires subject to this analysis were contained in the room of origin at the time the FRS arrived. Some of the fires that extended beyond the room of origin most likely did so because of the actions of Firefighters in re-ventilating the fire prior to the application of sufficient volumes of water, by them not controlling the door by which they entered the property.

59. In the section on incident analysis, I highlight the number of incidents when the first attending Crew or Watch Manager describes smoke issuing from the property rather than flames showing. This would be an indication of an under ventilated fire.

60. In the interests of accuracy, I should highlight the deficiencies within the IRS in this context. Field 8.20 of the IRS asks, 'What was the extent of flame and/or heat damage on arrival?'. A drop-down menu then offers several choices including 'Limited to the room of origin', 'Limited to the floor of origin (not whole building)' right the way through to 'Whole building'. Depending on the position of the fire within a compartment it is possible that there would be heat damage in an adjacent compartment without fire spread, for example a synthetic based material starting to melt. To remove any ambiguity this question might be better phrased 'What was the extent of fire damage on arrival?'.

61. For most incidents, the messages on the incident log made it clear that there was fire and heat damage beyond the ROO. As a due diligence exercise, I reviewed where available fire investigation reports for incidents where it was reported through the IRS that there was fire and heat damage beyond the ROO on the arrival of the FRS.

62. The photographic evidence available to me showing fire progression confirmed that there was substantial fire damage beyond the room of origin. What the photographs also showed was that the initial tactics employed (high pressure hose reels capable of low flow rates on an interior attack) would have exposed Firefighters to unnecessary risk and would have taken longer to supress the fire than using a low pressure, high flow alternative (therefore resulting in unnecessary damage).

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[7] 20180423-BA-The-Renewed-View-on-Firefighting.pdf (nipv.nl)

How the tactics employed by the FRS affect the outcome of the incident

63. Over the 3-year data analysis period there was a total of 1196 domestic dwelling fire incidents across North Wales at which for 139 incidents fire or heat damage was recorded beyond the ROO.

64. Through access to the NWFRS mobilising system I was able to analyse the incident logs of each of the 139 incidents in detail. Through this analysis I established that 42 incidents did not meet the criteria of fire and heat damage beyond the ROO so were discounted from any further analysis leaving a total of 97 incidents.

65. For each incident I recorded the following information:

- The response time of the first attending appliance (taken from time of alert to time in attendance)
- The elapsed time from the time of the first appliance in attendance to the time of the first informative message which stated the operational tactics in use
- The elapsed time from the time of the first appliance in attendance to the time of the second appliance in attendance
- The content of the first informative which stated the operational tactics in use (i.e. 2BA 1HRJ which stands for a 2-person Breathing Apparatus team deployed with a high-pressure hose reel)
- Any significant information from the first caller or first appliance in attendance (i.e. 'Smoke issuing' or 'Well alight')
- Room of origin and property type (i.e. Kitchen, Living Room, Bedroom, Terrace, Semi Detached, Detached)
- Any relevant information from the Stop[8] message including the extent of overall damage

66. This information allowed me to establish what the initial caller had witnessed and how long it had taken the first fire appliance to arrive from that point. For example, a caller reporting heavy smoke issuing is an indication of a ventilation-controlled fire. Similarly, I could establish what the first attending Crew or Watch Manager had witnessed to give me a sense of the state of the fire at that point and how it might have developed from the time of the first call.

67. The room of origin gives an indication of the fuel loading, and the type of property gives an indication of the likely size of the compartments within the property. As an example, a 3-seater sofa in a living room or a mattress on a king size bed in a bedroom can generate a HRR of 5MW whereas chipboard kitchen units may only generate a HRR of 1.5MW. The intensity of a bedroom or living room fire is therefore likely to be greater than that of a fire in a kitchen.

[8] A Stop message is sent from the incident ground by the Officer in Charge to confirm that no further FRS resources will be required at the incident.

68. The first informative message gives definitive information on the tactics in use at first intervention which is critical to the subsequent development or otherwise of the incident. The extent of damage, typically stated on the Stop message confirms the amount of overall damage sustained at the dwelling.

69. At the time of this inspection (January/February 2025) the extant FRS National Operational Guidance (NOG) for dwelling fires was contained predominantly within 'Foundation for firefighting', 'Firefighting' and 'Fires in buildings'. 'Foundation for firefighting' and 'Firefighting' were published on 1 October 2024.

70. FRS NOG can best be described as generic risk assessments presented in the form of hazard and control measure statements which are developed by the National Fire Chiefs Council (NFCC) for policy writers within each FRS to use to form the basis of local Standard Operational Procedures (SOPs) or equivalent. NOG also includes a small number of 'Foundation' publications which provide technical information to support Operational Guidance. Once such example is 'Foundation for firefighting'.

71. I will address NOG and NWFRS Aide Memoirs in so far as they concern dwelling fires later in this report but for the purposes of this section, I offer the following definitions which are deliberately simplified and assume no knowledge on the part of the reader. These definitions, offensive exterior attack' and 'offensive interior attack', are drawn from the Dutch 4 Quadrant Model[9].

72. Similar terminology has been introduced within 'Firefighting' NOG (proactive exterior fire attack and proactive interior fire attack') but the Dutch 4 Quadrant Model is well established, recognised and long predates the 'Firefighting' operational guidance.

73. A Crew or Watch Manager in charge of the first appliance to arrive at a dwelling fire incident should undertake an initial assessment of the scene to gather hazard information to inform decision making in respect of the control measure tactics they will employ to safely resolve the incident.

74. International research[10] identifies that the most effective control measure tactic to reduce risk to Firefighters and trapped occupants at a dwelling fire is to apply water onto the fire or at least into the room on fire in the shortest possible time. The quickest method to do this is to direct water into the room from outside the structure using either a high-pressure hose reel jet or a low-pressure jet on a straight stream which in NWFRS will be via a 45mm delivery hose (preferably the latter for reasons explained below). For the purposes of this report, I will refer to this control measure tactic as an 'offensive exterior attack'. To be effective it is however reliant on using sufficient flow rate alongside the correct techniques to minimise air entrainment and maximise internal water coverage within the affected room.

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[9] 201411-BA-Quadrant-Model-for-Fighting-Structure-Fires.pdf (nipv.nl)

[10] 20170926-BA-The Offensive exterior approach (nipv.nl)/All UL FSRI research

75. An offensive interior attack is when Firefighters, typically in 2-person team multiples wearing BA (from here on in referred to as a BA team), enter the affected property to locate and then fight the fire with some form of firefighting media. This can take longer to achieve, even when the location of the fire, and the quickest route to it, is known.

76. This is because Firefighters must progress through heavy smoke, heat and humidity while manoeuvring a high-pressure hose reel or a low pressure 45mm delivery hose, sometimes through several rooms and around numerous obstructions.

77. At this point it is necessary to make a distinction between the capabilities of the high-pressure hose reel versus the low pressure 45mm delivery hose.

78. Every fire appliance in NWFRS carries 2 x high pressure hose reels. They are stowed in lockers on either side of the fire appliance and coiled on a drum for ease of deployment. Each hose reel consists of 3 x 20m lengths of 19mm diameter hose with the final length of hose terminating in a branch (the device that controls the flow of the water discharged out of the end of the hose, usually supplied with a pistol grip and on on/off mechanism known as a bale). They operate at between 25 – 30 bar pressure and can flow up to 110 litres of water per minute (lpm). This is known as the flow rate. The primary advantage of the high-pressure hose reel is that it can be quickly deployed and that it is easier to manoeuvre than a low pressure 45mm delivery hose. A significant disadvantage is that the 110 lpm flow rate is inadequate to effectively supress a fully developed (post flashover) fire in a room.

Note: Hose reel tubing of 22mm diameter provides almost twice the flow rate of 19mm hose reel tubing and is in use in several UK FRS[11]. NWFRS are considering the provision of 22mm hose reels on front line appliances

79. Each fire appliance in NWFRS carries up to 4 x 25m lengths of 45mm low pressure delivery hose and up to 6 x 25m of 70mm low pressure delivery hose. At stations with high rise properties on the station ground an additional 2 x 51mm lengths are carried in the Cleveland coil configuration. At one end of the hose is a male coupling and at the other end of the hose is a female coupling. The male coupling on the first length of hose is inserted into an outlet (delivery) on the fire pump and the branch is inserted into the female coupling at the other end of the hose. If more than one 25m length of hose is required, the male coupling on the second length of hose is inserted into the female coupling on the end of the first length of hose and so on until the required total length of hose is reached. The total length of hose is known as a line. In NWFRS there are typically 3 delivery outlets from which to run hose lines on fire appliances.

80. The 70mm low pressure delivery hose is used to supply water from a fire hydrant into the fire appliance water tank to augment the water supply or to initiate a

[11] Flow method | Fire Protection Association (thefpa.co.uk)

hose line prior to adding low pressure 45mm delivery hose at the end of the line to be used on an interior attack, as it is easier to manoeuvre than the 70mm variant. Appliance tanks in NWFRS hold 1800 litres of water.

81. A low pressure 45mm delivery hose typically operates at between 3 – 7 bar pressure and can flow up to 685 lpm dependent on the type of branch utilised. The primary advantage of the low pressure 45mm delivery hose is that the flow rate is sufficient to effectively supress a fully developed (post flashover) fire in a room. It is however more difficult to manoeuvre than a 19mm high pressure hose reel. Hose management can be a physically demanding task which requires regular practice to perform effectively.

82. In some UK FRS fire pumps are equipped with flow meters which allow the pump operator to observe the actual flow they are delivering to the Firefighters through the low-pressure hose line. NWFRS pumps are not currently equipped with flow meters, but this is something that the Service are moving towards providing as it is difficult for a pump operator to accurately estimate flow rates without them.

83. At all 97 incidents at least one high pressure hose reel was utilised. From analysis of the incident logs, it is almost certain that the high-pressure hose reel was the first and subsequent firefighting media deployed, and at all but 11 incidents in an offensive interior attack. As an example, the first informative message at 86 incidents was either 2BA 1HRJ, 4BA 2HRJ or at one incident 6BA 3HRJ which means a BA team of 2 Firefighters equipped with a high-pressure hose reel or 2 or 3 x BA teams of 2 Firefighters each equipped with a high-pressure hose reel. At the remaining 11 incidents there was no reference to BA being in use on the first informative message which strongly indicates the fire was being fought externally.

84. At only one incident was a low pressure 45mm delivery hose stated as being utilised. However, at 85 of the 97 incidents the Crew or Watch Manager providing information for the IRS report stated that there was fire or heat damage beyond the ROO on their arrival which indicates a fully developed (post flashover) fire.

85. On a small number of informative message reference was made to a safety jet. This is a line of low pressure 45mm delivery hose which should be charged with water and of equal length to any hose line (high or low pressure) deployed for the purposes of interior attack. It is intended to be available for use should there be any adverse development with the incident, particularly one that renders the primary attack line inoperable. While the logic for this is sound, it does not negate the need for the primary attack line to be capable of effectively dealing with any fire for which it is deployed.

86. A safety jet deployed outside the dwelling primarily as a back-up will be of no use to BA teams deployed on an interior attack with a high-pressure hose reel in the event of a deterioration of the fire conditions.

87. By the time any subsequent BA team had deployed the safety jet it would be too late to mitigate the effects of rapid-fire development on any BA teams already within the dwelling.

88. There were a small number of incident logs when the first informative message expressly stated that the fire was being fought externally due to the severity of the fire (my assumption). On station visits Firefighters stated to me that they had attacked dwelling fires externally when the fire had vented through a window on their arrival. They did not however have knowledge of the technique by which this control measure tactic should be applied to achieve the maximum cooling effect through water mapping. The analysis of incident logs shows that on the 11 occasions when an exterior attack has been undertaken as an initial tactical option, a high-pressure hose reel (as opposed to a 45mm low pressure hose line with a much higher flow rate) was utilised. This would account for why the tactic would have had limited success and that fire and heat damage would have been subsequently recorded beyond the ROO.

89. I expressly asked Firefighters how they attacked a fire when deployed on an offensive interior attack. The responses varied dependent on the levels of exposure the Firefighters involved had to dwelling fires (mostly them having had very little) so it was not possible for me to form a definitive conclusion around tactics commonly employed.

90. Over the last two decades UK Firefighters have been trained to cool fire gases using pulses of water on a spray setting from a high-pressure hose reel as they progress towards the fire. This will almost certainly be ineffective against a high HRR fire. It can result in Firefighters being subject to excessive thermal insult and unnecessary damage being caused to the property through taking longer to control the fire.

91. Dutch research demonstrates that arching a straight stream of water from a low-pressure high flow delivery hose achieves greater temperature reductions than pulsing with a high-pressure hose reel when advancing towards a fire[12]. In addition, it was found to be an easier technique to achieve than pulsing in a spray pattern.

92. A low-pressure delivery hose can also achieve a substantial reach (more than that achievable by a high-pressure hose reel) which places a greater distance between the Firefighters and the fire thus reducing thermal insult.

93. I return to these issues in greater detail further on in this report however one of the Dutch principles set out within the 2018 publication 'The Renewed View of Firefighting' is of relevance here:

> *'Gas cooling has limitations and is predominantly effective in small spaces (maximally 70 m2 and with a maximum height of 4 metres) (Lambert & Baaij, 2011). It is important to keep the depth of the attack as short as possible and to apply water to the fire as quickly as possible. Extinguishing the fire is the best form of gas cooling'.*

[12] 20211207-BA-When-water-goes-up-in-smoke.pdf (nipv.nl)

What the data shows for NWFRS

94. To help inform my analysis I created a table for the 3-year data set that captured critical information that described the state of the fire from the perspective of the first arriving Crew or Watch Manager. Despite the exact terminology differing slightly, I was able to determine two distinct groupings.

95. The first was when the property was described as ‘well alight’ or words to that effect. This indicated to me a well-developed post flashover fire that may well have spread beyond the ROO on the arrival of the FRS. This amounted to 71 incidents from the 97 total.

96. The second was where the term ‘smoke issuing’ or words to that effect were used. This indicated to me a ventilation-controlled fire that was unlikely to have spread beyond the ROO on the arrival of the FRS. This amounted to 12 incidents from the 97 total.

Table 5: Incident ground messages describing the state of the fire on arrival at the incident

	020/21	021/22	022/23	Total
Well alight	15	27	29	71
Smoke issuing	8	3	1	12
				83

97. At all 71 incidents when the property was described as well alight a high-pressure hose reel flowing in the best case 110 lpm and almost always on an offensive interior attack was utilised. On the offensive interior attack this has almost certainly exposed Firefighters to peak HRRs well in excess of what a high-pressure hose reel is capable of effectively suppressing.

98. At all 12 incidents when smoke was described as issuing from the property on arrival of the FRS, thus indicating a ventilation-controlled fire contained to the ROO, fire and heat damage beyond the ROO was subsequently recorded as having occurred. This strongly suggests that full room involvement and fire spread has occurred after the deployment of Firefighters on an offensive interior attack using a high-pressure hose reel. It is likely that this has happened through an absence of door control at the point of entry thus causing the fire to become reventilated with the corresponding rapid increase in temperature and HRR that is more difficult to supress with a high-pressure hose reel capable of a low flow rate. The heightened risk to Firefighters and of additional damage to the property will be self-evident in these circumstances.

99. At 12 incidents the Crew or Watch Manager providing information to Fire Control to complete the IRS report stated that the fire was in the ROO on their arrival but subsequently spread beyond the ROO. At all 12 incidents the first tactic employed was an offensive interior attack using a high-pressure hose reel. At 5 of the incidents

the phrase ‘well alight’ or words to that effect were used to describe the fire. This strongly suggests that insufficient weight of attack combined with the absence of ventilation control has contributed to the deterioration of the incident following the arrival of the FRS. The heightened risk to Firefighters and of additional damage to the property will again be self-evident in these circumstances.

100. The following text is copied from the ‘The Renewed View of Firefighting’ and is directly relevant here:

> *‘Research shows that an attack with sufficient cooling capacity in the fire room, or as close to the fire room as is possible, is most effective. So if this can be done, this is the approach to take. As long as the building remains closed, there is still time. Therefore, the adage is: When everything is closed, the fire is at a pause. Creating an opening is to step on the accelerator’.*

101. Oxygen will reach the fire far more quickly than Firefighters deployed on an offensive exterior attack if the opening through which they enter isn’t controlled. This will cause a ventilation-controlled fire to grow rapidly. The situation is compounded by Firefighters only having an available flow rate of 110 lpm. This is an extremely dangerous combination that can absolutely be avoided.

102. The NWFRS mobilising system functionality includes a filter option to list informative messages in chronological order. On a sizeable number of incidents, the spread of the fire from the first to subsequent informative messages is starkly illustrated (i.e. spreading from ground to first floor or first floor to attic space).

103. Given the weight of evidence available I consider that the control measure tactics employed have on a substantial number of occasions resulted in Firefighters being unnecessarily exposed to a level of hazard that had the potential to cause serious injury or worse and/or that avoidable damage to property has occurred.

104. In the next section of this report, I consider the underlying causes as to why this might be.

Section 2

Operational policy – background

105. Regulation 3 of the Management of Health & Safety at Work Regulations 1999 places a duty on employers to make a suitable and sufficient assessment of the risk to the health and safety of its employees to which they are exposed to while at work. FRS are therefore required to produce risk assessments setting out hazards and control measures for all activities including responding to dwelling fires.

106. The NFCC produces NOG on behalf of the FRS sector across the UK. NOG can best be described as incident specific generic risk assessments presented in the form of hazard and control measure statements which are developed nationally for policy writers within each FRS to use to form the basis of local Operational Risk Assessments (ORAs), SOPPOs or equivalent. This is intended to assist the FRS to meet its duties under Regulation 3 of the Management of Health & Safety at Work Regulations 1999.

107. When NOG was conceived the intention was to replace all previous nationally published FRS guidance (Generic Risk Assessments (GRAs), Fire and Rescue Service Manuals, Dear Chief Officer Letters etc) by consolidating guidance in one place and with a structure that was simple to understand and easy to navigate. The following description is copied directly from the NOG website[13]:

> 'Operational Guidance spans a wide range of activity. There is a structure to make sense of it all; it uses the hazards encountered at incidents and the measures used to control or eliminate them. The guidance is structured so that it starts with the elements that affect all incidents, then explores the environments in which fire and rescue services work, and finally the activities that are carried out'.

108. At the time of writing the 'Foundation for firefighting', 'Firefighting' and 'Fires in buildings' is the relevant extant NOG in the context of this inspection. 'Firefighting' and 'Fires in buildings' fall within the 'Activity' section of NOG.

109. The 'Foundation for firefighting' and 'Firefighting' were published on 1 October 2024 to replace the legacy operational guidance 'Fires and firefighting'. NWFRS provide a link to the NOG website on Hwb Tân through which any employee with a NWFRS email address can create a NOG account.

110. The content of 'Fires and firefighting' was largely based on 'Fire Service Manual Compartment Fires and Tactical Ventilation' which was first published in 1997 to replace amongst others the legacy Manual of Firemanship Book 6a 'Practical Firemanship' (the legacy Manuals date back many years hence the male gender

[13] About Operational Guidance - NFCC

specific terminology). The contents of Book 6a were to an extent still based on the essays of James Braidwood (the founder of what is now the London Fire Brigade and the first CFO to have introduced internal firefighting) written in the 1800s and which strongly advocated tactics such as controlling the flow of oxygen into a structure (anti ventilation) along with applying enough water onto a fire in the shortest possible time (all the control measure tactics advocated through international research and supported by science).

111. 'Compartment Fires and Tactical Ventilation' was strongly influenced by two studies commissioned by the Fire Research Development Group in 1994, and which are referenced in the 'Compartment Fire Behaviour Training' section of the Thematic Review report on Operational Training[14]. These reports considered firefighting tactics developed in Sweden and the approach to tactical ventilation utilised in America at the time. The reports recommended both tactical approaches for adoption by the UK FRS. It should be noted that the intent of both reports was to reduce losses to the insurance industry rather than to achieve any improvements to Firefighter safety.

112. The Swedish approach[15] had been developed by Matts Rosander (a fire behaviour training instructor) and Krister Gisselson (a fire engineer) in the late 1970s in response to a spate of Firefighter fatalities at incidents in Sweden. This consisted of a full system inclusive of new equipment, tactics and training facilities.

113. The Rosander and Giselsson system was designed primarily for use in Swedish apartments built from concrete, that were well insulated, with triple glazed windows that could be expected to still be intact when the FRS arrived. Fires in these circumstances will almost certainly be ventilation controlled. Unlike in the UK and in NWFRS, BA teams in Sweden consist of three Firefighters. The third Firefighter, who performs the role of team leader, holds the door closed behind the two remaining Firefighters in the team to prevent the ingress of oxygen into the room on fire, thus limiting the chances of rapid-fire development (smoke curtains were not widely used at this time). Critically, the system was only ever intended for use in small residential compartments with limited fire loads (and therefore HRR potential) when compared to larger commercial or industrial compartments.

114. When creating their system, Rosander and Giselsson spent two years working with a manufacturing company to develop the Fogfighter branch. This became the universally used firefighting branch in Sweden for over 20 years. It was designed to have the optimum droplet size on a spray setting for the purposes of cooling fire gases through pulses of spray as the Firefighters progressed through the structure towards the room on fire. It was (and still is) used with low pressure 38mm delivery hose and can deliver a flow rate of 300 lpm. This cooling of fire gases through the pulsing technique combined with controlling the inflow of oxygen is what in very simplistic

[14] Thematic Review of operational training within the Welsh Fire and Rescue Services

[15] This description is taken from a comprehensive report into NOG written in 2017 by Lee Johnston, a Station Manager in West Sussex FRS

terms prevents a ventilation-controlled fire developing as rapidly as is seen in Figure 1 in Section 1 of this report.

115. Once the Firefighters close in on the room on fire, they switch from pulses of water in a spray pattern at the branch to cool and dilute fire gases to a straight stream of water to extinguish the fire with the maximum achievable flow rate.

116. In NWFRS (and across much of the UK), the door through which Firefighters enter a property is not routinely controlled to prevent the inflow of oxygen. The implications of this are set out within Section 1 of this report.

117. As has been demonstrated through the analysis of incident data in Section 1, the default firefighting medium in NWFRS is the 19mm high pressure hose reel which is capable of a flow rate of 110 lpm on a straight stream but in practice would deliver far less than 110 lpm when discharging pulses of water using a spray pattern for the purposes of gas cooling and dilution when progressing towards the fire. The pulsing technique, albeit with a 19mm high pressure hose reel as opposed to a low pressure, high flow delivery hose, is the only substantive element of the Rosander and Giselsson system that has been adopted and embedded as a tactic across the UK and within NWFRS.

118. The position is compounded when considering the American approach to ventilation advocated within ‘Compartment Fires and Tactical Ventilation’, namely ‘vent early, vent often’ which is the opposite of what the UK FRS had practiced up until 1997 when ventilation overwhelmingly took place only once a fire was extinguished.

119. There are many differences between FRS in the UK and Fire Departments in America. Fire stations in America are typically crewed by an Engine Company and a Ladder Company. Both will typically arrive at an incident at the same time.

120. The Engine Company provide large volumes of water for the purposes of offensive exterior or interior attack through 1 ½, 1 ¾ or 2-inch diameter low pressure delivery hoses (38mm, 45mm or 51mm). In America the domestic water supply is drawn from the fire main (400mm diameter plus) which is the opposite to the position in the UK where fire hydrants are located on domestic water mains (100mm diameter) so there is usually no shortage of water available in urban areas across America.

121. Ladder Company Firefighters have typically utilised their apparatus (the equivalent of an extendable turntable ladder in the UK) to access the roof to cut a vertical outlet (exhaust) vent through which smoke and fire gases exit the structure using natural buoyancy. When coordinated with an offensive interior attack to supress the fire this is undoubtedly an effective tactic, (notwithstanding the damage to the roof made by creating the vertical vent) and will result in improved conditions for Firefighters and trapped occupants. If, however, water is not applied to the fire at the same time as the fire is ventilated then rapid-fire growth inevitably follows when modern synthetic based building contents are involved leading to a significant deterioration in conditions.

122. This technique may well have been successful in the days when lower HRR building contents would have been involved in fire as the fires may well have been fuel controlled rather than ventilation controlled. There is however very little, if any, margin for error with the typical modern fire loads of today when dealing with a ventilation-controlled fire. As a result of research carried out by Underwriters Laboratories Fire Safety Research Institute (UL FSRI) many US Fire Departments no longer practice this tactic.

123. Vertical ventilation (creating an outlet vent in the roof) is not a tactic which has gained significant traction in the UK. Horizontal ventilation through opening doors or windows is however much easier to achieve. Up until 1997 and the publication of 'Compartment Fires and Tactical Ventilation' UK Firefighters would not routinely ventilate at fires within buildings until the fire had been extinguished. That undoubtedly changed after 1997.

124. 'Compartment Fires and Tactical Ventilation' strongly advocated the advantages of ventilation but was less explicit over the disadvantages and the imperative to simultaneously apply water to the fire at the same time as ventilation is undertaken. To an extent this was reflected in the 'Fires and firefighting' and 'Fires in buildings' NOG although there were/are several explicit references to the effects of uncontrolled ventilation on a fire without concurrent water application within NOG. This has been addressed to an extent in 'Foundation for firefighting' and 'Firefighting'.

125. The following is copied directly from the Executive Summary of the 2017 report authored by Station Manager Lee Johnston of West Sussex FRS entitled 'Firefighting guidance in the UK: A proposal to move to an evidence-based strategy'.

> *'UK firefighting guidance underwent a complete transformation between 1994 and 1997. Following a programme of research aimed at reducing the financial losses from large fires, UK fire service guidance began advocating an American-style ventilation strategy combined with a Swedish-style suppression strategy.*
>
> *However – neither strategy was fully implemented; neither was fully suited to the UK fire environment; the two approaches had not been designed to work together; US ventilation theories were not based on scientific evidence and have since been disproved; and both the US and Sweden have moved on in many ways from the strategies that they used in the 1990s, while the UK has not'*

126. In my view this is an accurate reflection of the position in the UK and in NWFRS in respect of the control measure tactics typically employed at dwelling fires and why that is.

Operational policy – NWFRS Aide Memoirs

127. Operational guidance within NWFRS is contained within Aide Memoirs accessed through the Technical Operations page on Hwb Tân. There is also a link to the NOG website on the Technical Operations page.

128. Historically NWFRS published SOPPOs which were aligned to the legacy Generic Risk Assessments (GRA) index that was replaced by NOG. SOPPOs have been archived by NWFRS and replaced by Aide Memoirs. Officers explained to me that when NOG was first introduced there was a strong desire within NWFRS for simplification and for the consolidation of guidance from multiple locations into one portal. A NOG product envisaged at the time to assist this process was the 'Service Integration Tool'. It was the view of Officers that this tool, accompanied by updated Aide Memoires would provide the appropriate operational doctrine and policy that would negate the need to update what was considered a significantly outdated suite of SOPPOs. Effort was invested into updating the operational Aide Memoires, so that they reflected local and national control measure tactics and so that this information would be available to crews at the incident ground. However, a delay in the introduction of the Service Integration Tool has left a substantial gap for NWFRS. I return to this point in the summary of this section.

129. GRAs were published by the UK Lead Government Department for the FRS which at various times has transitioned between the Office of the Deputy Prime Minister, the Department for Communities and Local Government (and various iterations thereof) and the Home Office. The purpose of GRAs was broadly similar to that of NOG, to provide guidance to FRS policy writers when developing local ORAs, SOPPOs or equivalents.

130. Aide Memoirs are typically included at the front end of an ORA or SOPPO to be accessed via Mobile Data Terminal on route to or when first in attendance at an incident to act as a prompt for the initial Incident Commander on hazards and control measure tactics. They do not usually extend beyond two pages and do not contain the detail that would be found within an ORA or SOPPO.

131. NWFRS have produced the following Aide Memoirs relevant to hazard knowledge and firefighting control measure tactics in domestic dwellings:

- F (7) Fireground hydraulics & flow rates (5 pages)
- F (17) Fires in basements (2 pages)
- F (18) Fires in thatched roofs (2 pages)
- P (5) Positive pressure ventilation (1 page)
- T (1) Timber framed building fires (2 pages)
- T (2) Fires in tall buildings (6 pages)

132. The format of the Aide Memoir is to a greater extent standardised and consists of the following sections:

- Introduction
- Hazard knowledge (or Significant hazards and risks)

- Control measures (under the heading of ‘Incident Commanders should’)

133. The hazards listed in the Aide Memoir are denoted by a NOG hazard symbol (to indicate a direct lift from NOG). The control measures listed in the Aide Memoir are either denoted by a NOG control measure symbol (to indicate a direct lift from NOG) or an NWFRS badge symbol (to indicate a local control measure).

134. For the purposes of this inspection, I reviewed the following Aide Memoirs as they contain content directly relevant to this analysis:

- F (7) Fireground hydraulics & flow rates
- F (17) Fires in basements
- F (18) Fires in thatched roofs
- P (5) Positive pressure ventilation
- T (2) Fires in tall buildings

NWFRS Aide Memoir content analysis

135. NWFRS does not have a single definitive Policy that sets out its position in respect of firefighting tactics in dwellings or any structure fire. Structural firefighting guidance is instead spread across the Aide Memoirs listed previously. Aide Memoirs for structural firefighting are limited in scope and do not reflect all the hazard and control measure knowledge set out within the 'Firefighting' and 'Fires in buildings' NOG or the 'Foundation for firefighting'.

136. The absence of overarching guidance for structural firefighting, or any substantive ORA for all aspects of fire and rescue operational activity (technical rescue, hazmat etc) is an omission which I believe leaves NWFRS exposed. Following my feedback to this effect to Principal Officers prior to the publication of this report, the Service has taken steps to implement a solution working with South and Mid & West Wales FRS.

137. On every station visit Firefighters recognised that Aide Memoirs were limited in scope and strongly expressed a preference for one single point of reference for firefighting guidance containing sufficient and all-encompassing detail on hazards and control measure tactics. Firefighters did however state that Aide Memoirs were a useful point of reference to act as a prompt on the incident ground.

138. Aide Memoir **F (7) Fireground hydraulics and flow rates** provides guidance to Firefighters on weight of attack which is a critical control measure.

139. The 'Introduction' section contains the following text:

> *At its simplest, the flow rate is the amount of extinguishing media being applied to a fire at any one time, referred to in litres per minute (L/min).*
>
> *Required flow rate may be simply viewed as the amount of firefighting media required to control and ultimately extinguish a fire.*
>
> *This introduces many variables; more precisely two flow rates need to be considered:*
>
> - *Critical Flow Rate (CFR): typically this would be the absolute minimum amount of firefighting media flow needed to fully suppress a fire at any given level of involvement*
> - *Tactical Flow Rate (TFR): the target flow for a primary attack hose line or lines*

140. This is an abridged version of the text contained within EuroFirefighter, Chapter 12, Adequate 'Firefighting Water' – you need this! (p. 235) authored by the late Paul Grimwood. The actual text from EuroFirefighter is as follows:

> *Critical flow-rates, below which a developing fire is unlikely to be controlled during the growth or steady state periods. (2.0 L/min/m2)*

Minimum flow-rates where suppression is achievable but Firefighters may be exposed to longer duration fires and more punishing conditions. (3.7 L/min/m2)

Optimum (adequate) flow-rates where control of the fire is achievable without unnecessary punishment to Firefighters. (6.0 L/min/m2, two dwelling rooms totalling 32m2). 6.5 L/min/m2 (commercial building fire 50-100m2)

Note: 'Optimum' means the absolute minimum amount required to extinguish a certain sized fire effectively and safely. A secondary safety (back-up) line of at least equal flows should always be provided in addition, in support.

141. There is a substantial difference between the Paul Grimwood definition of the Critical Flow Rate and that in the Aide Memoir. If the definition of Critical Flow Rate is to remain in the Aide Memoir, then it should reflect the version from EuroFirefighter.

142. The 'Hazard knowledge' section continues with the following:

…The mathematical calculations for the amount of water required to extinguish a given fire are relatively complex. However, as a fire ground rule of thumb, for fires from 50 to 600m2 the following calculation could be considered:

Optimum flow rate (L/min) = fire area (m2) x 5

143. Aside from the fact that this is control measure knowledge rather than hazard knowledge it is again is an abridged version of text contained within EuroFirefighter, Chapter 12, Adequate 'Firefighting Water' – you need this! (p. 236/7). The actual text is as follows:

Based on the author's earlier research from 100 fires in London in 1989 and the GCU research described here, a series of rough fire ground rule of thumb guides were developed for UK national operational guidance (NOG) as follows:

- *Area of fire (m2) multiplied by 5 (for fires involving between **100-500 m2** of floor area) A x 5 = required flowrate (L/min) - (A = Area of floor in m2)*
- *One low flow handheld fire stream (350 L/min) (say 100 galls/min) per 75 m2 of floor area fire involvement*

144. **Where the fire area is less than 120m2 the fire-ground rule-of-thumb is inadequate** and where fire areas >600m2 it begins to estimate very high flow-rates. Therefore, the fire-ground formula A x 5 is only suited for use within the parameters as discussed above. **Where deployment is for a fire area less than 120m2, the minimum target flow-rate on any primary attack hose-line should be 200-500 L/min (1 or 2 x 22mm hosereels) on high pressure or 350-500 L/min on low pressure**. (Also, see guidance in chapter 3 – Fire Dynamics).

145. The text highlighted in bold is my emphasis. At no point does the text in the Aide Memoir state the minimum target flow rate on any primary attack line should be 200 – 500 lpm which cannot be achieved with the 19mm hose reel in use within NWFRS.

146. The graph at Appendix 1 shows a minimum flow rate of 200 lpm for residential, hotel, office, shop and other fires but this may not be obvious to the reader. There were no Firefighters, Crew or Watch Managers who were aware of the appendix when I asked the question on station visits.

147. This should be addressed as a priority.

148. The 'Introduction' section of Aide Memoir **F (17) Fires in basements** states the following which is drawn directly from the Hazard Knowledge section of the 'Fires in basements' chapter within the 'Fires in buildings' NOG:

> *'Fire behaviour in basements is unpredictable and they may behave in a similar way to highly insulated buildings; the highly insulated space may allow for more intense and rapid fire growth'.*

This statement in isolation is misleading. A highly insulated space will limit the amount of oxygen available to the fire which will in turn limit fire growth which is the opposite of '*more intense and rapid fire growth'*. It is followed by the sentence copied below:

> *'There is likely to be a lack of ventilation within the basement, however some ventilation may be provided by means of pavement lights and doors. There is a risk of rapid fire development or backdraught during opening of such vents during firefighting operations'.*

149. I can understand why this has been copied directly from NOG, but it is not well worded. It would be much clearer to the reader if it was explained unequivocally why the highly insulated space will limit fire growth i.e. due to the limited availability of oxygen, but when oxygen is introduced then rapid-fire growth will invariably follow if the fire is not suppressed concurrently. An additional sentence which explains that insulation limits external oxygen supply and clearly states that uncontrolled ventilation of the basement will invariably lead to rapid fire growth of a ventilation-controlled fire if concurrent suppression is not undertaken would remove any ambiguity.

150. The following quote from James Braidwood should be the guiding principle in respect of ventilation for any compartment fire, basement or otherwise:

> *The door should be kept shut while the water is being brought, and the air excluded as much as possible, as the fire burns exactly in proportion to the quantity of air which it receives - James Braidwood, 1866*

This highlights the need for an overarching ORA or hazard and risk control statement covering all the generic hazards arising from structure fires including ventilation-controlled fires which may be more likely in, but are certainly not limited to, basements.

151. Page 2 of F (17) contains a list of 6 single sentence considerations for the Incident Commander in respect of control measure tactics for basement fires which is fine for an Aide Memoir but in no way qualifies as suitable and sufficient for a comprehensive ORA.

152. I have included Aide Memoir **F (18) Fires in thatched roofs** in this analysis as there were several incidents in the analysis when fires spread either from rooms within the dwelling to roofs or from the roof into the dwelling.

153. The 'Introduction' section of F (18) states that 'Thatched roofs are designed to repel water making traditional firefighting tactics ineffective'. As obvious as this might be this is still sound guidance. There were several incidents included within the incident analysis in Section 1 which involved roof fires, all of which, from the informative messages, appeared to have been attacked externally using what would be considered 'traditional firefighting tactics'.

154. Page 2 of F (18) contains a list of ten single sentence considerations for the Incident Commander, of which three constitute firefighting control measure tactics:

- *Consider creating a firebreak to prevent fire spread, considering the time to implement*
- *Consider separating burning material from the fire using heavy plant and extinguishing it*
- *Consider requesting or using lances to penetrate thatch – (i.e. Wildfire vehicle, Pinzgauer, Bremach)*

This is entirely suitable for an Aide Memoir but in no way qualifies as suitable and sufficient for a comprehensive ORA.

155. Aide Memoir P **(5) Positive pressure ventilation** consists of a single page and a fourteen-bullet point list which sets out the criteria for using positive pressure ventilation preceded by a statement in red font and capital letters that makes it clear that PPV is to be used in post fire situations only.

156. This is entirely suitable for an Aide Memoir but in no way qualifies as suitable and sufficient for a comprehensive ORA.

157. The 'Introduction' section of **T (2) Fires in tall buildings** states that 'This Aide Memoir is to assist the initial Incident Commander with initial firefighting, command and sectorisation considerations'. It then runs to 6 pages containing numerous bullet points which takes it beyond being a prompt for an initial Incident Commander.

158. In the 'Hazard Knowledge' section ten hazards are listed including the following which are specific to initial firefighting:

- *Failure of compartmentation*
- *Undetected fire spread*
- *Flashover and backdraught*
- *Torch and coandra (sic) effect*

159. There is no further detail provided as to what any of these hazards are and how they might be identified which is fine for an Aide Memoir but not if the necessary underpinning knowledge detail is not available to Firefighters elsewhere.

160. This is followed by an 'Initial Actions' section which details the actions to be undertaken by the first attending appliance commander. This includes the following direction:

> '*A fire suppression crew must **NOT** be committed until the safety crew/jet is established*'

This is followed by an Operational Tactics section which lists 23 considerations including the following:

- *Identify the location of the fire, materials involved and any potential for flashover or backdraught*
- *Ensure an adequate water supply based on the flow requirements of multiple jets being used at height*
- *Consider requesting aerial or special appliances to reduce risk, demand on resources or external main if internal mains fail*
- *Continually monitor and assess the fire development for signs/symptoms of escalation*
- *Consider the effect of firefighting tactics/flow path of smoke on evacuation routes*

These are all effective prompts for Incident Commanders which would apply to any structure fire, tall building or otherwise, but they only feature in this one Aide Memoir. The earlier point over absence of underpinning knowledge detail elsewhere refers.

Of concern however is the following bullet point:

- *Use minimum extinguishing media considering the appropriate weight of attack*

161. The appropriate weight of attack will be determined by the tactical flow rate referenced earlier in this section. This bullet point should either be deleted or reworded to make it clear that the appropriate weight of attack should be established through the correct application of the fireground formula.

162. What then follows are 'Further Considerations' in relation to 'Access & egress', 'Tactical Ventilation' (referenced below) and 'Control measures for entrapment' taking the length of the Aide Memoir to 6 pages.

163. Under the heading 'Further Considerations – Tactical Ventilation' 11 considerations are listed which include the following:

- Consider the isolation or containment of the fire compartment
- Put covering jets in place prior to the creation of exhaust vents where possible
- Consider leaving unopened doors closed to prevent the unnecessary spread of smoke and fire gas travel whilst maintaining access, egress and ventilation

164. Isolation or containment of the fire compartment is a valid control measure tactic at any structure fire as is leaving unopened doors closed.

165. At mid to upper floors at a tall building fire, covering jets can only be achieved through deployment of an aerial monitor or a floor below branch which are not currently utilised within NWFRS. This should be made clear within the text.

166. As stated previously these are all effective prompts for Incident Commanders which would apply to any structure fire, tall building or otherwise, but they only feature in this one Aide Memoir. It is a substantive omission that there is no all-encompassing guidance in respect of underpinning hazard or control measure tactic knowledge available to Firefighters elsewhere. I return to this point in the summary section.

Operational policy - summary

167. The purpose of an Aide Memoir is to act as a prompt to Incident Commanders for initial actions to be considered while on route to or when first in attendance at an incident. Aide Memoirs undoubtedly have a place. On station visits Firefighters, Crew and Watch managers all stated that they were a useful point of reference at incidents. They cannot however replace the detail that should be present within ORA or SOPPO hazard and risk control statements covering all aspects of structural firefighting. The delay in the introduction of the 'Service Integration Tool' has left a gap in the NWFRS suite of operational policy documentation which needs to be filled without delay. Without addressing this immediately, the Service will be failing in its duties under Regulation 3 of the Management of Health and Safety at Work Regulations to provide a suitable and sufficient risk assessment of the risk to Firefighters at incidents.

168. I have made this known to NWFRS Principal Officers who have to their credit taken immediate action to engage with South Wales FRS to access and adopt the structural firefighting guidance developed by their Officers in response to Recommendation 2 of the October 2024 South Wales FRS inspection report as an interim measure pending further collaboration on a pan Wales basis.

169. The following is repeated from the South and Mid & West Wales FRS inspection reports.

> *The National Fire Protection Association (NFPA) 1700 'Guide for structural firefighting' is the American version of the 'Foundation for firefighting, 'Firefighting' and 'Fires and firefighting' and 'Fires in buildings' NOG. The 'Tactical Considerations for Fire Control and Extinguishment' set out in Chapter 10 have been developed from the UL FSRI research undertaken over the last 15 years and referenced heavily in this report.*
>
> *Chapter 10 is the best example I have seen of a clear and unambiguous articulation of control measure tactics ranging from what would be considered in the Dutch 4 Quadrant Model as a Defensive Exterior Attack, right the way through to an Offensive Interior Attack with an easily understandable explanation of how each is executed in practice. What Chapter 10 also does is to differentiate firefighting attack control measures from tactical ventilation control measures using the distinct headings of 'Water' and 'Air'.*

170. The firefighting guidance developed by SWFRS takes this into account and represents an exemplar of good practice. It is undoubtedly a strong foundation for the three Welsh FRS to build a standardised approach to operational guidance across Wales. On every station visit the view was expressed by Firefighters that a single point of reference for firefighting control measure tactics was necessary. The guidance produced by SWFRS would meet that requirement.

171. Accordingly, I make a recommendation to that effect in Section 3 of this report.

Organisational arrangements for the delivery of operational policy

172. Operational Policy is predominantly imparted to Firefighters through their initial and ongoing training. There are three phases to Firefighter training in NWFRS:

> Phase 1 Initial Skill Acquisition – Wholetime duty system Firefighters undertake an initial 14-week training course split between the Dolgellau training centre and the Rhyl fire station complex covering all core skills. The RDS Firefighters initial acquisition program is delivered over three modules. Module 1 is a 6-day initial firefighting skills course, Module 2 is a 10-day BA initial course and Module 3 is a 4-day RTC course. The wholetime 14-week initial course and RDS Modules 1 and 2 cover input on hazard knowledge and control measure tactics for fighting fires in dwellings.
>
> Phase 2 Development to Competent - For wholetime and RDS Firefighters' initial skill acquisition training is followed by a 24-month period within which the wholetime Firefighter is expected to move from development to competent to achieve the Skills for Fire & Rescue diploma apprenticeship and the RDS Firefighter to achieve the Skills for Fire & Rescue custom certificate. Wholetime and RDS Firefighters undertake 6 monthly assessments against all core skill areas over a 24-month period.
>
> Phase 3 Maintenance of Competence – NWFRS utilises the pdrPro competency recording system to implement a risk-based approach to competency maintenance training and assessment. The pdrPro system is linked to the Learn Pro Learning Management System which consists of what is a limited number of theoretical training packages on structural firefighting. In the structured interview with the Training and Development Manager it was acknowledged that NWFRS Learn Pro content for structural firefighting fell a long way short of what was required and was in the process of being reviewed. Recruit initial training packages are available through Hwb Tân. This is supplemented by periodic structured skill maintenance training courses delivered by instructors at Dolgellau, Rhyl and at the compartment fire behaviour demonstration unit at Broughton Airbus factory in Flintshire.

173. For the purposes of this inspection, I reviewed the following training packages which apart from Tactical Ventilation packages were accessed through the Operational tab on the Learn Pro home page. The Tactical Ventilation packages were accessed through the Additional Station Learning tab also on the Learn Pro home page.

- Fire behaviour (5.08)
- Tactical ventilation (3.06)
- Tactical ventilation – NOG v2
- Fires in buildings: basements, tunnels, atriums – NOG
- Fighting fires in tall buildings – NOG
- Fireground hydraulics and flow rates

174. I also reviewed the following presentations which I accessed through the Training and Development page on Hwb Tân:

- BA 14 Fire behaviour and compartment fires
- BA 15 CFBT fire attack

NWFRS training package analysis

175. The **Fire behaviour (5.08)** presentation dates to the late 1990s and is based on the content of the legacy 1997 Fire Service Manual 'Compartment Fires and Tactical Ventilation'.

176. It consists of an Aims and a Learning Outcomes slide followed by 6 sections:
- Section 1: Mechanisms of Combustion
- Section 2: Compartment Fires
- Section 3: Key Control Measures
- Section 4: Branch Techniques and Operational Considerations
- Section 5: Firefighting at an Incident
- Section 6: Operational Considerations

177. The presentation concludes with a Summary slide followed by an assessment.

178. The sequence in which information is presented is somewhat disjointed. Section 2: Compartment Fires contains 15 slides, which for the most part describe hazard knowledge. On the slide entitled 'Flashover' there are two links embedded, one for 'Signs and symptoms' and the other for 'Key control measures'. This is not replicated for the 'Backdraught' slide.

179. The 'Key control measures' include:

- *Ensure proper protection…*
- *Stay low*
- *Use spray pulses at ceiling level…*

180. Given the extreme hazard to Firefighters from a flashover there is a need to expressly state what proper protection is. Staying low and using spray pulses at ceiling level will offer next to no protection to Firefighters from the heat flux of a flashover.

181. 'Section 3: Key Control Measures' consists of one slide containing 11 bullet points. There is no differentiation on the slide between the control measures for a flashover, backdraught or a fire gas ignition which are not necessarily all the same.

- *Ensure proper protection*
- *Keep door closed and cover with protective branch*
- *If possible, keep out of the room and ventilate from outside*
- *Ensure escape routes are protected*
- *Cool and ventilate outer compartments*
- *Plan escape route for gases before releasing them*
- *Stay low and to the side of the door*
- *Open the door slightly and direct spray upwards and into the room*
- *Cool the compartment as much as possible*
- *Keep out of the way of steam and hot gases*
- *Only enter room if required*

182. The first key control measure listed is ‘Ensure proper protection’ but again without any detail as to what this constitutes.

183. There is limited reference to anti ventilation and no reference at all to undertaking an offensive exterior attack both of which would be effective control measure which limited the risk to Firefighters in a potential flashover, backdraught or fire gas ignition scenario.

184. Section 4: Branch Techniques and Operational Considerations runs to six slides. The second slide is entitled ‘Extinguishing methods’ and states the following:

> *Extinguishing methods can be grouped under three main headings:*
>
> - *Gas Cooling*
> - *Indirect*
> - *Direct*

This is followed by a slide each setting out ‘Purpose’, ‘Branch’ and ‘Effect’.

> The slide entitled ‘Indirect techniques’ contains the following under the ‘Branch’ heading:
>
> - *Medium spray aimed above and around the fire*
> - *Branch must be moved around with pulsations to ensure maximum coverage*

185. In this context an ‘Indirect attack’ can be considered as the same as an offensive exterior (or interior) attack when it may not be possible to direct the water stream at the fire. The technique described is the opposite technique to how an offensive exterior (or interior) attack should be executed. A straight stream (or solid stream if using a smooth bore branch) should be held steady and directed on a steep angle at the ceiling of the affected compartment for minimum air entrainment and maximum water coverage. In an offensive interior attack scenario Firefighters would do the same using the reach of the stream to maximise the distance between them and the fire.

186. Under the ‘Effect’ heading the following bullet point is included:

> - *Lowers neutral plane, reducing vision and worsening conditions*

An effective offensive exterior or interior attack has been shown through research referenced earlier in this report to improve conditions significantly through supressing the fire. Content such as this serves to perpetuate the belief that flowing higher volumes of water on a straight stream worsens conditions when in fact the opposite is true. It should also be noted that a branch on a spray setting being moved around will entrain significantly more oxygen than a straight stream held steady.

187. ‘Section 5: Firefighting at an incident’ runs to five slides. The title slide contains the following guidance:

When Firefighters are inside a compartment they should always consider one of the following three options:

- *Maintain position: Protect position using gas cooling.*
- *Move forward: Attack fire gases using gas cooling with short or long pulsations.*
- *Withdraw: If conditions deteriorate, withdraw protecting themselves using gas cooling.*

Firefighters should try to use the minimum amount of water as effectively as possible, ensuring the neutral plane is kept as high as possible, whilst cooling the maximum amount of fire gases…

188. If Firefighters are attempting to fight a fire inside a fire compartment, then they are undertaking an offensive interior attack which places them at greatest risk. At no point is the option of an offensive exterior attack mentioned. Nor is there any explicit guidance over anti ventilation (reducing the amount of oxygen to the fire typically using door control thus limiting the HRR). The only branch technique advanced is gas cooling using pulses which offers the least protection to Firefighters as it flows the least water.

189. The comment that 'Firefighters should use the minimum amount of water as effectively possible' is deeply concerning. In these circumstances Firefighters should use the tactical flow rate required to effectively suppress the fire using the reach of the straight stream to put as much distance between them and the fire.

190. The presentation reflects guidance introduced in 1997 which has since been superseded. It is seriously dated and, in my view, should be withdrawn from Learn Pro.

191. The **Tactical Ventilation 3.06** presentation also dates to the late 1990s and is based on the content of the legacy 1997 Fire Service Manual 'Compartment Fires and Tactical Ventilation'.

It consists of an 'Aims' and 'Learning Outcomes' slides followed by 14 further sections:

- Section 1: What is Ventilation?
- Sections 2: Features of Smoke
- Section 3: Ventilation Types
- Section 4: The Effects of Wind
- Section 5: Assessing the Need for Ventilation
- Section 6: How Ventilation Will Be Achieved
- Section 7: Positive Pressure Ventilation
- Section 8: Considerations Prior to Ventilating
- Section 9: What is Positive Pressure Ventilation?
- Section 10: Incident Command - Initial
- Section 11: Operational Procedures
- Section 12: Sealed Rooms

- Section 13: Venting a dwelling
- Section 14: What to do if PPV does not Work

The presentation concludes with an assessment.

The opening slide contains the following text:

> *Welcome to the eDevelopment module on Tactical Ventilation Module.*
>
> *Tactical ventilation is the well planned and controlled ventilation of a building. It dramatically aids Firefighters committed into the risk area, assisting them in dealing with the incident as well as making it far safer by reducing the chances of backdraught.*
>
> *The content of this module is based upon Operational Risk Assessment 3.6 Fighting Fires using PPV and Fire Service Manual Volume 2 Compartment Fires and Tactical Ventilation.*
>
> *Further reference should be sought in Service SOPs and Training Manuals*

192. As stated previously GRA 3.6 and the Fire Service Manual 'Compartment Fires and Tactical Ventilation' have been superseded by the 'Firefighting' and 'Fires in buildings' NOG.

193. The definition of Tactical Ventilation on this slide does not align with the definition in the **Tactical Ventilation – NOG v2** presentation reviewed below and drawn from the extant 'Firefighting' NOG. It also claims to make the risk area far safer by reducing the chances of backdraught however this cannot be achieved by tactical ventilation alone.

194. 'Section 3: Ventilation Types' runs to four slides.

The slide 'Value of ventilation' has a picture of a fuel-controlled fire in what is most likely an open sided test rig with the following text:

> *What is the effect ventilation has had on this room?*
>
> *Try to think about the conditions that can be seen in this vented room and what it would mean for a firefighting crew e.g.*
>
> .
> - *Increased visibility*
> - *Improved conditions for potential casualties*
> - *Rapid discovery of the seat of the fire, quicker application of firefighting media to the seat of the fire*
> - *Reduction in compartment temperature*

Assuming the picture is from an open sided test rig, and it is unlikely it can be anything other than that, the ventilation profile in no way reflects a typical room in a dwelling which would almost certainly not be open sided and would have ventilation openings

limited to a door and windows. Venting what would be a ventilation controlled or limited fire in those circumstances without concurrent suppression would almost certainly result in the complete opposite outcome to that listed above. As an aside the same picture is used on the **BA 14 Fire behaviour and compartment fires** presentation reviewed below to demonstrate a flashover.

195. The following slide is titled 'Value of ventilation 2'. It contains the following text:

> *As long as ventilation is carried out safely and effectively there are enormous benefits for firefighting crews and occupants.*
>
> *However, great care must be exercised when employing tactical ventilation as a firefighting technique. This is because incorrect or random opening up of structures to facilitate ventilation could lead to uncontrolled fire spread!!*

There is no reference to the need for concurrent suppression with the appropriate weight of attack, which is how the hazard of uncontrolled fire spread is mitigated, on this or any other slide throughout the presentation.

196. The final slide in this section is entitled 'When to use ventilation'. It contains the following guidance:

> *…In the majority of instances, tactical ventilation should not be used until the fire has been located and, in all cases, an assessment must be made of the likely effects of ventilation…*

Ventilating without knowing where the fire is will almost certainly result in rapid fire growth. This should be explicitly stated after the sentence above so there is no doubt as to what the likely effect will be.

'Section 7: Positive Pressure Ventilation' consists of five slides. The slide entitled 'Definition of ventilation' contains the following text:

> *As you should have learnt in the first half of this module, the text book definition of ventilation is:*
>
> *"The systematic removal of heated air, smoke or other airborne contaminants from a structure, and their replacement with a supply of fresh air."*

This conflicts with the definition provided on the opening slide in the presentation and with the most current definition contained within the extant 'Firefighting' NOG copied below:

> *Ventilation can be defined as the removal of heated air and products of combustion, which are replaced with a supply of cooler, cleaner air.*

197. The next slide 'When to use positive pressure ventilation PPV' clearly states the following:

In order to avoid dangerous conditions level 1 Positive Pressure Ventilation must only be used when the FIRE IS TOTALLY EXTINGUISHED.

This is consistent with NWFRS policy set out within Aide Memoir **P (5) Positive pressure ventilation** which is reassuring despite much of the presentation content being significantly dated.

198. The slide titled 'Significant hazards and risks of PPV' contains the following guidance:

The most significant risk when using PPV is the likelihood that either the occupants or Fire Service Personnel within the building involved may become trapped between the fire and the outlet vent.

Internal conditions can worsen as follows:

- *The tactics involved in using PPV should not be initiated until it is certain the fire has been extinguished and an outlet vent has been created*
- *Ineffective use of PPV is likely to result in increased intensity of a fire thereby causing serious danger to persons within the structure*

This is sound guidance which applies to ventilation in general.

199. The remaining sections in the presentation are specific to post fire use of PPV and therefore remain relevant in the context of NWFRS policy.

200. Considering the observations of concern relating to this presentation there is still some relevant content that NWFRS may wish to retain. I will return to this point after reviewing **Tactical Ventilation – NOG v2**.

Tactical Ventilation – NOG v2 consists of four sections:

1. Introduction (6 slides)
2. Natural Ventilation
3. Forced Ventilation
4. Assessment

201. The first slide titled 'Introduction – What is ventilation?' contains the following definition:

*In simple terms ventilation can be **defined** as:*

'The removal of heated air, smoke or other airborne contaminants from a structure or other location and their replacement with a supply of cooler, cleaner air'.

This differs slightly from the version in the extant Firefighting NOG which was published in October 2024 and instead dates to the legacy 'Fires and firefighting' NOG.

While the difference is not substantive it does however highlight the need to update training materials when guidance is updated.

202. The second slide titled 'Introduction – What is tactical ventilation?' contains the following:

> *As part of an overall firefighting strategy, incident commanders should always have a clear and informed objective before commencing any form of ventilation activity. This will ensure that the full range of benefits of ventilating can be realised including:*
>
> - *Improving conditions for the survivability of building occupants*
> - *Improving conditions for Firefighters to enter and search*
> - *Reducing the potential for rapid fire development.*

It does not explicitly state anywhere in the presentation how these benefits will be achieved. For the first two bullet points to be achieved concurrent fire suppression will invariably be required. For the last bullet point to be achieved anti ventilation will invariably need to be employed (i.e. closing doors and windows to shut down the flow of oxygen to the fire).

There would be much merit in including a simple explanation to that effect.

203. The third slide titled 'Introduction – When can tactical ventilation be applied?' contains the following example:

> *After control but before extinction*
>
> *Example: A BA team are downstairs in control of the fire compartment (one seat of fire only) they do not want to necessarily extinguish the fire due to the excessive amounts of steam this may create within the building they have communicated that the fire is under control. A second BA team are searching on the first floor venting smoke filled rooms as they progress with their search for casualties.*

UL FSRI research disproves any concerns over excessive steam through fire suppression[16]. In this example it might be better to state that the downstairs BA team isolate the compartment by closing the door which would be an act of tactical ventilation in of itself (isolation).

204. The fourth slide in the Introduction section is titled 'Introduction – flow paths' and contains the following text:

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[16] Study of the Impact of Fire Attack Utilizing Interior and Exterior Streams on Firefighter Safety and Occupant Survival | UL's FSRI – Fire Safety Research Institute

In a building that has an unobstructed flow path from the inlet to the fire compartment, cooler, denser air will be entrained towards the fire area allowing movement of heat and smoke (high pressure) to all other areas of lower pressure.

If an under ventilated fire is suspected and entry has to be made, crews should be aware that by gaining access and progressing towards the fire compartment they may introduce oxygen into the structure, the movement of denser cooler air being entrained will create a natural flow path and may assist in bringing fuel rich flammable gases back into their flammable range as well as increasing the intensity of the fire's development.

Where possible crews should use anti-ventilation tactics and take control of the flow path to ensure the amount of oxygen available to the fire is minimised.

Crews should try and stay out of any flow path, in particular between the fire and any potential exhaust vent, this includes any windows that may not have already failed.

205. The first two paragraphs are essential hazard knowledge. The third paragraph is the first occasion anti ventilation, a substantial control measure tactic, is mentioned in the presentation. The fourth paragraph should be reworded to state that crews should **never** (my emphasis) position themselves between the fire and potential exhaust vent. There would be much merit in having the flow path slide at the front end of the presentation to give context to the following slides.

206. The fifth slide 'Introduction – Locating the fire' lists three considerations, the second of which is copied below:

In the majority of incidents, ventilation should only be used when a fire has been located and an assessment of the likely impact of ventilation has been taken into account. However, in circumstances where the location of the seat of fire is difficult for crews to establish, tactical ventilation may be used to clear adjacent compartments, corridors or staircases etc. to assist Firefighters in identifying the seat of fire, maintaining safe access and egress routes to and from a risk area and also mitigating or reducing the potential for phenomena such as fire gas ignition.

207. I appreciate the difficulties in wording this guidance to make it absolutely clear for the reader what is intended. To remove any ambiguity there may be merit in rewording the second sentence as follows (text in bold is my emphasis);

…tactical ventilation may be used to clear and isolate compartments, corridors or staircases etc ***confirmed to be not involved in fire****…*

208. The 'Natural Ventilation' section contains four slides which explain 'Natural', 'Offensive', 'Defensive' and 'Sequential' Ventilation respectively.

209. The ‘Forced Ventilation’ section contains eight slides which explain forced ventilation, methods of forced ventilation, when PPV can be used (with the clear direction that NWFRS policy is post fire suppression only), information gathering and preplanning, PPV techniques for single doors, larger openings, sealed rooms and sealed rooms within a compartment. This is followed by five appendixes and an assessment.

210. As stated previously despite the presentation being dated there is some relevant content within **Tactical Ventilation 3.06**. There would be merit in including the content of relevance highlighted earlier, within **Tactical Ventilation – NOG v2** in order to archive the former leaving a single point of reference for the subject matter.

211. **Fires in buildings: basements, tunnels, atriums – NOG** consists of an introduction page, nine content sections followed by knowledge check questions and an assessment. This includes sections covering cellular layouts, open plan layouts, mezzanines, heritage buildings and auditoriums. For the purposes of this analysis my focus was on the basements content due to the relevance to dwelling fires.

212. The first slide in the Basements section titled ‘Basements’ contains the following text:

> *‘Fire behaviour in basements is unpredictable and they may behave in a similar way to highly insulated buildings; the highly insulated space may allow for more intense a rapid fire growth’.*
>
> *‘There is likely to be a lack of ventilation within the basement, however some ventilation may be provided by means of pavement lights and doors. There is a risk of rapid fire development or backdraught during opening of such vents during firefighting operations’.*

This replicates the ‘Introduction’ section of Aide Memoir **F (17) Fires in basements** drawn directly from the Hazard Knowledge section of the ‘Fires in basements’ chapter within the ‘Fires in buildings’ NOG:

213. The comments I make earlier under the guidance review heading apply equally here. I can understand why this has been copied directly from NOG, but the content is not well worded. It would be much clearer to the reader if it was explained unequivocally why the highly insulated space will prevent rapid fire growth due to the limited availability of oxygen but when oxygen is introduced then rapid-fire growth will invariably follow if the fire is not suppressed concurrently. An additional sentence which explains that insulation limits external oxygen supply and clearly states that uncontrolled ventilation of the basement will invariably lead to rapid fire growth of a ventilation-controlled fire if concurrent suppression is not undertaken would remove any ambiguity.

214. The second slide titled ‘Shallow basements’ contains the following bullet point under the heading ‘Inherent hazards’

- *Basements are highly insulated spaces allowing the possibility for more rapid-fire growth*

215. The comments directly above refer. This same bullet point is replicated on the next slide titled 'Deep basements'.

216. On the 'Basements – Control measure – Appropriate intervention' slide the following bullet point is listed under the 'Tactical Actions' heading:

- *Use basement firefighting techniques according to service procedures and training*

217. There is no guidance in any Aide Memoir or training package I reviewed that set out what basement firefighting techniques are in NWFRS.

218. On the same page there is a Procedural Alert PA 017 2020 titled 'Initial means of attack at operational incidents'.

219. The 'Introduction' section of PA 017 2020 states the following:

> *A Service wide trend has been identified by the Operational Learning Forum (OLF) as part of the Operational Assurance process. Incident Commanders of the initial attending appliance are defaulting to the use of a Hose Reel Jet as a first means of attack on all occasions. The purpose of this Procedural Alert is to ensure that Incident Commanders consider and deploy the appropriate weight of attack at the initial stages of an incident based on good situational awareness and a sufficient Dynamic Risk Assessment (DRA).*

220. Under the 'Narrative' heading the following guidance is provided;

> *Situational awareness represents the perception and understanding an IC has of an incident, including its hazards, risks and operational activities. It also consists of how an IC anticipates the incident will develop taking into account their actions. Good situational awareness is fundamental to being able to make good decisions.* ***For the majority of operational incidents attended by NWFRS the use of a HRJ would be deemed as an appropriate first means of attack i.e. when attending an average sized domestic dwelling****.* ***However, when attending a well-developed fire at i.e. a large industrial unit, it may be necessary to deploy a greater weight of attack at the initial stages, such as 45/70mm hose lines.*** *A DRA of this nature will result in a more effective response and ensure the safety of the crews in the immediate risk area. To accurately perceive a situation an IC should always accurately gather and understand information to enable them to anticipate how an incident may develop and what the impact of an intervention may be on its development…*

221. This is not directly specific to incidents in basements however it is relevant at any compartment fire in respect of appropriate weight of attack. The reference to a HRJ being deemed appropriate at an average sized dwelling directly contradicts

research evidence set out in the graph at Appendix 1 contained within Aide Memoir **F (7) Fireground hydraulics and flow rates** which demonstrates that a minimum flow rate of 200 lpm is required to suppress a typical fire in a domestic dwelling. This flow cannot be achieved with the 19mm HRJ in use within NWFRS.

222. The **Fighting fires in tall buildings – NOG** presentation consists of an introduction section, three content sections on 'Stay put/evacuation procedures', 'Complex Fire Engineering (Fixed Installations)' and 'Fighting Fire' followed by knowledge check questions and an assessment.

223. The slide titled 'Fire Mains' within the 'Complex Fire Engineering – Fixed Installations section' contains a simple description of a fire main (dry or wet riser) and how they operate. The slide also contains a 'Hazard' section with the following points listed:

> *Landing valves vandalised or left open can cause severe water damage and a reduction in pressure and flow to the fire floor*
>
> *Possibility of over running water supply*
>
> *Pressure at the branch will be reduced as height increases.*
>
> *Where a single rising main is being used to supply multiple jets, opening branches will reduce the working pressure of other jets.*
>
> *If fire mains fail, seek other alternatives, such as;*
>
> - *Utilising Aerial Ladder Platform as a rising main*
> - *Hauling hose aloft*

224. I highlight this as I consider it to be an example of good training material content that is of real value to Firefighters. On previous inspections I have highlighted how in guidance and training materials rising mains have been listed as a hazard. I observed that the fire mains themselves are not a hazard; to the contrary they support the deployment of effective control measures. The point I then made is that failure of the fire mains or any limitations arising from the use of fire mains is the hazard. These hazards are succinctly captured in the list above.

225. Similarly on the following slide titled 'Hose reels' a simple description of where they might be provided, and their purpose is followed by the bullet point below under the 'Hazard' heading:

> *Hose reels will not provide sufficient flow or pressure to deal with a well-developed compartment fire*

226. On the slide titled 'Ventilation Systems' there is a Procedural Alert embedded which highlights an incident that occurred in West Yorkshire where fire spread from the third to the sixth floor of a seven-story block of flats because of a fault on the Automatic Open Vent system. This is another example of good training material

content through providing a real-world example of the hazards associated with such systems.

227. The final slide in the Complex Fire Engineering (Fixed Installations) section is titled ‘Contingency Arrangements’. It contains the following text:

> *As the failure of fixed installations can have serious consequences, suitable contingency plans should be developed. These plans should determine good practice and alternative actions in the event of failure or inappropriate operation.*
>
> *Contingency arrangements may include:*
>
> *…The use of aerial appliances to provide a temporary fire main*
>
> *…Using hose lines as temporary rising mains*
>
> *…Providing external firefighting equipment to surround the fire*

Again, this is concise relevant control measure knowledge that is of value to Firefighters.

228. The ‘Fighting Fires’ section consists of one slide from which cue cards can be accessed. The introductory text is as follows:

> *Fighting fires in 'Tall Buildings' requires some additional control measures and specific equipment and techniques. The following 'cue cards' will detail some of these.*
>
> - *Psychological stress*
> - *Internal navigation and search*
> - *Limited space*
> - *Tall building equipment pack*
> - *Cleveland coil*
> - *Cables*
> - *Cable cutters*
> - *People*

229. The list does include specific equipment (Tall building equipment pack, Cleveland coil, cable cutters) but there are no additional control measure tactics referenced. Acknowledging that at the time of writing NWFRS appliances do not carry floor below branches for offensive exterior attack or smoke curtains for ventilation control and stairwell protection these control measure tactics (which can be deployed at any structure fire but might be considered to be tall building specific) can still be achieved by other means (i.e. through aerial monitors and manual door control).

230. If this omission were to be addressed, then this would be a very good training package. I will consider the issue of training package development, maintenance and review in the summary section below.

231. The **Fireground hydraulics and flow rates** presentation consists of seven content slides followed by a slide which sets out further reading material.

232. Slide 2 describes 'Critical Flow Rate' however it repeats the NOG definition contained within Aide Memoir **F (7) Fireground hydraulics and flow rates** rather than the definition from EuroFirefighter. My earlier comments on this refer.

233. Slide 3 describes 'Tactical Flow Rate'. This slide includes a graph taken from NOG titled 'Modern Fire Development'. Despite it being entirely accurate it is not clear as to why it is included.

234. Slide 3 is titled 'The Concept' and provides an explanation of how flow rates can be determined either by estimating HRR or by use of the fireground formula.

235. Slide 4 is titled 'Mathematical Calculations' and sets out the fireground formula to determine the tactical flow rate (referred to as Optimum flow rate):

236. However, as a fire ground rule of thumb for fires from 50 to 600m^2, the following calculation could be considered:

Optimum flow rate (L/min) = fire area (m^2) x 5

237. As highlighted previously when reviewing the content of Aide Memoir **F (7) Fireground hydraulics and flow rates** I made the point that the fireground calculation produces inadequate flow estimates when the surface area is less than 120m2 as explained within the text from the EuroFirefighter publication authored by Paul Grimwood:

> *'Where deployment is for **a fire area less than 120m2, the minimum target flow-rate on any primary attack hose-line should be 200-500 L/min** (1 or 2 x 22mm hosereels) on high pressure or 350-500 L/min on low pressure'.*

238. The slide should be updated to reflect the above and state unequivocally that a 45mm line is the minimum control measure tactic for a confirmed dwelling fire.

239. The **BA 14 Fire behaviour and compartment fires** presentation is delivered on initial training for wholetime and RDS Firefighters but is available on Hwb Tân for the purposes of on station skill maintenance training.

240. The presentation consists of 40 slides. The aim of the presentation is 'to provide students with an appreciation of the inherent dangers of compartment fires, specifically: Flashover and Backdraught conditions'.

241. The objectives of the presentation are that by the end of the session the student will be able to:

- *Describe the basic mechanism of combustion*
- *Describe the characteristics of a compartment fire*
- *Identify the behaviour of fires in compartments*

- *Describe the signs and symptoms of flashover and backdraught*

242. In hazard and risk control terms the aims and objectives of the session are to give the student the necessary underpinning hazard knowledge relating to compartment fires. These are entirely appropriate aims and objectives, and it is undoubtedly sensible to sequence hazard knowledge input prior to control measure knowledge input on initial training.

243. There are no notes included with the slides that would give an indication to the additional detail the instructor might provide. The slide content largely replicates that found within the now archived 'Fires and firefighting' NOG, much of which is now available in the 'Foundation for firefighting' guidance published in October 2024.

244. Slides 25 and 26 at the end of the section of the presentation covering flashover have embedded videos which cannot be accessed via Hwb Tân which means Firefighters on station cannot view the videos. I was not able to view the videos either so I cannot be certain of the content but the video on Slide 26 was from the National Institute of Science and Technology which have published several excellent studies relating to flashover so the content would undoubtedly be highly valuable to Firefighters on initial or skill maintenance training. I would argue that flashover is the most significant hazard to Firefighters fighting compartment fires so the unavailability of the videos should be addressed as a priority. I raised this with instructors during the focus group meeting. They were aware of this which was an obvious cause of frustration to them. I return to the issues raised by instructors during the focus group further on in this section.

245. The same is also true for the videos embedded at Slides 32 and 33 in the 'Backdraught' section and Slides 36 – 39 in the 'Fire Gas Ignition' section.

246. An obvious omission from the presentation is input on HRR from modern building contents and the impact on the ventilation profile along with the issue of ventilation itself. This was acknowledged by the instructors who expressed a real desire to develop their own subject knowledge to enhance the quality of the training they were delivering.

247. The **BA 15 CFBT fire attack** presentation is also delivered on initial training for wholetime and RDS Firefighters but is available on Hwb Tân for the purposes of on station skill maintenance training.

248. The presentation consists of 30 slides. The aim of the presentation is 'to provide students with an appreciation of the inherent dangers of compartment fires and the procedures and extinguishing techniques to safely deal with potential backdraught and flashover conditions when attending incidents'. The objectives of the presentation are that by the end of the session the student will be able to:

- *Identify the behaviour of fire in compartments*
- *Identify the main differences between a flashover and a backdraught*
- *Describe the actions to be taken if a flashover is suspected*
- *Describe the actions to be taken if a backdraught is suspected*

- *Understand and recognise the importance of applying correct door and branch techniques*

249. The first 14 slides provide a recap of the content within the BA 14 Fire behaviour and compartment fires presentation.

250. Slides 15 - 17 considers hose reel branch techniques and specifically wide or narrow cones (spray patterns). This is of concern on two levels. Firstly, I would expect to see input on tactical flow rates and all fire attack techniques as opposed to just gas cooling, as primary control measure tactics immediately following the hazard recap. There is no reference at all throughout the presentation to tactical flow rates which is a serious omission. Secondly, only showing a hose reel and how to switch between wide and narrow spray patterns serves to perpetuate what the analysis in this report demonstrates which is a default to a hose reel at every dwelling fire irrespective of potential peak HRR and required flow.

251. This is further compounded on the next slide entitled '3 Phase Gas Cooling'. The extant Firefighting NOG advocates 4 tactical approaches which are effectively the Dutch 4 Quadrant Model referenced earlier in this report. '3 Phase Gas Cooling' sits within the final quadrant of offensive interior attack, which presents the greatest risk to Firefighters.

252. The full content of the slide is as follows:

- *Phase 1 – cooling prior to entry (door procedure)*
- *Phase 2 – entry and attack (gas cooling/indirect attack)*
- *Phase 3 – extinction and hot spots (direct attack) pencilling and painting*

253. Slide 19 'Door procedure' contains no text or illustration. In the absence of the notes accompanying the slide my assumption is that the instructors would give a practical demonstration of door procedures at this juncture in the presentation.

254. Slide 20 'Phase 2 – indirect attack consists of a picture of a BA team on the left-hand side of the slide applying a pulse of spray into smoke above what appears to be bookshelves in a library with a relatively small fuel-controlled fire on the right-hand side of the slide.

255. Technically this technique represents a form of indirect attack although the picture could equally be interpreted as simply gas cooling. In any event all the research referenced in this report shows that the most effective technique for an indirect attack is to direct a high flow straight stream on a steep angle at the ceiling to achieve minimum air entrainment and maximum water coverage.

256. This technique should be included under the indirect attack heading along with an explanation that it can be employed on an exterior or an interior attack.

257. Slide 21 'Branch techniques/water application' contains the following text:

Branch techniques and water application "is a balance between enough water to control the fire without lowering the neutral plane, thereby protecting Firefighters from rising temperatures and steam, and helping to maintain vision"

258. The assertion that attacking a fire with a high flow of water will cause temperatures to rise is factually and scientifically incorrect as demonstrated through the research referenced within this report. The complete opposite will happen. While vision may be momentarily obscured ventilation can be safely commenced immediately on suppression. The quality and effectiveness of modern PPE, if worn correctly, is such that firefighters would be unlikely to suffer steam burns in any event.

259. Slides 22 and 23 are both titled 'Water Application'. Slide 22 states the following:

"Water when heated creates steam at a ratio of 1700:1, 1.7 cubic meters of steam for every litre of water, this ratio further increases to 3400:1 when heated past 250 degrees C

The contraction ratio of hot fire gases are greater than this expansion, meaning that when applied in moderation water will reduce the volume of the neutral plane"

260. Slide 23 includes the following bullet points:

- Water applied into the gas layer, in moderation, will reduce the volume of fire gases improving conditions for casualties and Firefighters
- 3 phase approach is most effective

261. Research referenced in this report demonstrates that flowing high volumes of water on a straight stream at a steep angle into the fire compartment (indirect attack) or directly at the fire (direct attack) delivers significant reductions in temperature which ultimately is what improves conditions for Firefighters and casualties alike[17].

262. The target audience for this presentation is recruit Firefighters. These slides advocate minimum water use with no consideration of any form of ventilation control. The 3-phase approach is the least effective against a ventilation-controlled fire with the potential to quickly transition the compartment to flashover once ventilated and one which places Firefighters, casualties and the property at most risk.

263. This is further compounded on Slide 24 titled 'Phase 3 - Painting'. The slide consists of a picture of a BA team directing a pulse of water with the bale of the branch partially open onto a small fuel-controlled fire on the floor in the same library depicted in Slide 20 along with the following text:

Minimal amounts of water should be applied up close and direct

[17] Study of the Impact of Fire Attack Utilizing Interior and Exterior Streams on Firefighter Safety and Occupant Survival | UL's FSRI – Fire Safety Research Institute

This may be effective for a small fuel-controlled fire. It almost certainly will not be for high HRR potential pre or post flashover fire. The amount of water applied should be that estimated as sufficient to extinguish the fire established through the fireground formula or estimation of HRR.

264. Slides 25 – 29, all titled 'Operational Considerations' reiterate the 3-phase approach described above.

265. The aim of the presentation is '*to provide students with an appreciation of the inherent dangers of compartment fires and the procedures and extinguishing techniques to safely deal with potential backdraught and flashover conditions when attending incidents'.*

266. There is nothing in the content of the presentation that would give me confidence that this aim would be met.

267. The tactics advanced within the 3-phase approach reflect the partial adoption of the Rosander and Gisselson method described in the Operational Policy section. Slides 15 and onwards should be deleted and replaced with the control measure tactics that feature in whatever all-encompassing operational guidance for structure fires is introduced by NWFRS to address the current gap described previously in this report.

268. In my view these control measure tactics should replicate the Tactical Considerations outlined within Chapter 10 of NFPA 1700 Guide to structural firefighting. I return to this point in the summary section below.

Issues raised on previous Thematic Review inspections

269. The 3 previous Thematic Reviews I have undertaken have raised issues which are relevant to this inspection and to the organisational arrangements through which operational policy is delivered.

270. Recommendation 4 of the Learning the lessons from Grenfell Thematic Review[18] (copied below) concerned tactical flow rates as I had noted the default to high pressure hose reels at incidents during this inspection.

271. Recommendation 4 – that input on tactical flow rates for firefighting attack and fire ground calculations be included on the syllabus for Breathing Apparatus and Compartment Fire Behaviour initial and refresher courses. This should be supplemented by an online training module for skill maintenance within the station work routine.

272. Aide Memoir **(F 7) Fireground hydraulics and flow rates** and the training package of the same name contain input on flow rates but as previously identified they do not accurately reflect the findings of the Paul Grimwood Glasgow Caledonian University research. Procedural Alert PA 017 2020 'Initial means of attack at operational incidents' issued around the same time as the Thematic Review inspection fieldwork contains contradictory guidance as explained previously.

273. Recommendation 5 was concerned with the FRS establishing a robust method by which to ensure the recommendations of the Thematic Review were embedded. The text of the recommendation is copied below:

274. Recommendation 5 - Should the 3 FRS be minded to accept the recommendations contained within this report the Operational Assurance criteria in use within each of the FRS should be amended to capture specific evidence in relation to the recommendations in order to demonstrate they are being applied on the incident ground. Alternatively, the 3 FRS could utilise a Thematic Assurance process to target the issues identified within this report.

275. The Learning the lessons from Grenfell Thematic Review report was issued on 25 February 2021. The incident data analysed in this report covers the periods 1 April 2020 – 31 March 2023 and includes over 2 full years after this recommendation was made. There is no evidence from the analysis to suggest the default position of using a high-pressure hose reel (the tactical option offering the lowest flow rate and therefore lowest level of protection to Firefighters) has in anyway shifted in NWFRS despite this or the issuing of Procedural Alert PA 017 2020. I consider the effectiveness of the NWFRS operational assurance process further on in this report.

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[18] Chief Fire and Rescue Adviser thematic review: learning from Grenfell Tower Inquiry recommendations | GOV.WALES

276. In the Broadening of the role of Firefighters Thematic Review[19] report published in December 2021 I raised a concern that the current shift system, dating back to the 1970s, does not allow sufficient time for training, exercising and risk reduction activities.

277. NWFRS have recently formalised a station work routine for the shift system however this has not released any of the capacity identified within the Review from the night shift rest periods which accounts for 14 hours of the available 48 hours worked across the 8-day reference period (29.1%).

278. Any interruption to this rest period, which is reasonably foreseeable from emergency calls, increases the risk of excessive fatigue for Firefighters and for which there is no control measure. This is a failure on behalf of the Service to meet its legal duties under Regulation 3 of the Management of Health & Safety at Work Regulations.

279. This is a serious cause for concern, not least because of the issues identified through this inspection which can only be addressed through substantial increases in training and should not be undertaken at the expense of risk reduction activity. Firefighter safety must be the overriding priority for the Service.

280. In the Operational Training Thematic Review report published in October 2022 I raised several concerns which remain directly relevant to the issues highlighted throughout this inspection.

281. The first was that none of the Welsh FRS know definitively the amount of time that should be allocated within station work routines to skill maintenance training.

282. In response to Recommendations 2a and 2b NWFRS undertook a review of time allocated to training (NWFRS Operational Core Skills Review), the outcomes of which were shared with me in February 2024. I wrote to NWFRS on 6 March 2024 with two substantive observations on the review methodology.

283. The review allocated timings to each objective for the relevant core skill area as they are presented within the National Occupational Standards (NOS). The NOS objective descriptions can be broad and encompass several control measure tactics or techniques. The NOS also fail to capture the full range of tactical options available to the FRS. As an example, at no point in the NOS are tactics for offensive interior or exterior attack explicitly (or otherwise) referenced.

284. My recommendation at the time was that NWFRS should undertake the analysis against the full range of control measure tactics and techniques for each incident type which should be set out within NWFRS operational guidance. As has been identified already in this report no all-encompassing guidance for structural firefighting currently exists within NWFRS. Until this is rectified it is not possible for the Service to meet this recommendation. Recommendation 2 of the M&WWFRS

[19] Fire and rescue service capacity: thematic review | GOV.WALES

inspection report published in January 2025 states that all-encompassing structural firefighting guidance should be developed on a pan Wales basis to avoid unnecessary duplication of effort across the 3 Welsh FRS.

285. The time allocations for many of the objectives contained within the NWFRS analysis were for one individual only whereas a crew on a fire station will consist of at least four and possibly five Firefighters. In practical terms therefore a multiplication factor of 4/5 (or 2 in the example of say a BA team related control measure tactic or technique) should be applied to these time values. As an example, BA Core Skill Matrix, Objective 14, gas cooling techniques has a time value allocation of one hour over the course of a year. Aside from the fact that gas cooling is the only tactical option to feature on the matrix a multiplication factor of 4/5 (depending on default appliance staffing assumption) should be applied as all 4/5 members of the crew would need to independently practice and then demonstrate competence in this technique. I recognise that combination drills and scenarios allow for simultaneous activity which can reduce the overall time as suggested within the review report. This however needs to be offset by the point I make above, notwithstanding the reality that it is much more difficult for an assessor to determine competence having been demonstrated when observing simultaneous activity.

286. My recommendation at the time was that NWFRS produce training videos of each control measure tactic or technique which in addition to being an excellent training aid, can be measured to give a definitive time value from which to determine an accurate time allocation. This time value would include the crew viewing the video, each crew member undertaking practice on the control measure tactic or technique and then being assessed individually. Recommendation 3 of the M&WWFRS inspection report published in January 2025 states that structural firefighting training packages should be developed on a pan Wales basis to avoid unnecessary duplication of effort across the 3 Welsh FRS.

287. Recommendations 5 and 6 are directly relevant to the substantive issues raised throughout this inspection.

288. I make the point within the Operational Training Thematic Review that there are significant challenges for the FRS in replicating real world modern fire conditions in a training environment.

289. The fire behaviour training facility at the Broughton Airbus factory is a demonstration unit that is not designed for the purposes of training for fire attack. The facility at Dolgellau has the same limitations as Cardiff Gate and Earlswood around the HRRs and ventilation profiles that can be achieved and with the need to not extinguish the fire to facilitate multiple student rotations. It is also much older than the South and Mid & West Wales facilities with all the associated challenges that brings. NWFRS are actively working towards building a new training centre. This should be pursued as a priority.

290. In the Dutch report ‘When water goes up in smoke’ referenced earlier, the experiments to determine the safest and most effective firefighting method of

advancing through a property towards a room on fire were conducted in a purpose-built rig.

291. The text copied below directly from the report describes the construction of the test rig:

> *'One base scenario was applied to all experiments:*
>
> *A major fire in a living room (6 – 8 MW) where the door from the fire room to the corridor is open, smoke is flowing into the adjacent corridor and the front door to the residence is open; no fire attack…*
>
> *…In order to best approximate the real-life situation, the research was conducted in a brick building. The building was L-shaped, with the long part of the L-shape consisting of a 2- metre wide, 2.5 metre high and 20-metre long corridor. The fire room was located in the short part of the L-shape. This shape was chosen so that it would be impossible for the seat of the fire to be reached directly while carrying out the smoke cooling methods'.*

292. Officers from the 3 Welsh FRS visited the Dutch FRS in February 2025 to view this and other training facilities. A rig such as that described above would be an excellent addition to a new training centre and to the best of my knowledge would be the only facility of its kind in the UK.

293. In the Operational Training Thematic Review, I referenced the UL FSRI Hose Stream prop. The text copied below describes its evolution:

> *'The idea for the innovative Hose Stream Prop was sparked when FSRI research studies began to yield thought-provoking findings around the fundamentals of hose stream mechanics – specifically air entrainment and water mapping. These concepts are the ground-level building blocks needed to understand the impact of varying suppression tactics on the fireground. From these findings, FSRI research engineers began by building a prototype training prop to visualize and interactively demonstrate these concepts.*
>
> *With the help of trusted fire service partners and live training demonstrations throughout the country, FSRI research engineers designed several enhancements to optimize usability, increase the suppression concepts able to be visualized with the prop and much trial and error – leading up to the final version and current construction plans'.*

294. UL FSRI have shared the plans online to allow FRS to build their own Hose Stream props along with instructional videos and lessons plans. If NWFRS were to adopt a hub and spoke approach to training delivery a Hose Stream prop at each hub would be an excellent resource.

Organisational arrangements for the delivery of operational policy - summary

295. Operational guidance and training programme development are dealt with by individual Station Managers. As with all Station and Group Managers in NWFRS they also undertake the role of Station Support Officer (SSO) for an RDS fire station/s. The SSO is responsible for all people management issues including the process by which trainee Firefighters move from development to competent.

296. The Operational Guidance Manager is responsible for Aide Memoirs and NOG implementation along with National Operational Learning (NOL) and Joint Organisational Learning (NOL). The Operational Guidance Manager sits within the Technical Operations Hub which is located at the Rhyl fire station complex. The Technical Operations Hub is the responsibility of the Area Manager for Technical Operations who reports to an Assistant Chief Fire Officer (ACFO).

297. The Training Programme Development Manager is responsible for all aspects of the pdrPro competency maintenance and recording system along with the Learn Pro Learning Management System and content. The Training Programme Development Manager sits within the Training & Development Hub and is also based out of the Rhyl fire station complex. This function is the responsibility of the Area Manager for Training and Organisational Development who reports to an ACFO.

298. Despite being in different functional Hubs both Managers work closely together. They both recognise the need to align operational guidance with training content. The very real challenge they have is the resourcing available to them to deliver this in practice. Neither Station Manager has a dedicated Team working to them despite the significant workload that writing, reviewing and developing guidance and training materials gives rise to. The Operational Guidance Manager explained that the process by which Aide Memoirs are developed is through allocating a work package to subject matter experts who are expected to undertake the work in addition to their core role. The Training Programme Development Manager acknowledged during our meeting that Learn Pro content requires a substantive review but that at present there is not the capacity available within the training instructor cadre to undertake such a review.

299. Training instructors work within Training Delivery and are located between the Rhyl fire station complex and the Dolgellau training centre. The Training Delivery Department are responsible for the delivery of all core skills training, the Incident Command School and the Driving School. Training Delivery sits within the Training & Development Hub along with the People and Organisational Development Team.

300. I raised the issues I have identified in this report relating to Learn Pro and Hwb Tân training package content with the instructors at the focus group I held with them at Rhyl. The instructors highlighted numerous challenges relating to course content development and training delivery in general which are summarised below:

- *Lack of instructor CPD days – not only for the purposes of standardisation but also self and training course content development. Organising guest*

speakers or subject matter experts with knowledge of fire attack / BA procedures would help to broaden instructor knowledge.

- *Training delivery taking priority over instructor CPD – the Service is playing a numbers game to keep pumps on the run rather that giving instructors time to update training packages/CPD days etc.*
- *Outdated procedures - learning following attendance on instructor courses should be shared to provide operational knowledge to be disseminated throughout the Service, as opposed to the instructor just obtaining a qualification.*
- *Middle managers recently attended an all-Wales training session on fire attack techniques; however no instructors were invited to attend; instructors would appreciate and greatly benefit from more involvement in training and learning sessions.*
- *Visits to training centres and other FRS would be beneficial to add leverage during any future CPD/standardisation days. CPD days in line with neighbouring services would also be beneficial to learn and share ideas/procedures and network with other instructors.*
- *SSOs would benefit from visiting initial training courses or refresher days, which would help them to cascade current and correct training techniques taught to their station during visits.*
- *Inadequate facilities with training venues spread across the Service – there is no single training hub which means extra hours spent travelling and organising equipment/resources across North Wales.*
- *Inadequate equipment and difficulty moving equipment to venues – equipment used for training has often been rejected from stations and the training appliance is an older divisional spare, meaning trainee Firefighters learn with outdated equipment which is different to what they'll experience on station.*
- *Moving equipment between venues is difficult and dangerous, as vehicles used are not appropriate for transferring equipment. Most Service training vehicles do not have a separate rear/cab space, which makes clean cab decontamination protocols difficult to follow.*

301. NWFRS is not a well-resourced organisation. The number of Station and Group Managers is largely predicated on that required for operational cover purposes. This is not the same as the minimum numbers required to cover all essential roles and is why Station and Group Managers also have SSO responsibility for fire stations.

302. The size of an FRS in respect of the number of stations and the population it serves is academic in the context of operational guidance and training material development and maintenance. NOG and the workload associated with its local implementation, development and maintenance are the same no matter how big or small the FRS. The development and maintenance of quality operational guidance and training materials is resource intensive and is beyond the capability of individual Station Managers no matter how committed they are. It is also a legal requirement. A pan Wales approach would absolutely assist but there is still a substantial in-Service workload to be managed.

303. It is outside of the scope of this report to consider funding of the Welsh FRS. The observation I would make is that based on the evidence gathered during this inspection I have serious concerns that NWFRS are not meeting their legal duties in respect of the provision of suitable and sufficient ORAs for all reasonably foreseeable incident types including dwelling fires and in relation to the training of Firefighters in appropriate hazard knowledge and control measure tactics. This can only be addressed by substantially increasing resources in this area of the Service.

Organisational arrangements for monitoring, auditing and reviewing operational performance

304. A robust operational assurance (OA) process is a critical component of any safety performance management system. For the FRS it consists of the active monitoring of incidents (either remotely or on scene), incident ground audits and reviews including through the debrief process. This is supported by the station audit program where skill maintenance training and all aspects of operational preparedness are quality assured. Done properly it allows the FRS to continually check the effectiveness of operational procedures, equipment and training and to make changes were necessary. It is critical to Firefighter and public safety which is why it featured so prominently in this inspection.

305. **Service Administrative Policy & Procedure Section 2 Order No. 11 – Operational Assurance** accessed through the Policy section on Hwb Tân is the extant policy for operational assurance within NWFRS.

306. The purpose of the policy is:

> *To detail the specific elements of the Operational Assurance (OA) process, which is conducted to monitor the organisations operational activities and compliance with Performance Standards (PS).*

307. Section 6 of the policy is titled 'Internal/external related and other related documents' under which Health & Safety Guidance Note 65 (HSG 65) Successful health & safety management and **SAPPO Section 6, Order No 19 – Incident Debriefing Policy** is listed. HSG 65 is published by the HSE and is available on their website. I was unable to locate a copy of **SAPPO Section 6, Order No 19 – Incident Debriefing Policy** on Hwb Tân.

308. Section 7 of the policy is titled 'Introduction'. Paragraph 7.1 rightly states that a critical aspect of a safe and healthy workplace and compliance with HSG 65 is the effective monitoring of activities. It goes on to state that a 'fundamental area, where monitoring and assessment of our activities is crucial, is during practical activities whether operationally, scenario or exercise based'.

309. Section 8 of the policy describes the role of the Performance Standards (PS) Team however this Team, and the Professional Services Standards (PSS) Team that replaced it, no longer exist. I return to current arrangements further on in this section.

310. Section 9 of the policy describes the procedure for Officers mobilised to incidents for the purposes of incident command or operational assurance. This aspect of the policy remains extant and gives discretion to the Officer to either take charge of the incident or to carry out OA.

311. Section 11 of the policy is titled 'Operational Assurance Process' the principles of which remain extant although the mechanisms of data capture have been updated.

312. The final section, Section 12 ‘Policy Review’, states that the SAPPO will be reviewed every 2 years. The policy is dated 12 July 2012. There are no entries on the version control page to indicate it has been reviewed since then.

313. The Group Manager responsible for Operational Assurance (Group Manager Response) shared with me a draft Operational Assurance policy and procedure which he confirmed will replace **Service Administrative Policy & Procedure Section 2 Order No. 11 – Operational Assurance** once approved.

314. The draft policy is titled Operational Assurance (OA) of Operational and Control staff and runs to two pages.

315. The draft policy statement reflects the intent contained within the extant policy:

> *The Service is constantly seeking to improve its performance as an organisation.*
> *A critical aspect of the management of a safe and healthy workplace, and compliance with Health and Safety Guidance Note 65 (HSG65), is the effective monitoring of activities.*
>
> *OA is conducted to monitor compliance with current operational policies, procedures and adopted National Operational Guidance (NOG) relating to the mobilisation and attendance at operational incidents.*
>
> *OA is a means of measuring and recording organisational, team and individual performances of uniformed operational and control staff during their response to operational incidents, training exercises, simulations and drills.*

316. The substantive detail underpinning the draft policy is contained within a procedure of the same name - **Operational Assurance (OA) of Operational and Control** procedure.

317. The ‘Introduction’ section of the procedure sets out the membership and purpose of the Operational Assurance Team (OAT) and the Operational Assurance Group (OAG).

318. The OAT consists of the 11 Station Managers each responsible for 4 fire stations (known as Locality Managers) and the 3 Service Delivery Group Managers who are responsible for the 3 Service areas within which the 44 fire stations are located - East; West and Central. The role of the Locality Manager differs from that of an SSO. Locality Managers are responsible for all aspects of the Station Assurance program which includes audits and the active monitoring of all competency maintenance and development activities ranging from individual standard practices, composite drills, scenarios to tactical exercises. Locality Managers are also SSOs for the wholetime station within their grouping of 4 stations and have overall responsibility for the performance management of the grouping. As with their functional counterparts these are large references which reflect the limited resources available to the Service.

319. The OAT has for all intents and purposes replaced the PSS Team which was disbanded in 2022. The PSS Team was introduced in 2016. It was headed by an Area Manager along with a Group Manager and five Station Managers to ensure one PSS Team member was always on duty. The substantive difference between OAT and PSS is that the Locality Managers in the former each have responsibility for 4 designated stations whereas the latter was a pan Service dedicated resource.

320. There were mixed views expressed to me on station visits and in focus groups on the merits or otherwise of the current arrangements versus the legacy arrangements. I will revisit this issue later in this section.

321. All operational senior officers in NWFRS conditioned the flexible duty system referred to as 'Officers' in this report are responsible for the active monitoring of operational incidents when mobilised and when they take the decision not to take charge of the incident.

322. Although it is not expressly stated in the procedure the Group Manager Response explained to me that the purpose of the OAG is to consider the outcomes of active monitoring of incidents and exercises and from station audits undertaken by the OAT. The OAG will meet as a minimum once each quarter and will be chaired by the Group Manager Response. The membership of the OAG is as follows:

- 3 x Service Delivery Group Managers
- A member of the Fire Control Management Team (CMT) responsible for OA within Fire Control
- Station Manager Assurance & Resourcing
- Station Manager Incident Command

323. The procedure states that the Group Manager Response will:

> *…compile a report to provide regular updates to the Operational Learning Committee (OLC) on Operational Assurance activity, identified issues and any additional work streams being undertaken by the Team or Group.*

The OLC is chaired by an ACFO and consists of the following standing members:

- Head of Response
- Head of Technical Operations
- Head of Fire Safety
- Head of Training and Development
- Head of Control
- Operational Assurance Group Chair
- Operational Learning Group Chair
- Operational and Control Training and Development Group Chair
- NOG and Policy Group Chair
- Research and Innovation user Group Chair
- Risk Information Group Chair
- Station Manager National Resilience
- Risk, Safety and Claims Manager

- Executive Assistants

The objectives are the OLC are to:

- *Monitor and scrutinise organisational learning from internal sources to ensure a safe and effective workforce.*
- *Monitor and scrutinise organisational learning from external sources to ensure a safe and effective workforce.*
- *Provide timely strategic direction in relation to on organisational Learning to maintain a safe and effective workforce;*
- *Provide strategic insight and intelligence in relation to organisational learning, from internal and external sources, to maintain a safe and effective workforce.*

324. The Post Incident Form (PIF) is how operational crews submit observations from post incident hot debriefs.

325. The OA return function on pdrPro is how Officers submit observations from active monitoring at incidents. Observations specific to individual Incident Commanders are submitted through the Effective Command system.

326. The Station Manager Assurance & Resources maintains an OA trends spreadsheet to record examples of positive and negative practice submitted through the various OA electronic reporting systems. This is the OA element of the role. The ‘Resources’ element is concerned with all aspects of operational crewing across the Service which takes most of this Officer’s time.

327. The Group Manager Response confirmed to me that there is limited scrutiny of the OA returns as there is no dedicated resource to undertake it.

Incident monitoring

328. Incident monitoring is undertaken by Station and Group Managers conditioned to the flexible duty system. Area Managers and Principal Officers also undertake incident monitoring at larger incidents.

329. Because of the size of the area covered by NWFRS Fire Control mobilises the nearest Station or Group Manager irrespective of rank to the incident. Officers can be mobilised to take charge of the incident or to undertake active monitoring. **SAPPO Section 2 Order No 11 Operational Assurance** states that an Officer will be mobilised to every incident with a pre-determined attendance of more than one fire appliance other than Automatic Fire Alarm actuations. At the meeting with the Area Manager (Head of Response) and Group Manager Response they explained that the only variation to this is when the Officer in Charge of the fire appliance is in development and is on the mentoring list. In these circumstances an Officer would be mobilised for the purposes of mentoring even if the incident only required the attendance of a single fire appliance.

330. Once in attendance the Officer can either decide to take charge of the incident or remain on scene to undertake OA. The guidance within the policy states that the decision to take charge should be '*based on the size, complexity and duration of the incident*'.

331. There are no pre-determined triggers based on spans of control for when an Officer will take charge i.e. when four or more appliances are in attendance.

332. I recognise the significant geographic challenges faced by NWFRS in responding Officers to remote rural locations. That said I consider that there would be merit in undertaking an analysis of incident ground roles and responsibilities to predetermine the point at which spans of control for an Incident Commander are likely to be exceeded. This would typically be based on the numbers of appliances in attendance and would allow Fire Control to mobilise an Officer for the designated purpose of assuming command. In these circumstances an Officer of the next highest rank would be notified or mobilised for the purposes of active incident monitoring.

333. In any event for management of road risk purposes when any Officer is mobilised to an incident irrespective of the purpose, I strongly recommend that NWFRS formalise the process of immediately notifying another Officer to undertake active incident monitoring. The notified Officer would log into the mobilising system, familiarise themselves fully with the incident log and progress of the incident and monitor incident ground messages on their fire ground or main scheme radio. This would allow the Officer responding under emergency response conditions to focus solely on driving without having to also attempt to monitor any developments with the incident. Once in attendance they would contact the Officer undertaking active incident monitoring who would update them fully on the incident and share with them their appraisal of progress and any potential areas of concern. I make a substantive recommendation to this effect in Section 3 of this report. The draft **Operational Assurance (OA) of Operational and Control** procedure contains guidance on OA at incidents along with a mentoring checklist.

Incident review and debriefing

334. On station visits Firefighters, Crew and Watch Managers confirmed that it was standard practice to undertake a hot debrief at the conclusion of an incident.

335. It was well understood that any issues of good practice or concern would be captured on the PIF. On every station visit there was an awareness of the PIF its purpose, where it could be found and where it should be submitted to. There were however few occasions noted when either acknowledgement or feedback had been received following the submission of a PIF on an operational firefighting matter post incident. The opposite was true for non-operational firefighting matters for example those relating to home safety issues to which Firefighters stated that there was almost always a response.

336. I was unable to locate a copy of **SAPPO Section 6, Order No 19 – Incident Debriefing Policy** on Hwb Tân.

337. Under the heading 'Debrief management' the draft **Operational Assurance (OA) of Operational and Control** procedure states that:

> '*Incidents of note, requiring a structured debrief will be identified by Locality Managers or requested via the OAT by attending FDS officers, CMT or attending ICs. A structured debrief will have the ability to record all information relating to an incident and produce data that can be used for scrutiny, discussion and action purposes*'.

338. The procedure goes on to explain that the Station Manager Assurance & Resources will be responsible for collating information and arranging structured debriefs following incidents identified as containing internal and/or external learning opportunities.

339. There are structured debrief reports published to Hwb Tân accessed via the Response page however the most recent dates to 2017. More recent debrief reports are held on a dedicated Teams channel however this has limited accesses permissions.

340. To ensure immediate capture and review of issues identified at incidents the Group Manager Response or their deputy should host daily meetings at the change of shift to be attended by all on duty Officers to review all incidents occurring over the last 24 hours. This would give advance notice of identified issues that they could act on immediately without having to await the submission of a PIF or an OA return through pdrPro. I make a recommendation to this effect in Section 3 of this report.

341. There is no process set out for the review of Analytical Risk Assessments (ARAs) in the OA procedure. The Group Manager Response explained to me that hard copy ARAs are completed on scene. Post incident they are sent to the Operations Department where they are scanned and held on file. They are not routinely analysed but are available on request.

342. In a follow up meeting with the Group Manager Response, I asked how many near miss reports had been submitted for issues identified at dwelling fires. The answer I was given was none that relate to the issues identified in this report.

343. At my meeting with the Group Manager responsible for fire investigation I explained the purpose of me requesting fire investigation reports, specifically that my interest was in fire development rather than cause and origin. We reviewed numerous scene photographs from incidents that I had highlighted through the analysis and were able to identify incontrovertible evidence of fire development and progression particularly in respect of bidirectional and unidirectional flows at the point where Firefighters made an entry into the premises. When this is mapped against the incident log and first account statements it is possible to build a comprehensive understanding of the incident and how the tactics employed contributed to the outcome.

344. Many of these incidents would make excellent case studies and highlight the value that fire investigation officers can bring to the incident review process.

Organisational arrangements for monitoring, auditing and reviewing operational performance – summary

345. NWFRS cover a large geographic area. Apart from Wrexham which has two wholetime and one RDS appliance, the other two shift and five day crewed wholetime stations are located along the coast (one wholetime and one RDS appliance at each). Inland of the coast the remaining territorial area is covered by RDS stations. Given the size of the area and distribution of population centres this is a limited number of wholetime appliances which is reduced further overnight when the day crewed appliances switch to RDS cover. RDS availability is low during the daytime as it is throughout much of the UK. This results in significant disparities in emergency response cover across North Wales with extended response times for fire appliances and even longer for Tactical Officers due to their travel distances. I do not therefore underestimate the challenges facing NWFRS in achieving a robust process of operational assurance and particularly active incident monitoring.

346. NWFRS have a well-established and understood process for hot debriefs, through completion of the PIF. As stated previously I was unable to locate a copy of **SAPPO Section 6, Order No 19 – Incident Debriefing Policy** on Hwb Tân. The **Operational Assurance (OA) of Operational and Control** procedure places the responsibility on Locality Managers for determining if an incident requires a structured debrief.

347. The issues of concern I have set out in Section 1 of this report and to a degree referenced within Procedural Alert PA 017 2020 have not been identified either through the hot debrief process, submission of near misses or in any of the structured debrief reports I viewed through Hwb Tân and have not therefore been acted on to change the default tactical approach. I am of the view that is as much because of deficiencies I have highlighted within the content of Aide Memoirs and training packages than it is because of deficiencies with the OA process. The issues are simply not being recognised because the underpinning knowledge is not there.

348. The Group Manager Response has corporate responsibility for all aspects of OA which is delivered through the OAT (station audits) and the Station and Group Manager cadre (active incident monitoring). It is not possible for one individual to perform this safety critical role effectively in isolation no matter how committed they might be.

349. There were mixed views on the merits of the current OA arrangements versus the legacy arrangements through the PSS Team.

350. The PSS Team would often attend stations unannounced. It was relayed to me that the PSS Team was *'feared'* and that station audits were '*dreaded'* by Firefighters and Watch Officers. It was rightly acknowledged on all station visits, focus groups and structured interviews that there is no place for Teams, or any individuals being feared in the FRS.

351. There were however many comments and observations made in favour of the PSS Team in respect of its effectiveness in delivering OA and maintaining standards when compared to the extant arrangements, some of which are set out below:

> *…the assurance of almost every point of service delivery was in place, from acquisition of Firefighter skills to delivery of training, auditing of competency, procedural delivery against national guidance. The station auditing programme ensured that all H&S areas of the service were maintained and clearly understood. The team also assured incident data both during operational incidents and post through the debriefing and learning process…*
>
> *The shift to 3 area OA Managers was a dilution of the OA delivery as no central function was in place or standardisation across the areas due to the logistics and service delivery area. However, it was still able to deliver some assurance with station auditing in a less formal delivery…*
>
> *This year we have moved to an OA team of 1.5 persons, with the expectation of the station commanders to deliver OA. This is not actually practicable as it allows us to effectively mark our own homework if and when capacity allows as the paper round is so big currently.*

352. I consider that there would be much value in a dedicated Operational Assurance Team or at least one additional Officer to support the Group Manager Response in actively monitoring, auditing and reviewing operational incidents alongside undertaking station audits. I recognise however that resource challenges mean that this may not be practical for NWFRS.

353. The arrangements for active incident monitoring make sense given the resources available to the Service and the geography. I believe that these arrangements could however be strengthened.

354. The purpose of declaring a tactical mode on the first informative message at an incident is to record on the log the outcomes of the dynamic risk assessment undertaken by the Incident Commander. This first informative message presents an opportunity to capture the extent of the hazards the Incident Commander has identified and the control measure tactics they intend to deploy to mitigate them and resolve the incident.

355. The typical content of an informative message from the analysis in this report is '*2BA, hose reel, offensive mode'*. This often follows an initial message stating *'smoke issuing*' or *'well alight'*.

356. If the Incident Commander was required to state the primary hazard alongside the control measure tactics this might look something like the following:

> *'Ground floor fully involved in fire, offensive exterior attack using a 45mm jet, transitioning to an offensive interior attack using a 45mm jet once knockdown is achieved, offensive mode'*

357. Such a message would serve two purposes. Firstly, from an active monitoring perspective it would give confidence to the Officer monitoring the incident that appropriate control measures were being deployed to mitigate the identified hazard. In the example used above, if the tactical option was anything less than a 45mm jet (i.e. a 19mm high pressure hose reel), then there would be an opportunity for the Officer monitoring the incident to intervene, albeit remotely. It would also serve to reinforce the Decision Control Process being used by the Incident Commander and avoid the possibility of adopting a default tactic as, in my view but supported by the analysis of tactics adopted at the 97 incidents considered in this report, is the case now.

358. Secondly, from an incident audit and review perspective there would be no doubt as to the tactics that had been employed. Their effectiveness could be assessed by the extent of the damage at the conclusion of the incident, which would be stated on the Stop message, and by analysis of any fire investigation report.

359. The Service would need to determine how such a message should be framed and articulated but discharged as a fast time action I believe it would have an immediate and beneficial effect on Firefighter and public safety. For that reason, I make a substantive recommendation to that effect in the next section of this report.

Section 3

Recommendations

360. The recommendations from the 3 previous Thematic Reviews referenced within this report are all directly relevant to issues identified during the inspection. NWFRS have made some progress against the recommendations from the Learning from Grenfell and Operational Training reviews but no progress at all against the recommendations in the Broadening of the role of Firefighters' review. Given the significance of the issues identified in this report this should be actioned as a priority.

Recommendation 1: All previous Thematic Review recommendations should be fully implemented and by no later than December 2025

361. 'Foundation for firefighting' and 'Firefighting' operational guidance was published on 1 October 2024. All 3 Welsh FRS must now review and revise their firefighting operational guidance. There is no logic that supports each Service doing this individually. Accordingly, I revised Recommendation 2 of the South Wales inspection report within the Mid & West Wales inspection report to reflect a pan Wales intent. I repeat that recommendation here.

362. The operational guidance developed by South Wales FRS should be adopted by NWFRS as an interim measure to address the gap created through the transition from SOPPOs to Aide Memoirs pending the development of pan Wales guidance.

Recommendation 2: NWFRS should collaborate with South Wales and Mid & West Wales FRS to undertake a fundamental review and rewrite of firefighting guidance. The outcome of this review should be that firefighting hazard knowledge and control measure tactics are scientifically correct, reflect the most current research and are clearly and unambiguously expressed in one piece of guidance that is easily accessible to all Firefighters. Work on this recommendation should commence immediately with updated guidance published no later than July 2025

363. As identified within the South and Mid & West Wales FRS inspection reports rewriting operational guidance will only be the first step in changing well embedded practices. A comprehensive program of retraining will be required to shift the current default approach followed by an ongoing program of maintenance training. This will require a substantial investment of time and effort, but it is critical to improving Firefighter and public safety.

Recommendation 3: In parallel with Recommendation 2 a comprehensive training program must be developed. This should be done in collaboration with South Wales and Mid & Wales FRS. Underpinning knowledge packages on the LearnPro system must fully reflect the content of the updated operational guidance. Micro teaches should be developed for every control measure tactic to give Crew and Watch Managers the best possible resource library of training aids to support the delivery of on station practical skill maintenance training.

Combined, and subject to a time and motion study, these packages will give a meaningful time value to inform the allocation of blocks of time within the station work routine. Work on this recommendation should commence immediately with updated training packages published no later than November 2025.

364. The OA arrangements within the Service largely reflect the available resourcing. There is no dedicated Operational Assurance Team to attend incidents solely for the purposes of active incident monitoring. Instead, active incident monitoring is undertaken by the Officers on duty at the time. The function of OA is the responsibility of the Group Manager Response but there is the potential for a delay in them being made aware of risk critical occurrences at incidents due to the time it may take for a PIF to be submitted or for the OA section of pdrPro to be updated.

Recommendation 4: To ensure immediate capture of issues identified at incidents the Group Manager Response or an Officer deputising on their behalf should host daily meetings at the change of shift to be attended by all on duty Tactical Officers to review all incidents occurring over the last 24 hours. This would give the Group Manager Response advance notice of identified issues that they could act on immediately without having to await the submission of a PIF or the OA section of pdrPro to be updated.

365. The first informative message from an incident at which the tactical mode is declared presents an opportunity to capture the extent of the hazards the Incident Commander has identified and the control measure tactics they intend to deploy to mitigate them and resolve the incident.

366. If this message stated the primary hazard and the control measure tactics in use alongside the tactical mode this would be recorded on the incident log but could also be monitored live via main scheme radio. Any obvious disconnect between hazard and control measure tactic could be picked up in real time and addressed possibly prior to an adverse safety event.

Recommendation 5: NWFRS should introduce the concept of a first informative message that states the primary hazard and control measure tactics in use alongside the tactical mode. The same would apply to any subsequent informative messages.

367. The geographic size of the NWFRS area is such that Officers mobilised to incidents may have to travel excessive distances, sometimes at night on rural roads. Notifying a second Officer to undertake active monitoring of the incident to allow the mobilised Officer to focus solely on driving would serve as an effective control measure in these circumstances.

Recommendation 6: For management of road risk purposes NWFRS should consider formalising the process of notifying another Officer to undertake active incident monitoring. This would allow the Officer responding under emergency response conditions to focus solely on driving without having to also attempt to monitor any developments with the incident. Once in attendance they would

contact the Officer undertaking active incident monitoring who would update them fully on the incident and share with them their appraisal of progress and any potential areas of concern.

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