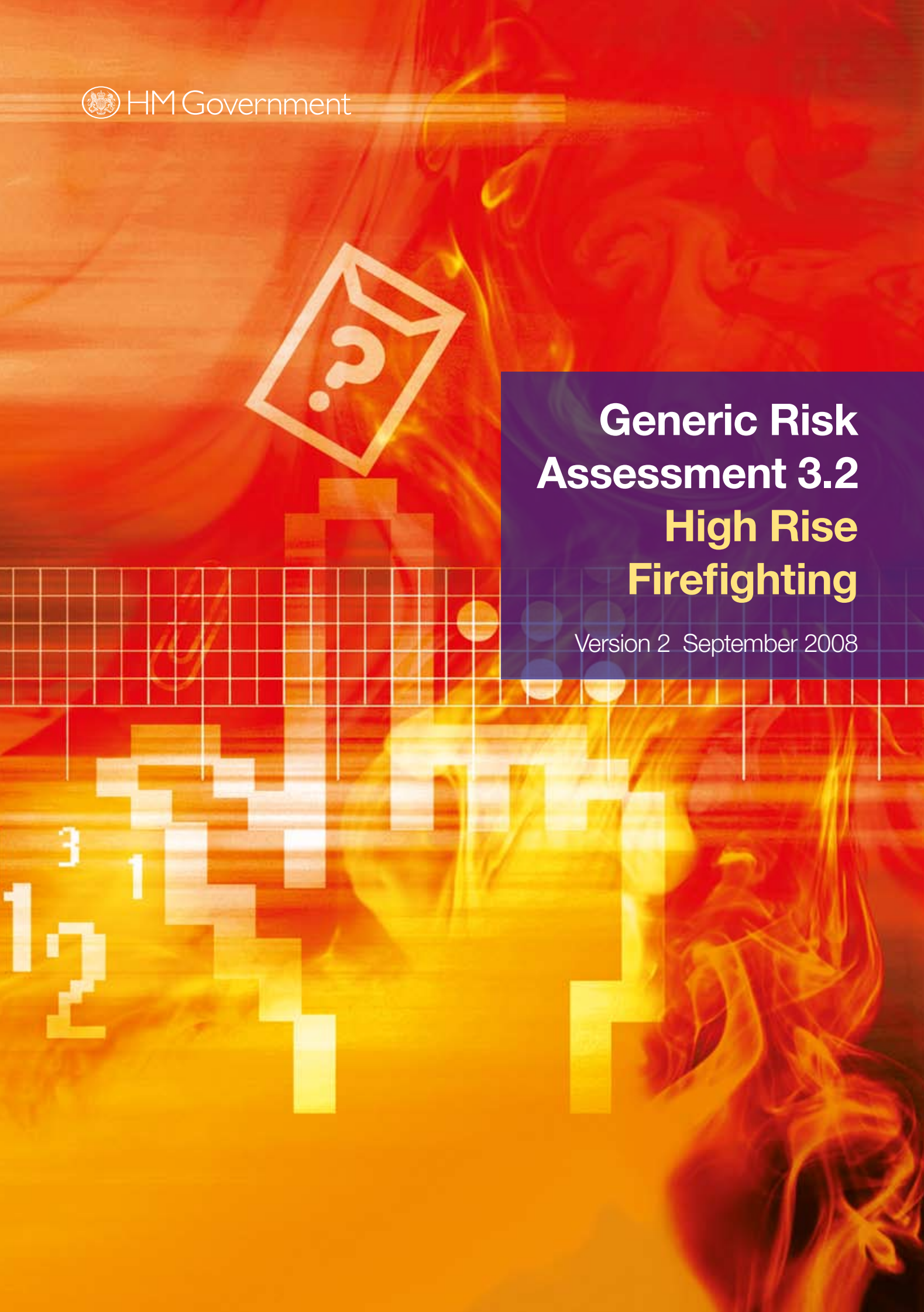
HM Government

Generic Risk Assessment 3.2 High Rise Firefighting

Version 2 September 2008



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London: TSO

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information & publishing solutions

Published by TSO (The Stationery Office) and available from:

Online
www.tsoshop.co.uk

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Published with the permission of the Department for Communities and Local Government on behalf of Her Majesty's Stationery Office.

ISBN 978 011 341325 6

Contents

SECTION 1

Key operational factors

Scope

This assessment considers the hazards risks and control measures for operational incidents involving high rise buildings.

This Generic Risk Assessment (GRA) does not cover all aspects of firefighting in buildings, however, the principles espoused within this document could still be applicable, subject to information and dynamic risk assessment (DRA).

As with all GRAs this assessment provides a starting point for Fire and Rescue Services (FRS) to conduct their own assessments within the context of local conditions and existing organisational arrangements.

Introduction

For firefighting purposes, a high rise building is considered to be one containing floors at such a height or position, or design that external firefighting and rescue operations may not be feasible or practicable.

It should be borne in mind that a similar approach to firefighting and search and rescue may also be required in other buildings which although not viewed as high rise by the very nature of their design may be reliant upon the use of internal access and facilities provided for the FRS.

In England and Wales Building Regulations require all buildings over 18m in height to have provisions for firefighting and search and rescue.[1] Basic facilities to be provided within these buildings will include a Firefighting Shaft, a Fire Main (wet system for all buildings above 60m height (50m as of 2007) and a Firefighting Lift. Firefighting Shafts including fire mains (but not firefighting lifts) may also be found in certain building types with floor heights exceeding 7.5m. In addition to those within Firefighting Shafts fire mains may also be located in other staircases within a high rise building.

1 Similar provisions also exist in Scotland and Northern Ireland.

Hazards and risks

Hazards of high rise firefighting are grouped under three headings:

1. Building height and design
2. Fire behaviour and development
3. Firefighting and rescue operations.

Whereas many of the hazards are specific to incidents in high rise buildings, others may be considered to be generic but are included here due to their likely presence at high rise fires and the potential for the characteristics of the building to exacerbate and intensify their effect.

Building height and design

HEIGHT OF THE BUILDING

Operations may be beyond the limitations of key items of FRS equipment. Appliances, ladders, lines and hose will be of limited use on the upper floors of high rise buildings. As an alternative to conventional firefighting, facilities are provided within the building to support an effective FRS intervention.

FALLING OBJECTS AND BURNING DEBRIS

Falling objects will be hazardous to personnel working at ground level. Debris can be ejected explosively from the building or in the case of glass and curtain walling can 'plane' and travel over a considerable distance. Burning debris may fall from the building; conceivably as a consequence of firefighting actions and can cause secondary fires.

EXTENDED LINES OF COMMUNICATION

The location of operations may impede communication. The scene of operations may be a considerable distance from the FRS access level and point of command; additionally communication 'blind spots' may exist within high rise buildings. These difficulties will create an additional demand on resource management.

PREMISES SECURITY

Access for firefighters may be significantly delayed due to security arrangements. Security measures may include code entry system, card access points, security grilles and multi-lock door systems. Progress may be inhibited on more than a single occasion as devices are encountered at a number of points along the route to the fire.

COMPLEXITY OF INTERNAL LAYOUT

Large or complex floor layouts and a lack of information on the internal layout of the building can challenge crews seeking safe access and egress routes to and from the scene of the fire and may increase the risk of crews becoming disorientated or lost.

Fire behaviour and development

VERTICAL FIRE SPREAD

Vertical fire spread can be extensive and rapid. Such spread may travel internally but more commonly occurs externally when fire breaks out of windows and hugs the building where it can quickly travel to storeys above. This is known as the coanda effect.

STACK EFFECT

The stack effect can increase fire spread throughout the building. Undivided stairways in high rise buildings have the potential to act as a chimney allowing the products of combustion to rise throughout their height increasing the risk of fire spread to other floors.

WIND PATTERNS AND VELOCITY

Fire growth and spread may be exacerbated by strong winds. Wind speed generally increases with height. High rise buildings magnify wind speed and can create complicated and unpredictable wind patterns. Fast air currents entering the fire compartment can create a 'blow torch' accelerating fire growth and will increase the likelihood of flashover.

FIREFIGHTING LOBBIES

Fire service operations may breach firefighting lobbies placing occupants at risk and impacting on operations at the bridgehead. The capacity of firefighting lobbies may be insufficient to contain the resources necessary to mount an effective attack. It will be necessary to run hose lines onto protected routes and stairways to undertake firefighting and search and rescue creating hose management hazards and allowing the products of combustion to spread into previously unaffected areas of the building.

COLD SMOKE

Cooling smoke loses buoyancy so that the accumulation of combustion products within the building will increase. Smoke rising through a high rise building may travel a considerable vertical distance to reach open air during which time it will start to cool and lose buoyancy. As the smoke stops rising, stratification may occur as it spreads laterally creating an additional hazard. As it further cools it will sink and increase the density of smoke at a lower level.

FLASHOVER

In a compartment fire there can come a stage where the total thermal radiation from the fire plume, hot gases and hot compartment boundaries causes the generation of flammable products of pyrolisis from all exposed combustible surfaces within the compartment. Given a source of ignition, this will result in the sudden and sustained transition of a growing fire to a fully developed fire. This is called flashover.

BACKDRAUGHT

Limited ventilation can lead to a fire in a compartment producing fire gases containing significant proportions of partial combustion products and unburnt pyrolysis products. If these accumulate then the admission of air when an opening is made to the compartment can lead to a sudden deflagration. This deflagration moving through the compartment and out of the opening is a backdraught.

Firefighting and rescue operations

FIREFIGHTING FACILITIES

Loss of facilities provided to support firefighting operations will increase risk to firefighters. Facilities including fire mains, firefighting lifts, ventilation systems and compartmentation are provided to assist firefighters and to aid occupants evacuating the premises. These facilities are not under the direct control of the FRS, their effectiveness and availability cannot be taken for granted but are dependent upon the vigilance of the responsible person (including building owner/occupier) and rely upon adequate maintenance and premises management. The responsible person is however, required to maintain the access and facilities provided for the FRS including dry and wet fire mains and firefighting lifts. All components provided are considered to be interdependent with each contributing to the safe system of work. The loss of any single part will be significantly detrimental to FRS operations.

LOCATING THE FIRE FLOOR

The potential exists for crews using the firefighting lift/s to proceed directly onto a floor area involved in fire (Internationally firefighters have died as a result of exposure to fire when they have inadvertently travelled directly to the fire floor).

GATHERING RESOURCES

Commencing operations before adequate resources are assembled to facilitate a safe system of work will severely compromise firefighter safety. There is an inevitable paradox here in that the time necessary to assemble sufficient resources will allow conditions in the fire compartment to deteriorate and increase the risk of flashover or backdraught.

If adequate resources are *not* available to implement a safe system of work firefighters may face a 'moral dilemma' and make a premature attempt to save life.

AVAILABILITY OF WATER

Pressure and flow may be insufficient to extinguish the fire. There is a limit to the supply of water that can be delivered for firefighting purposes in high rise buildings. The height of the incident, characteristics of the fire main, water supply and fire service equipment each contribute to this limitation. Given sufficient fire loading and time for development fires may exceed the capacity of the FRS to extinguish them.

Additionally FRSs should ensure that the equipment they provide for firefighting in high rise buildings is compatible with the characteristics of flow and pressure available from fixed installations to ensure that effective fire fighting operations can be maintained throughout the building.

PHYSIOLOGICAL DEMANDS AND PHYSICAL WORKLOAD

The intensity of work rate in the fire compartment can lead to a dangerous increase in core body temperature of firefighters. External ventilation of the fire compartment to improve conditions for crews may not be practicable due to the height of the building or the design and type of construction. In addition, access to the property or floor alight may be limited to a single point so that crews entering the premises may have little or no option to avoid hostile conditions.

Personnel involved in firefighting may have to climb a number of flights of stairs before reaching the scene of operations. This physical exertion will make a contribution to physiological stress and may lead to exhaustion or collapse. The need to transport equipment and the pressure to move rapidly in PPE will increase this risk.

CONGESTION OF ACCESS AND EGRESS ROUTES

Congestion can arise when fire crews moving into the building encounter occupants evacuating to safety. There is the potential for both the evacuation and firefighting/rescue operations to be impeded.

CASUALTY RETRIEVAL

The removal of casualties to medical care beyond the building may involve vertical transportation over a considerable distance. Personnel involved in carrying casualties down long stairways will be at increased risk of manual handling injury. Additionally time taken to deliver the casualty to medical care may impact upon their potential for survival and recovery.

ANTI-SOCIAL BEHAVIOUR

Verbal and physical attacks; fire loading, fire setting and vandalism may compromise the safety of firefighters. Anti-social behaviour can be associated with residential high rise premises in areas of social deprivation. Abuse ranging from verbal attacks through to physical assaults has been reported. Crews have been the target of objects thrown or dropped from height.

Building facilities such as fire lifts, fire mains, ventilation systems, and fire doors have been rendered unusable or compromised due to vandalism. This can range from positioning of sharp objects such as hypodermic needles and razor blades to flammable materials placed in lifts and fire fighting shafts.

While attending incidents fire crews have been exposed to unexpected fire loadings within properties from unlawful activities eg drug manufacture and storage. The fire loading may also be increased by the deliberate placement of flammable materials or gas cylinders in properties and or additional fire setting while crews are in attendance.

SECTION 2

Key control measures

Operational pre-planning and information gathering

Operational pre-planning and information gathering forms the basis for strategic and tactical planning for incidents. Arrangements should be made under Section 7(2)(d) of the Fire and Rescue Services Act 2004[2] to gather relevant information pertaining to premises within the FRS area. Information which should be gathered includes:

- access and facilities provided for FRS use:
  - size, type and design of firefighting lifts and staircases available to gain access to the fire sector and or bridgehead.(i)
  - location of FRS access points, fire main inlet(s) and water supplies
  - the identification of floor levels with respect to the FRS access level
  - type of fire main (dry or pre charged – wet) and whether the system has been designed in accordance with BS 5306 Part 1 1976 (with amendments) or BS 9990[3] 2006
  - type and operation of smoke control systems and location of associated control features
  - the possible effects of vandalism upon access and facilities provided and measures which may have been put into effect to counter these, eg chaining fire main outlets
  - the efficiency of radio communications.

Note:
(i) Some staircases in tall buildings in England and Wales may be provided with fire mains but do not contain a firefighting lift or smoke control system. See Approved Document B paragraphs 17.8 to 17.10.

- Is the building designed for phased evacuation; staying put or simultaneous evacuation; what means are in place for giving warning in case of fire and identifying the location of fire?

2 Throughout this document references to legislation should also be taken, where appropriate, to refer to the equivalent legislation in the devolved administrations.

3 BS 9990 includes the following changes from BS 5306-1.

- A maximum design charging pressure for dry fire mains of 10 bars
- The change-over height for dry to wet fire mains systems of 50m
- The running pressure at oulets of wet fire mains systems has been increased from 4-5 bars to 8 bars.

The use of 51mm hose and firefighting branches which are effective whilst operating at lower pressures.

- Type and coverage of any sprinkler system and location of associated control features
- Occupancy profile by time of day
- Compartmentation, layout of floors and any unusual features within the premises, eg atria, pressure differential systems, cooling towers etc
- Building construction features which may promote abnormal or rapid fire spread such as sandwich panels, cladding systems, voids etc
- Identification of the type of building, its inherent hazards and risks such as:
  - Hazardous processes
  - Hazardous materials, such as asbestos
  - Sandwich panels
  - Illicit drug laboratories.

Building occupiers should be made aware of their obligation to advise the FRS of any inherent hazards within the premises and failures arising with fire fighting facilities. In the event of a notified failure appropriate adjustments should be made to the pre determined response and the tactics employed. FRSs should have effective systems in place to collate and disseminate all up to date information to those who could reasonably be expected to attend incidents at relevant buildings.

Pre-planning arrangements should also include:

- Assessment of the selection and use of proposed firefighting equipment and its compatibility with the fixed installations.[4]
- The development of contingency plans for a range of reasonably foreseeable events such as; fire spread beyond the compartment of origin and the potential for multiple rescues, loss of water supplies (including internal supplies and identification of distances from the bridgehead to the full extent of the possible fire compartment), communications failure, lift failure, pressure differential systems and planned actions in the event of firefighters becoming marooned within lifts. FRS's should ensure that in developing contingency arrangements for loss of water supplies they do not knowingly exceed the design pressure of the fire main system leading to the potential consequence of system failure.

Note:
Firefighting lifts designed and installed in accordance with BS EN 81-72 have the provision of escape hatches and ladders. This method of self rescue should only be used as a last resort when all other methods of dealing with the confinement have been exhausted and there is immediate risk to the lives of the FRS personnel.) Firefighting crews should have a firm understanding of the procedures for access to, and egress from, a stalled lift in the event it becomes absolutely necessary.

4 See FRS Circular 71 2006.

Pre-planning should also make provision for a pre determined response (PDR) that reflects the access and facilities provided for the FRS and the type of incident likely to be encountered. Consideration should also be given to the time required to gain access, assemble sufficient resources to undertake firefighting and search and rescue operations from the PDR and the effect that this will have on the anticipated mode of firefighting and search and rescue operations. PDRs must ensure that adequate resources are provided to undertake initial assessment and effect an early response to the incident. Consideration must be given to the size of the building, level and nature of occupation and socio-economic factors which may adversely impact on the ability of the PDR to carry out firefighting operations.

Consideration should be given to the development and adoption of a system to provide role related relevant information concerning the premises to all personnel. This should include call handlers, first and subsequent responders, and responding supervisory officers. FRSs should consider the development of common call handling prompts to elicit and gather appropriate, relevant and timely information about the nature of the incident, affected areas, floors etc. FRSs should also develop proactive means of call handling, in which the caller is offered reassurance and offered practical advice to minimise risks and injury. This would have maximum effect as the call handler takes control of the call and does not allow the caller to lead the information sharing.

FRSs should undertake and monitor regular training for all personnel who can reasonably be expected to attend incidents of a high rise nature. This should include outlying stations and neighbouring FRSs where FRS Act 2004 s13 and 16 arrangements are in place.

On arrival

Effective command and control must be established at the onset of the deployment. The Incident Commander (IC) should have a developed plan of action based upon the GRA, standard operating procedure (SOP), information received, knowledge of the location, wind direction etc. Subject to a DRA, continuation or amendment to the plan may be required.

Roles and responsibilities should be assigned pre arrival to ensure that personnel are fully aware of what is required when the instruction is given. Deployment protocols must be implemented in accordance with the current National guidance on the Incident Command System. Effective command and control is vital to ensure that personnel do not take it upon themselves to do what they think is best.

One of the primary functions of the IC is to examine the plans of the building, if available, to identify the key factors associated with the building and to ensure that they are fully conversant with the layout. Some basic information such as the location of the fire, any serious life hazards, to what extent an evacuation has been implemented, and the status of the lift system must be provided to additional personnel arriving on the scene.

The first attendance IC must ascertain as much information as available; both by a visual check of the structure, as well as by gathering information from building occupants and any fire control systems that may be present. Information should be gathered from

security personnel, occupants etc. as to where the fire is located and its extent. It is this officer's responsibility to ensure that the fire floor is correctly identified and ascertain if the floors have an odd configuration.

It may be necessary to restrict access to the incident ground by the public and other agencies. The establishment of cordons would require a collaborative approach with the police. It may be necessary to establish a 'hazard zone' around the incident outside of which FRS personnel and others can be relatively safe from the affects of falling materials. Consideration should be given to the large distances that 'planing' glass and other similar materials such as laminates can travel when falling from high buildings.

Team continuity is an important consideration in order to ensure the safety of personnel. Team continuity relies on some very important key factors: knowing who is on your team and the team leader, staying within visual contact at all times (if visibility is obscured then teams should remain within touch or voice distance of each other) in accordance with BA control procedures and communicating needs and observations to the team leader. These key factors help to reduce risks involved in fire fighting operations by providing personnel with the security of fellow team members. As teams enter a hazardous environment together, they should leave together to ensure that team continuity is maintained.

Management strategies for control and maintenance of access and egress routes should be implemented at an early stage. In the event of the existence of more than one protected stairwell, the IC should consider having an "attack" stairwell and an "evacuation" stairwell. Personnel assigned to assist evacuation must then use a different stairwell that should be clearly identified as the "evacuation" stairwell. However any evacuation plan, and the sequencing between evacuation and intervention, must take cognisance of the fire safety design strategy and the method of evacuation proposed for the building. The IC may need to consider allowing evacuation underway to continue or be completed before commencing firefighting activities.

The IC must determine the status of all the Heating, Ventilating and Air Conditioning (HVAC) systems in the building in consultation with the building occupier. Any systems that have not been automatically shut down may have to be manually shut down. ICs should consider the use of ventilation systems specifically built into the building to minimise smoke logging in areas outside the fire sector, or alternatively the use of positive pressure fans strategically located to prevent/limit smoke contamination outside the fire sector. Before operating any systems or undertaking ventilation the IC will need to consider any adverse affect on fire development and ensure personnel in any affected areas are apprised of the proposed operation and where necessary withdrawn from the area before systems are operated.

After the fire floor has been adequately determined, all HVAC zones that do not include the fire area can be re-activated where the system allows. This will pressurise unaffected areas of the premises limiting the spread of smoke. It will also supply fresh outside air to any occupants on the unaffected floors in these zones. It is important to note that when HVAC systems are reactivated, all personnel operating in the building must be alerted so that they are able to report any adverse effects.

Proceeding to and establishing the bridgehead

It is imperative that sufficient water, equipment and personnel are assembled at the bridgehead to safely mount an attack on the fire.

FRSs should ensure that policy and procedures are in place to safely identify the fire floor.

The use of lifts can greatly reduce the workload and therefore the physiological stresses imposed upon firefighting crews when accessing the bridgehead. Care should be taken to ensure that only firefighting lifts are utilised. These will be clearly marked in accordance with BS 5499-1; however they should be identified during the preplanning phase eg 7(2)(d) inspections. Early control of the firefighting lifts should be taken. If any doubt exists as to which floors a lift serves, its use should be avoided. Lift usage must terminate at the bridgehead floor level or the staging area, never at the fire floor.

Whenever any uncertainty remains as to the location of the fire floor approach should proceed on foot within the protected stair from the highest confirmed unaffected floor. Prior to utilising a firefighting lift the shaft should be checked to ensure that it is clear of smoke. If clear, the crews can take the lift, ensuring its operability by stopping at intermediate points to confirm control of the lift and to check the shaft again for smoke.

It is very important to remember that the *door open* and *door close* buttons will have to be utilised for door control when in fire service control. Controlling the lift will entail assigning one crew member to take control of and operate one lift as a hoist for members and equipment going aloft. This is particularly important in buildings where there are only one or two lifts equipped with fire service control. Once the FRS has established control of lifts they must be never left unattended. Anytime water is observed in the lift shaft by personnel operating lifts, the IC must be notified. These situations will likely lead to the loss of the lift and the IC should make preparations for additional personnel to minimise the logistical and physiological burden created.

In the event of lift failure or lack of firefighting lift provision careful consideration should be given to the extra resource implications this will have for crews accessing the bridgehead and additional resources should be requested at the earliest opportunity to assist in the carrying of equipment to the bridgehead. Careful consideration should be given to the relaxation of dress by BA crews in order to minimise the physiological impact of accessing the bridgehead. This must however, be accompanied with strict control measures to ensure personnel engaged in firefighting and search and rescue operations have the appropriate PPE and RPE in place before proceeding beyond the bridgehead.

The implementation of strict hydration regimes will help to minimise physiological stress. All personnel must be provided with information on the physiological effects associated with fires in these types of premises, and the difficulties associated with any forms of rescue. This should also include recognition of precursors to heat stress conditions.

ICs should ensure that the Bridgehead is established two or more floors (dependent upon likely fire development) below the fire floor. ICs should also refer to current guidance on vertical sectorisation in the National Incident Command System and the advice and guidance on occupant and firefighter interaction in Approved Document B paragraph 4.27 which refers to buildings with phased evacuation.

Should smoke and the products of combustion enter areas outside the fire compartment including staircases consideration should be given to establishing the provision of inlet air at ground level to improve staircase ventilation. Subject to appropriate control measures the use of positive pressure ventilation can assist this process.

Firefighting, search and rescue

Prior to entering a compartment a DRA must be undertaken by the firefighting crew(s) and communicated to the Sector Commander. Firefighters must be trained to recognise the signs, symptoms and conditions which may lead to backdraught (or other abnormal fire development) and flashover and the adoption of appropriate operational tactics.

No compartment or space is to be entered without a charged line if it is affected or thought to be affected by fire or smoke. Where no signs, symptoms and conditions which may lead to backdraught (or other abnormal fire development) and flashover are present a line of hose should be deployed from the highest floor not affected by fire to provide an attack jet. A covering jet must always be deployed as soon as practicable from another appropriate floor.

However where signs, symptoms and conditions which may lead to backdraught (or other abnormal fire development) and flashover are present a covering jet and BA team must be in position before the fire fighting team commence door/room entry into the fire compartment. A line of hose should be deployed from the highest floor not affected by fire to provide a covering jet and a second line of hose deployed from the floor below to provide an attack jet for entry into the fire compartment.

Hose lines must therefore be laid and charged in an area unaffected by fire or smoke and behind the safety afforded by a fire resistant structure or fire resisting door(s). This will be determined by the construction and floor plan of the building involved and the fire conditions at the time.

The covering jet must always be able to be advanced further than the attack jet, the length of both hose lines should be determined by the planned distance of intervention.

Adoption of effective door entry procedures and compartment fire fighting tactics should be employed. Appropriate PPE/RPE must be worn until final fire extinguishment, including damping down operations.

If the potential for backdraught exists, when the compartment door is opened, a rapid inflow of air at low level and outflow of high pressure hot gases at high level could indicate the mixing processes (a gravity current) which may precede a backdraught (providing an ignition source is present). This must be considered in the context of any other venting

of the compartment. The roaring noises sometimes reported may be an indication that an intense fire phenomenon, a 'blowtorch effect' is in progress, at which stage there is probably little action that can be taken by firefighters to prevent it.

In addition to training in the recognition of these phenomena and appropriate firefighting tactics, FRSs should provide training to understand the effects of wind pressures upon fire development. This should include the impact of uncontrolled or unplanned ventilation and its affect upon fire development. Recognition of the effect of wind around high rise premises and its proportional increase with height is an important factor. FRSs should ensure that crews are trained to recognise conditions where defensive firefighting methods are appropriate and an offensive firefighting attack should not be mounted.

FRSs should be aware of the possibility of uncontrollable fire development within the fire compartment and fire spread beyond the fire compartment both horizontally and vertically including the 'coanda' effect. The provision of adequate resources at the bridgehead to deal with the developing situation is essential.

The physiological impact on firefighters should not be under-estimated. Adoption of appropriate tactical fire fighting techniques to reduce impact of environment conditions eg gas cooling, keeping low in fire compartment, is essential. FRSs should review and where necessary revise fire fighting tactics and set achievable targets for firefighting crews. Additionally ICs and firefighting personnel should be aware that wet or damp PPE may increase the risk of injury from scalds and burns. Operational tactics should include integration of building design parameters.

An important factor in minimising physiological stress is the maintenance of firefighting facilities. FRSs should advise the premises responsible person of their obligations for the testing and maintenance of access and facilities provided for the FRS through operational preplanning under 7(2) (d) and fire safety enforcement activities. This will include the testing and maintenance of fire mains, firefighting lifts etc.

Where security measures are likely to be encountered FRSs should examine the provision of appropriate equipment, procedures and training to enable forcible entry to be gained. Similarly the development of knowledge skills and understanding for firefighters on the impact of fire upon the building fabric, fixtures, fittings and occupant behaviour will assist firefighters in carrying out a valid DRA to ensure that their means of egress is maintained.

Post firefighting operations

FRSs must be aware of the risk posed by the potential for a delayed backdraught to occur during damping down/turning over operations. A delayed backdraught occurs when there is an accumulation of flammable vapour within the fire sector which is subsequently ignited. This condition may be exacerbated by uncontrolled or unplanned ventilation. Firefighters should be able to recognise the signs and symptoms of backdraught and the adoption of appropriate mitigation strategies. These should include cooling of all active surfaces using a water spray to prevent continued pyrolisation. ICs must ensure that PPE and RPE are maintained appropriate to the environment.

Note:
There have been examples of deflagrations occurring during damping down operations where personnel have been unaware of the risk.

RPE must be maintained so long as the risk of respiratory damage is present. This will include during damping down/turning over activities.

During the recovery phase of the incident effective monitoring of FRS personnel should take place. The potential for injury to personnel exists through manual handling injuries, sprains, strains and impact injuries resulting from tired firefighters carrying out recovery operations. The provision of relief crews and refreshments during and post incident should be considered.

Issues which could impact upon a response, exacerbate a fire situation and/or augment risk to firefighters

It has to be recognised that the production of illegal recreational drugs is now prevalent in most major cities in the UK. These production 'houses' may be situated in a high rise building. Consideration should also be given to drug paraphernalia such as sharps being left in fire main outlets, lift call buttons, and other areas which may not be immediately apparent. There is very little likelihood that the FRS would have forewarning of a premises being used for the illegal production and/or the use of recreational drugs. The area and social background of the building may give rise to concern that drug use or production may be reasonably foreseeable. The police may be able to assist in identifying high rise buildings where drugs production may exist. Proof of such activity may not be available but that, however, does not mean it is not happening.

When taking a call of a report of a fire in a high rise building, control operators should glean as much information about the suspected fire compartment and the occupants, as they can get from the caller. The reported location of the fire should automatically trigger concerns not only for illicit drug laboratories, but also a heightened possibility of other issues such as assaults on fire fighters, theft of equipment etc. These factors should be reflected in the standard operational procedures and subsequent pre-determined response.

Similarly there exists the possibility of FRS personnel being attacked whilst attempting to undertake a rescue, tackle a fire or carry out salvage operations. FRS personnel should always work in pairs, any requirement for separation of a team should be considered by the IC with a contingency plan in place before teams are allowed to split up.

Firefighters need to be cognisant of being placed in a position of increased danger through cultural pressures resulting in attempts to influence operational activities. For example people not wanting to be rescued before other members of the family.

SECTION 3

Aide memoires

Aide memoire 1: Considerations for Incident and Sector Commanders

Initial attendance

Establishment of strict command and control is essential. Consult the Site Specific Risk Information including but not limited to:

- Does the property have a Fire Safety design strategy based upon occupants 'Evacuating' or 'Staying put' and what affect will this have upon FRS intervention and operational strategy
- What firefighting facilities are provided on site and what is the most appropriate access point
- What security barriers/doors and access arrangements are in use and what procedures are in place to overcome them, eg provision of keys, codes, remote control fobs. Worst case outcome, is forcible entry equipment available?

- Ensure SOP is being implemented in line with GRA and adapt following additional information received (including information received from control) and when a DRA has been carried out accordingly
- Assess the requirement for further resources – being cognisant of the running time of reinforcing appliances in relation to likely escalation
- Consider the possibility of improvised barricades
- Be aware of possible ambushes or acts of aggression/violence
- Vehicles positioned too close to the building may be jeopardised if the fire escalates
- Is there intelligence regarding the manufacture of illegal drugs being undertaken at the premises? If in doubt contact police
- Assess the requirement for the immediate assistance of the police and ambulance services.

On arrival

- Implement SOP in line with GRA and adapt if necessary following additional information received (including information received from control) and when a DRA has been carried out accordingly

- Verify the fire floor(s) by visual check, AFD panel, security staff or occupants and inform FRS Control of any changes to that stated on the call out sheet
- Wind direction and velocity (this will affect fire dynamics and falling debris/ planing glass)
- Establishment of safety cordons (liaise with Police as appropriate)
- If fitted, consult the Guidance Plate or access the Premises Information Box
- Locate the fire main inlet and the nearest hydrant or other water supply
- Note the location of sprinkler valves, communications centres (may include CCTV), manual overrides, etc
- Does property have pressurised staircases – consider the possible effects in the event of system failure
- Re-assess the requirement for further resources – being cognisant of the running time of reinforcing appliances in relation to likely escalation
- Keep crews together and brief them of your action plan – Prevent self-deployment
- Action plan should include alternative system of work in the event of failure of water supply, lifts or communications
- As resources permit ensure landing valves are closed
- Charge dry fire mains and supplement water supply from hydrant
- Assemble all equipment together, before deploying to the Bridgehead including a means to cut any securing devices on the landing valves
- Take control of the fire lift and nominate a lift operator (who should maintain control for the duration of the incident)
- Plan for the attendance and marshalling of on-coming appliances
- Identify potential deployment sites for aerial appliances, bearing in mind that if a firefighting shaft has been provided there is no requirement to provide access and standing for aerial appliances and that the incident may be beyond their reach
- Ensure sufficient resources are in place for offensive tactics to be adopted
- Ensure effective arrangements are implemented to exchange information relevant to safety of FRS personnel, other emergency responders and agencies.

Proceeding to and establishing a Bridgehead

- The Fire Sector Commander should establish the Bridgehead at least one floor below the fire sector and implement an appropriate level of BA control measures relevant to the incident and its anticipated development
- If the Bridgehead is accessed via the stairs, consider physiological effect on crews as additional resources may be required
- It is pivotal to safe operational tactics that sufficient water, equipment and personnel are assembled at the bridgehead to safely mount an attack on the fire

- When sufficient resources are in place, adopt ICS vertical sectorisation with Sector command and safety officers
- Consider a Staging Area at least one floor below the Bridgehead to manage additional resources (equipment pool, BA servicing, rest area, relief crews, first aid)
- Test communications between Lobby Control and the Bridgehead
- Test communications between BAECO and BA teams prior to deployment.

Firefighting, search and rescue

- BAECO must ensure that all BA wearers are correctly rigged in PPE and BA prior to being committed to the fire Sector
- A line of hose to be deployed from an outlet on the highest floor not affected by fire but below the fire floor
- Provide a second line of hose as soon as practicable from another appropriate outlet as a covering jet
- Where signs and symptoms of backdraught, flashover or other abnormal fire development exist both jets and BA teams must be in position before the fire fighting team commence door/room entry into the fire compartment
- The covering jet must always be able to be advanced further than the attack jet, the length of both hose lines should be determined by the planned distance of intervention
- No compartment or space is to be entered without charged lines if it is affected or thought to be affected by fire or smoke
- Hose lines must be laid and charged in an area unaffected by fire or smoke and behind the safety afforded by a fire resistant structure or fire resisting door(s)
- Confirm all other landing valves up to the take off level for the attack hose line are closed before charging the fire main
- Fire Sector Commander to initiate offensive tactics from the Bridgehead including deployment of search and rescue teams
- BA teams briefed to report to BAECO any signs of impending fire phenomena (Backdraught, Flashover, etc)
- BA teams briefed to take action to identify and mitigate the impact of fire/heat damaged fixtures and fittings which may affect safe egress
- Regular contact with committed BA teams is essential
- Consider the provision of inlet air or PPV fans to supplement fixed ventilation systems
- Ensure that all personnel are advised of the intention to undertake any actions which may adversely affect fire development such as ventilation
- A developed fire may spread externally to the floor(s) above via the windows.

Ongoing incident considerations

- The need to manage issues outside the building (BA Main Control, appliance marshalling, water supplies, etc)
- At incidents likely to become protracted early consideration should be given to reliefs and refreshments
- Recovery from the physiological workload imposed by firefighting and search and rescue activities before withdrawn BA crews are redeployed on the incident ground
- Recovery from the physiological workload imposed by previous activity before personnel are deployed as members of BA wearing teams
- Adoption of management strategies to maintain access/egress (evacuation management)
- Re-assess the requirement for further resources – Consider running time of reinforcing appliances in relation to likely escalation.

Post firefighting considerations

- Possibility of delayed backdraught during damping down and turning over – Full PPE and RPE to be worn whilst in the risk area
- Possibility of collapse or partial collapse following damage to the fabric of the structure
- Oxygen deficient or toxic atmosphere possible during damping down, turning over and fire investigation
- Drain and secure the fire main (if a dry system)
- Are there any fire safety issues which need to be addressed to allow the building to be re-occupied or that need to be brought to the attention of the responsible person and fire safety/operations department
- Hot debrief.

Aide memoire 2: Key considerations for all personnel

- To be aware of the potential for falling debris/planing glass affecting access and egress routes to the premises and possibly areas outside the outer cordon
- To be aware of the possibility of improvised barricades
- To be aware of possible ambushes or acts of aggression/violence
- To be aware that there may be illicit drugs laboratories or storage being undertaken at the premises
- To be aware that access and egress routes will be limited and may consist of a single pathway
- The need to maintain team working and consideration of safety of self and others
- To maintain regular contact between all personnel operating within and outside the building
- To be aware of the signs, symptoms and conditions which may lead to backdraught (or other abnormal fire development) or flashover and the appropriate mitigating firefighting tactics
- To be aware of the need to report to Sector Commanders and or safety officers any signs or presence of:
  - impending fire phenomena (Backdraught, Flashover, etc):
    - A fire in a compartment with few openings that has been burning for some time
    - Oily deposits on windows
    - Pulsating smoke from openings
    - Blue flames in the hot gas layer
    - Low neutral plane
    - High levels of thermal radiation which may cause the generation of flammable products of pyrolisis from all exposed combustible surfaces within the compartment.
  - abnormal or rapid fire spread within the building fabric or contents
  - matters affecting or likely to affect the stability and integrity of the structure and safety of personnel operating within and outside the inner cordon.
- To be aware of the need to advise Sector Commanders and or safety officers before undertaking any tasks which are likely to adversely affect fire development such as ventilation
- To be aware of the physiological demands of tasks being undertaken and recognising your own physiological limitations
- To be aware of the need for appropriate rest, recovery and hydration arrangements to minimise physiological impacts of tasks

- To ensure that only personnel with appropriate PPE and RPE are allowed to enter the inner cordon
- To maintain dialogue with members of the public who are affected or concerned by the event. In some buildings the design assumption will be that members of the public remain in situ or evacuate the building in a phased basis.

ISBN 978-0-11-341325-6

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