Department for Communities & Local Government

Fire and Rescue Authorities
Operational Guidance

GRAs
generic risk assessments

GRA 3.2
Fighting fires –
In high rise buildings

Generic Risk Assessment 3.2

Fighting fires –
In high rise buildings

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Generic Risk Assessment 3.2 Fighting fires in high rise buildings

Scope

This generic risk assessment identifies the significant hazards and risks when attending fires in high rise buildings. These may be associated with the building structure, building contents and the tasks undertaken by firefighting personnel. It sets out the control measures relating to Fire and Rescue Authority personnel, personnel of other agencies and members of the public.

Similar hazards to those defined here can also be encountered in other buildings, which may not ordinarily be considered as 'high rise'. These are buildings where the layout and design means that firefighters will be reliant upon the use of internal access and any firefighting facilities that have been provided for Fire and Rescue Authority use.

Depending on the nature and scale of the operational incident, a variety of significant hazards may be present.

Fire and Rescue Authorities must consider the contents of other specific generic risk assessments in this series, including:

- 2.3 Rescues from lifts and escalators
- 3.3 Fighting fires in chimneys
- 3.6 Fighting fires using positive pressure ventilation
- 3.7 Fighting fires in refuse
- 3.9 Fighting fires in secure accommodation
- 5.1 Generic hazards – Electricity
- 5.8 Generic hazards – Flashover, backdraught and fire gas ignitions
- 5.9 Generic hazards – Asbestos
- 5.10 Generic hazards – Working at height.

Each Fire and Rescue Authority must conduct its own risk assessments. These must be based on operational intelligence and must be used to produce its own safe systems of work (which must include standard operating procedures, training programmes, provision of equipment and levels of response), taking into account local conditions, knowledge and organisational arrangements.

Introduction

For the purpose of this generic risk assessment, a high rise building is defined as a building containing floors at such a height or position that the deployment of external firefighting equipment and rescue operations may not be feasible.

The United Kingdom has suffered a number of fires in high rise buildings that have caused the deaths of firefighters and members of the public. The Health and Safety Executive has issued Improvement Notices to Fire and Rescue Authorities with recommendations specific to systems and equipment used for fighting fires in high rise buildings. High rise firefighting is a high risk activity and the varying frequency and outcomes of these events, across the United Kingdom, has the potential to create issues regarding the consistency of response.

The term 'high rise building' encompasses a wide variety of structures from conventional tower blocks containing residential flats to very large and complex commercial buildings. Some high rise buildings may be 'multiple-use' such as a mixture of commercial and residential occupants; they can contain complex systems, to control the building's internal environment, during normal use or in a fire situation.

In England and Wales, Building Regulations require all buildings over 18m in height to make provisions for firefighting. As these regulations are not applied retrospectively, it should be noted that some older buildings may have deficient or inferior systems or provisions for firefighting purposes.

In addition, those in excess of 50m in height require wet rising main systems (prior to 2006 this was 60m).

Basic facilities provided within these buildings include:

- firefighting shaft(s) – see Appendix 5

- dry or wet rising mains – see Appendices 3 and 4

- firefighting lift(s) – see Appendix 2.

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 be located in other staircases within a high rise building.

Sprinklers and other fire engineered systems may also be installed within high rise buildings. The installation of sprinkler systems may indicate that there are large compartments, which may contain significant fire loadings. For further information regarding fire sprinklers, see Appendix 1.

It is important that buildings with sprinklers and other fire engineered systems are identified as part of the 7(2)(d) process. A programme of familiarisation visits should be developed and maintained to ensure firefighters have adequate opportunities to understand the type of systems installed and how they function.

Significant hazards and risks

Fires in high rise buildings present a range of logistical and physical challenges. Incidents within these buildings can present an extremely hazardous environment for firefighters.

Some of the hazards and operational considerations below are specific to high rise buildings. Others are more general in nature but are included because of their likely occurrence at high rise incidents and/or because the characteristics of the building are likely to intensify their effects.

Hazards associated with high rise firefighting can be grouped under three headings:

1. Building height, layout and design

2. Fire behaviour and development

3. Firefighting and rescue operations.

Building height, layout and design

HEIGHT OF THE BUILDING
Operations at a high rise incident may be constrained by the finite capacity of personnel and equipment. Additional time and resources may be required to implement safe systems of work for operations at elevated levels.

OBJECTS FALLING FROM HEIGHT
There is a risk to those entering or exiting a high rise building, working or assembling outside from falling debris. This can be ejected explosively and materials such as glass and curtain wall panels can 'plane' some distance from the building.

EXTENDED LINES OF COMMUNICATION
High rise incidents may create difficulties with lines of communication and radio reception. The scene of operations may be a considerable distance from the access level and point of command. Building construction may cause radio reception 'blind spots' and affect radio based breathing apparatus telemetry systems.

PREMISES SECURITY
Access for firefighters may be delayed or blocked by security arrangements, such as door-code entry systems, security grilles, smoke cloak devices and multi-lock door systems. Multiple security arrangements along the route to a fire may also slow progress.

COMPLEXITY OF INTERNAL LAYOUT
Large compartments, complex floor layouts or flat or floor numbering systems can adversely impact on safe movement and increase the risk of firefighters becoming disorientated in smoke.

These effects may be made worse by the manual or automatic operation of fire engineering systems, such as fire curtains and a lack of information on the internal layout.

Individual 'maisonette' style dwellings may be encountered where access can be up or down a staircase from the front door. Personnel may also encounter interlocking staircases within one enclosure that provides two separate means of access or of egress, linked to two or more floors. These are sometimes referred to as 'scissor-style staircases' and, if these are used to gain access firefighters may find themselves exiting the stairs at different locations on each floor level, or on different floor levels. This can cause disorientation and/or affect the decision regarding where the bridgehead is sited.

Smoke logging of communal areas or multiple compartments can increase problems created by complex layout.

FLOOR AND CEILING COLLAPSE

There is a risk of a floor or ceiling collapse in individual dwellings within a high rise building which comprises of individual premises of more than one floor, such as a 'maisonette' style construction.

WALL PANEL FAILURE

There is a risk of falling from height due to the failure of external walls, window frames or panels made of lightweight construction.

CONSTRUCTION TECHNIQUE

Any building under construction may provide additional hazards as partitions, doors or fire protection measures may not yet be installed. Timber-frame construction can be vulnerable to rapid fire spread or collapse during the construction phase.

Combustible material in voids and cavities and poor quality construction can also contribute to the spread of fire and smoke beyond the compartment of origin.

INFORMATION GATHERING

It may be difficult for the Incident Commander or others working at ground level to be confident regarding the location of the incident and the extent of fire and smoke spread. External signs of fire and smoke may be difficult to see or may be misleading. In addition, information obtained from occupants or premises staff (either via Fire Control or at the incident) may not be accurate.

CABLE ENTANGLEMENT

There is a risk of entanglement in electrical or telecommunications cabling displaced from cable trunking. The risk is greatest from surface mounted trunking, which can be found in both residential and commercial buildings.

UNAVAILABILITY OR MALFUNCTION OF FIXED INSTALLATIONS, FIRE ENGINEERED SOLUTIONS AND FIREFIGHTING FACILITIES

High rise buildings may have a range of fixed installations, fire engineered solutions and firefighting facilities installed. If a particular building has been subject to poor maintenance, poor management or vandalism, these features may be unavailable or not working during an incident.

OXYGEN DEFICIENT OR TOXIC ATMOSPHERES

The operation of fire suppression/total flooding systems may result in either an oxygen deficient or toxic atmosphere.

BUILDINGS UNDER CONSTRUCTION AND REFURBISHMENT

When any high rise building is under construction or refurbishment additional hazards are likely to be present. Facilities such as firefighting shafts, rising mains and other fire safety measures may be incomplete or absent. The introduction of modern materials and services (such as cable television) may compromise existing fire safety measures or compartments.

Some buildings may be completed in phases and, in these cases, there may be partial occupancy and people other than construction workers requiring rescue.

Original doors may have been replaced with a type that does not necessarily offer the required level of fire protection and access to personnel may be hindered if additional security is encountered.

When under construction or significant refurbishment, an incident may cause:

- unexpected and more rapid spread of fire or smoke

- greater risk of collapse

- risk of spread to adjacent buildings or areas.

HEATING VENTILATION AND AIR CONDITIONING SYSTEMS

The operation of these systems within the building can cause unpredictable and rapid fire and smoke spread.

Fire behaviour and development

FIRE AND SMOKE SPREAD

Fire and smoke in high rise buildings can spread in an upward, downward or horizontal direction and this may be more rapid and less predictable than in other building types.

Fire and smoke spread can develop internally by breaching compartments, travelling along shafts and ducting and externally when fire breaks out of windows and through failed wall panels. This can lead to rapid spread to other compartments and floors (above or below), due to the effects of thermals, movement of hot gases and wind speed/pressure. Air currents may lead to smoke within the building being drawn upwards or downwards. Downward smoke spread, particularly in the staircase, can have a significant and adverse impact on operations.

A phenomenon known as the 'Coanda effect' refers specifically to the tendency for a fast stream of air to deflect to nearby surfaces. This helps to explain why external flames can often be observed to "hug" the outside of high rise buildings.

FIRE ON MULTIPLE FLOORS

Fires may be encountered on more than one floor at a time as a result of the factors identified above or by acts of deliberate fire setting.

EFFECT OF WIND

Wind speeds are likely to increase as the height of the building increases. Wind speed and direction can also be influenced by the position of other nearby buildings. Wind entering a fire compartment can intensify the fire creating a 'blow torch' effect as well as increasing the likelihood of flashover or backdraught. This can be in unpredictable directions resulting in rapid fire spread, extreme and rapid rise in temperature and the premature failure of structural features, such as fire doors.

BURNING DEBRIS FALLING FROM HEIGHT

Burning material falling from upper floors or propelled by the wind can also spread fires and start secondary fires by igniting combustible materials through open windows, on balconies and around the base of the building. Water supplies can be compromised if the firefighting hose is damaged by falling debris.

POOR HOUSEKEEPING AND HIGH FIRE LOADS

Poor housekeeping and the storage of combustible materials can obstruct balconies, doorways and escape routes. It can also hinder the evacuation of occupants, impede the progress of firefighting personnel and increase fire loading.

The fire loading may be increased by hoarding (in some cases stacked to ceiling height) or the deliberate placement of flammable materials or gas cylinders in properties and/or additional fire setting.

SMOKE TRAVEL AND 'STACK' EFFECT

Smoke travel or the 'stack' effect can be misleading and may result in the location and size of the fire being incorrectly identified.

The 'stack' effect can increase fire spread throughout the building. Undivided stairways in high rise buildings have the potential to act as chimneys allowing the products of combustion to rise, which increases the risk of fire and smoke spread to other floors. Smoke rising through a high rise building may start to cool and lose buoyancy. As the smoke stops rising, stratification may occur as it spreads laterally.

Fires in refuse or refuse containers can create extensive smoke spread through chutes, other shafts and voids. This can make fires difficult to locate. Small refuse fires have the potential to appear more serious due to the volume of smoke generated and smoke travel in different directions and potentially over large distances.

LIMITED VENTILATION IN COMPARTMENTS

Some buildings will have compartments that have few or no openings. This can create a build up of toxic gases and reduce visibility. It may also create backdraft/flashover and fire gas ignition conditions and promote horizontal and vertical spread of fire and smoke.

Firefighting and rescue operations

UNKNOWN PREMISES

If a Fire and Rescue Authority are unfamiliar with a building, or if the building has been subject to un-notified refurbishment or changes to use, this may lead to insufficient resources being mobilised. This may cause a delay in firefighting and search and rescue operations.

Firefighters may have no or limited knowledge of the premises layout and any fire engineered solutions present.

EVACUATION OF BUILDINGS

Firefighting operations can be affected by the type of evacuation being undertaken, the progress of the evacuation and the number and type of people being evacuated.

A distinction should be made between commercial and residential buildings, as these are likely to have differing evacuation policies in place.

In addition, the occupants may not be aware of the building's evacuation strategy or, in the case of many residential buildings, a "Stay Put" policy may be in place. This is based on the concept of secure compartmentation of fires.

Incident Commanders must consider both the effect of firefighting tactics on the evacuation of occupants and conversely the effect of evacuation on tactics. If, for example, a building's evacuation plan includes the use of lifts by occupants, there may be an impact on the availability of fire lifts for use by fire and rescue personnel. The need to assist with the evacuation of occupants can divert personnel away from the task(s) that they were briefed to undertake. This can have an adverse effect on the Incident Commander's plan and resourcing for the incident.

UNAVAILABILITY OF FIREFIGHTING FACILITIES

Facilities, such as fire mains and ventilation systems, are provided to assist firefighting operations and to aid occupants evacuating the premises. The unavailability or failure of these facilities will increase risks to firefighters and may lead to a need for additional resources to resolve an incident.

LOCATING THE FIRE FLOOR

The size, layout and height of the building may make it difficult to determine from the ground level the location of the fire floor and lead to an incorrect count of floors. In addition, locating the fire floor may be made more difficult if the fire service access level is any floor other than the ground.

Failure of smoke or heat detecting systems or incorrect mapping of addressable alarms may mislead personnel as to the location of a fire. This can create the risk of personnel using firefighting lifts to proceed directly to a floor involved in the fire or may mean that resources are deployed to inappropriate locations.

GATHERING RESOURCES

The Fire and Rescue Authority must ensure that sufficient resources are available to implement their high rise procedure as part of the pre determined attendance.

Where there is unexpected fire spread or unavailability of fixed installations, commencing operations without sufficient resources can increase the level of risk to occupants and firefighters (see also 'Moral pressure and human factors' below).

There is also a risk that conditions in the fire compartment will worsen exponentially, if an intervention with sufficient resources is not made in a timely manner.

WATER SUPPLIES

There may be an insufficient water supply on upper floors due to the height of the incident, characteristics of the fire main and the limitations of fire service equipment.

PHYSIOLOGICAL DEMANDS AND PHYSICAL WORKLOAD

Personnel may have to climb a number of flights of stairs or work in high ambient temperatures. This may lead to exhaustion, reduce the duration of respiratory protective equipment and increase the core body temperature of firefighters. The need to handle and move equipment, coupled with the psychological pressure to make rapid progress will increase this risk.

The intensity of work in a fire compartment can lead to a dangerous increase in firefighters' core body temperature. In addition, access to the fire may be limited to a single point making it difficult for personnel to proceed without encountering hostile conditions.

CONGESTION OF ACCESS AND EGRESS ROUTES

Congestion can arise as personnel moving into the building encounter occupants evacuating. There is the potential for both the evacuation and firefighting and rescue operations to be impeded and for congestion to cause accidents to firefighters and members of the public.

Hose, other equipment and firefighting operations in staircases and other parts of the building may create significant slip and trip hazards for firefighters and those evacuating. This risk will be intensified in buildings which only have one staircase.

PERSONS SHUT IN A LIFT

Any failure of lift equipment or use of non-designated lifts can lead to firefighters and evacuees becoming trapped in a lift car. Either the lift, its shaft and/or machine room may be affected by the spread of smoke, fire, heat and water from firefighting operations. Any diversion of resources necessary to rescue trapped lift occupants will have an adverse impact on firefighting operations.

BREACH OF FIRE FIGHTING LOBBIES

Operations may breach firefighting lobbies thereby increasing the risk to occupants and impacting on operations at and beyond the bridgehead. The size 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 and this will allow the products of combustion to spread to unaffected areas of the building.

FAILURE OF ELECTRICAL SYSTEMS

Total or partial electrical failure can occur as a result of electrical systems being damaged by fire, heat or water used for firefighting operations, sprinkler run off and any failure of water supply pipes. This may create a risk of electric shock or electrocution.

CASUALTY RETRIEVAL

The retrieval of casualties to medical care can involve transportation over a considerable distance and this can impact on their potential for survival and recovery.

Personnel involved in carrying casualties may be at increased risk of physical exhaustion and manual handling injury. This may lead to a casualty being dropped or injured.

ANTI-SOCIAL BEHAVIOUR, VANDALISM AND UNLAWFUL ACTIVITIES

Verbal and physical attack, vandalism and unlawful activities may compromise the safety of firefighters.

Traps may be set, involving sharp objects such as hypodermic needles or by placing flammable materials in bins or lift shafts, and objects may be thrown at firefighters.

Personnel may also encounter other unexpected hazards, such as those relating to drug manufacture and storage and "pirate radio". These activities may lead to increased risks from hazardous materials or electrical hazards due to illegal access to mains supplies.

Building facilities such as fire lifts, fire mains, ventilation systems and fire doors could be rendered unusable or compromised due to vandalism.

MORAL PRESSURE AND HUMAN FACTORS

There are public expectations that Fire and Rescue Authorities will attend incidents and that personnel will put themselves in harms way to save lives. This can lead to moral pressure to act immediately, even if the incident is beyond the capacity of the resources in attendance at the time.

This is most likely to be the case if an Incident Commander identifies the potential for saveable life is not proportionate to the risks to personnel and either decides not to commit or to withdraw teams.

Key control measures

Planning

Planning is key to the safety of firefighters and others likely to be affected by Fire and Rescue Authority operations. Each Fire and Rescue Authority's Integrated Risk Management Plan will set standards and identify the resources required to ensure safe systems of work are maintained.

Each Fire and Rescue Authority must assess the significant hazards and risks in their area relating to this generic risk assessment. The assessment should include other Fire and Rescue Authority's areas where 'cross border' arrangements make this appropriate.

Site-specific plans must be considered for locations where the hazards and risks are significant. These plans must take into account and specify any variation from the normal operational expectations of personnel, appliances and equipment and include all reasonably foreseeable scenarios. In particular, recognition should be given to the physical and psychological pressures that an operational incident can place upon fire and rescue personnel.

Where site-specific plans are considered appropriate they must be developed to include reference to:

- hazards

- details of any life risk

- levels of response

- water supplies

- relevant standard operating procedures

- tactical considerations, including rendezvous points, appliance marshalling areas and access points for appliances and equipment

- information on fire protection systems, such as heating ventilation and air conditioning, smoke shaft and forced smoke extraction

- identification and, where necessary, the formal notification to person(s) responsible for the site of any Fire and Rescue Authority operational limitations

- floor and flat layout and compartment identification.

Planning is underpinned by information gathering, much of which will be gained through inspections or visits, such as those covered by section 7(2)(d) of the *Fire and Rescue Services Act 2004*.

Information must also be gathered and used to review safe systems of work from sources both within and outside the Fire and Rescue Authority, these may include:

- fire safety audits/inspections and home fire safety visits

- incident de-briefs

- health and safety events

- local authorities

- local resilience fora.

Involving others in planning helps to build effective working relationships with partner agencies and other interested parties, such as site owners. Local arrangements, such as community policing panels, may provide relevant information such as the theft of dry rising main components.

Fire and Rescue Authorities must ensure systems are in place to record and regularly review risk information and to ensure that new risks are identified and recorded as soon as reasonably practicable. Planning should be amended to address any identified changes.

Fire and Rescue Authorities must ensure that the information gathered is treated as confidential, unless disclosure is made in the course of duty or is required for legal reasons.

Fire and Rescue Authorities will benefit from using consistent systems and formats to record information from all sources.

Gathering of operational knowledge has little value unless it can be stored, disseminated, updated and accessed in a suitable form when most needed at incidents where its use can save valuable time and inform critical command decisions. It must also be readily available to all personnel who are likely to attend the site.

Information needs will vary in proportion to the size, nature and phase of the incident. Fire and Rescue Authorities must consider the need for arrangements to be flexible and be based on more than one system.

Planning for incidents at high rise buildings must make provision for a pre-determined attendance that reflects the risks involved. The pre-determined attendance should take into account:

- life risk, having regard for the number of persons and their vulnerability

- access for both appliances and personnel

- identified hazards

- facilities provided for the Fire and Rescue Authority

- resources required to tackle the incident

- the nature, size and complexity of the incident likely to be encountered.

Fire and Rescue Authorities should also consider arrangements to ensure that the pre-determined attendance for a high rise premises can be temporarily or permanently increased to compensate for the absence of fixed installations. Some older premises may not provide all of the expected firefighting facilities, in which case additional planning may be required.

The frequency of familiarisation visits and the extent of information gathered/recorded will be determined by the type, use and occupancy of the building.

Information to be gathered in relation to high rise incidents should include:

- access for the siting of appliances, firefighters and equipment

- availability of information for firefighters

- height of the building (to assess impact on firefighting equipment and on the physiological effect on firefighters)

- the number and location of lifts suitable for use for firefighting purposes (noting not all lifts provide the necessary protection to meet the most recent standards)

- evacuation protocols for the building (such as a "Stay Put" policy, phased or full evacuation. Please see Approved Document B paragraph 4.27 for further information regarding phased evacuation)

- location, control and status of any fixed installations and fire suppression systems and the facilities provided for the Fire and Rescue Authority, such as firefighting shafts, rising mains and ventilation systems

- the layout, compartmentalisation and size of the building, including specific features such as atria or security features such as grilles or reinforced doors

- occupancy and use profile (demographic and socio-economic factors and changes which relate to the time of day and/or day of the week)

- effectiveness of communications and identification of any radio 'blind spots'

- building construction features, such as the presence and location of maisonette-style construction, sandwich panels, timber framing, cladding systems, surface mounted trunking, ducting and voids, in addition to features which present a specific hazard, such as asbestos

- evidence of poor housekeeping such as hoarding, obstructed escape routes and storage of combustible materials in escape routes

- location, nature and features of known hazards, such as high voltage electricity and storage of hazardous materials

- fire and Rescue Authorities must ensure the compatibility of equipment with the fixed installations provided.

Fire and Rescue Authorities must identify items of operational equipment to be taken aloft as part of their high rise operational procedure.

This equipment must provide a sufficient weight of attack, respiratory protection, first aid and resuscitation equipment for the foreseeable level of risk in the building.

Consideration should also be given to providing the equipment necessary to:

- access rising mains and individual properties

- locate 'hidden' fires

- enable breathing apparatus wearers to identify displaced cables

- escape from displaced cables, if they become entangled.

Contingency plans for particular premises should cover:

- fire spread beyond the compartment of origin and the potential for multiple rescues

- an operational evacuation plan being required in the event the "Stay Put" policy becomes untenable

- the logistical and physical demands on personnel when operations span multiple floors and compartments

- loss of water or inadequate water supplies (including internal supplies and identification of distances from the bridgehead to the furthest point within the fire compartment)

- the time required to assemble sufficient resources from the pre-determined attendance

- ensuring adequate resources are provided to undertake initial assessment, effect an early response and establish an effective safe system of work

- the complexity and size of building design and security measures, which may lead to personnel being delayed in reaching the scene of operations or persons in need of rescue

- the siting of bridgeheads and alternative options if they are compromised by worsening conditions

- floor and flat numbering, as some buildings may have concealed entrances and the gradient of the ground may lead to front and rear elevations having different floor counts

- alternative communication arrangements to overcome any radio 'blind spots'

- the number of occupants and factors such as hoarding which may impact on the level of resources required and adversely impact on firefighting operations

- the failure or unavailability of fixed installations.

Building owners (in the case of non residential buildings) should be made aware of their obligation to advise the Fire and Rescue Authority of any:

- inherent hazards within the premises

- failures with firefighting facilities

- changes to hazards or firefighting facilities.

In the event of a notified failure or change, the pre-determined response, planning and operational tactics may need to be adjusted for the building.

For complex or fire-engineered buildings the use of an Alterations Notice under the *Regulatory Reform (Fire Safety) Order* may be appropriate in some circumstances as a way of securing any changes to the layout or uses of the building.

Fire and Rescue Authorities must also have effective arrangements in place to handle fire survival guidance calls from residents and others when they believe they are unable to leave the building due to disability, poor mobility, illness or the affects of fire.

Fire and Rescue Authorities should consider both generic procedures for persons expected, likely or advised to remain in their homes (unless directly affected by heat, smoke or fire) as well as bespoke arrangements for specific buildings.

Fire survival guidance call arrangements should include:

- details of how calls will be passed to and recorded at the incident

- their impact on resources and mobilising

- a re-evaluation process to ensure the balance of risk to the public is reviewed if circumstances change (which may result in a change to the advice previously given)

- how information will be exchanged between callers, Fire Control and commanders at the incident.

Consideration must also be given to how required water flow rates and branch operating pressures will be achieved on the upper floors of the tallest buildings. This should cover both the Fire and Rescue Authority's area and beyond, where 'cross border' arrangements make this appropriate.

This must take into account the implications for operating multiple jets simultaneously on upper floors, including the need to liaise with water suppliers where supply problems are anticipated.

The diameter of hose lines and branches specified in standard operating procedures should take into account

- the weight of attack required for different building types

- the available water pressure and flow rates from fixed installations.

Larger diameter hose lines and branches able to make the best use of the available water supply are necessary for buildings with an open plan design and/or high fire loads.

Competence and training

When formulating a competence and training strategy, Fire and Rescue Authorities should consider the following points:

- The competency of staff to conduct specific risk assessments for this incident type. Those tasked with carrying out this assessment and developing procedures should be competent

- Ensure their personnel are adequately trained to deal with hazards and risks associated with high rise fires. Attendance at high rise fires in some Fire and Rescue Authorities may be rare and this lack of experience should be considered and addressed

- The level and nature of training undertaken should be shaped by a training needs analysis that takes account of Fire and Rescue Authority guidance on the competency framework, national occupational standards and individual training needs

- Training and development programmes should:

    - follow the principles set out in national guidance documents

    - generally be structured so that they move from simple to more complex tasks and from lower to higher levels of risk

    - typically cover standard operating procedures as well as ensuring knowledge and understanding of equipment and the associated skills that will be required to use it

    - consider the need for appropriate levels of assessment and provide for continuous professional development to ensure maintenance of skills and to update personnel whenever there are changes. This should include personnel who are required to undertake planning and the procurement of equipment.

Specific training requirements for high rise fires will include the standard operating procedure and the equipment to be used. Training outcomes should be evaluated to ensure the training provided is effective, current and meets defined operational needs.

Fire and Rescue Authorities must undertake and monitor regular training for all personnel who will attend incidents of a high rise nature. This should include outlying stations and neighbouring Fire and Rescue Authorities where the *Fire and Rescue Service Act 2004* Section 13 arrangements are in place.

The tactics and resources required to mount safe rescue and firefighting operations must be practised by personnel and they should be assessed as competent in the role(s) they are required to undertake.

Training, which will cover high rise incidents must include:

- The development of knowledge, skills and understanding for firefighters on the impact of fire on the building's construction, layout, contents and occupant behaviour

- Effective call-handling and management of any fire survival guidance calls. This includes the recording, passing and acting on information from Control to the incident

- The importance of correct sectorisation and the identification of sector commanders at high rise incidents

- Recognition of the signs and symptoms of backdraught, collapse, the effects of wind, risk of rapid and unpredictable fire spread and the adoption of appropriate tactics to mitigate these

- Establishing and maintaining effective command and communication at high rise incidents. This training must be for all relevant roles and levels of Incident Command

- Scenarios and exercises to develop and test operational tactics for overcoming the failure or absence of fixed installations, such as rising mains and fire lifts

- Tactics to recognise and reduce the physical and physiological effects associated with operations and respiratory protective equipment consumption rates

- An emphasis on the crucial importance of regular and effective communications between committed teams, the bridgehead, the Incident Commander and Safety Officers

- How to make effective use of firefighting systems, facilities and fire engineered solutions

- Use of thermal image cameras to identify fire location

- Evacuation and casualty removal tactics. Incident Commanders should understand when a partial or full evacuation strategy might become necessary in a residential building where a "Stay Put" policy is normally in place

- How to deal with occupant behaviour, which can range from anxiety to abusive and violent behaviour directed against firefighters

- The security measures which are likely to be encountered and suitable techniques to facilitate forcible entry

- The availability and utilisation of water supplies.

Command and control at incidents

The Incident Commander must follow the principles of the current National Incident Command System.

Before committing personnel into any hazard area, the Incident Commander must take account of the information available regarding the incident at the time. This will assist them in making effective operational decisions in what are recognised as sometimes hazardous, fast moving and emotionally charged environments.

When gathering information from occupiers and/or residents, it should be remembered that the size and complexity of the building and the dynamic nature of the incident could lead to inaccurate information being provided. Members of the public may misunderstand fire service priorities and operations, for example, a person in a position of responsibility for the building may try to lead personnel directly to the fire floor.

A thorough safety brief prior to deployment of teams within the hazard zone must be carried out.

The Incident Commander should review and change their plan whenever new information becomes available at the incident or from Fire Control. It is vital that the Incident Commander makes effective use of sector and functional commanders to implement their plan, minimise spans of control and prevent personal information overload.

Communication of new or changes to priorities for rescues or risks must continue throughout the incident.

Liaison with the police is essential where any deliberate fire setting is encountered or suspected.

Operational discretion

The Fire and Rescue Authority's operational procedure for high rise incidents must be robust but, recognising that it is impossible to anticipate every situation which may occur, the procedure must also allow sufficient flexibility. This will empower an Incident Commander to exercise operational discretion when either the planning arrangements or the prevailing circumstances at an incident make this justified.

It is anticipated that at the vast majority of high rise incidents, the full implementation of the Fire and Rescue Authority's operational procedure, without any deviation, will be necessary and wholly appropriate. This will assist in ensuring that these incidents are resolved safely and effectively.

However, scenarios can arise at high rise incidents where a more rapid response is necessary, including occasions when it is necessary or desirable to:

- Rescue a 'saveable' life in circumstances where the complete implementation of high rise procedure would lead to an unjustifiable delay, resulting in the potential for greater injury or additional lives lost

   or

- Tackle a known small fire through a pre-emptive strike to mitigate the risk that complete adherence to the high rise procedure might lead to delay. Any delay has the potential to create higher levels of risk for occupants and firefighters, who would then have to tackle a fully developed fire.

Any deviation from procedure must be justifiable in terms of risk versus benefit and based upon the Incident Commander knowing the actions which are normally required as part of operational procedure.

The Incident Commander must only deviate from high rise procedures having risk assessed their intended actions and their likely impact. Any deviation must be the minimum necessary to achieve the objective(s).

On rare occasions it will not be possible for the Incident Commander to deal with situations in relative safety and in these circumstances, the appropriate response may be to delay operations or, in very extreme situations, take no direct action. This is most likely to be the case if an Incident Commander identifies the potential for saveable life is not proportionate to the risks to personnel.

This approach will minimise exposure to unacceptable levels of risk and any decision to depart from operational procedure must be recorded.

The level of justification required from the Incident Commander must also be proportional to the degree of deviation undertaken. A significant deviation from an established procedure will require correspondingly high levels of justification.

The Incident Commander must return to standard operating procedures as soon as practicable.

En-route

Information received en-route and any planning that may affect tactics on arrival should be passed to all relevant personnel prior to arrival at an incident.

It will also be necessary to make sure other appliances attending the incident are informed of any relevant details, such as persons reported, appliance access, significant hazards, water supplies and rendezvous points.

Full use must be made of all available information, including any operational information systems provided.

On arrival

Attendance should be made to the main entrance of the premises, unless an agreed rendezvous point has been identified during the planning phase or prevailing conditions dictate otherwise.

The siting of appliances that form the pre-determined attendance should take into account the potential need for access for aerial appliances and other specialist appliances and the potential danger from objects falling from height.

The Incident Commander should:

- Liaise with a person in a position of responsibility, building occupants and/or Fire Control in order to determine the location of the fire and other relevant information, such as the involvement of persons or hazards to firefighters. The Incident Commander should confirm the accuracy of any information received by cross-checking different sources and clearly conveying what information they require

- Check any available systems (such as automatic fire detection, building plates, premises information boxes or close circuit television) to help confirm fire location

- Formulate incident objectives and formulate a plan based on available information, a dynamic risk assessment and, if required, request additional resources

- Establish a suitable command structure and communicate the plan to relevant persons

- Declare a suitable rendezvous points

- Follow the evacuation strategy of building (see Evacuation and fire survival guidance calls below)

- Use equipment such as aerial appliances and thermal imaging cameras when this would assist with scene reconnaissance, particularly where there is difficulty identifying the location of the fire and/or where the presence of building security systems hinder access

- Establish a safety cordon

- Set up a logistics area for equipment.

If not already in attendance, early consideration must also be given to requesting the attendance of the Ambulance Service to minimise any delay in casualties accessing medical care and the police to assist with evacuation and cordons.

Securing water supplies for firefighting

The Incident Commander of the pre-determined attendance must identify and secure an adequate water supply, using rising mains and twinned hose from a hydrant via a pumping appliance.

If fixed installations are vandalised or unavailable for any other reason, the Incident Commander should consider implementing alternative tactics and/or requesting additional resources.

Dry and wet rising mains have a finite capacity to deliver water. If multiple jets are in use, it may not be possible to achieve optimum flow rates or recommended operating pressure for individual branches.

If the requirement for water exceeds the fixed installation capacity, consideration should be given to augmenting supplies with hose lines on staircases or through the use of aerial appliances. Vertical water relays may be required using intermediate pumps to increase water pressure.

The Incident Commander must consider the premises layout, including the distance between the rising main outlet and the fire, as well as the fire loading, when making decisions regarding the size and length of hose lines (weight of attack) to be used.

If falling debris poses a risk to hose lines going into the building, consideration should be given to either protecting these with suitable coverings, such as hose ramps. Alternatively, it may be possible to route hose lines outside of the 'footprint' within which the debris is falling, or is predicted to fall.

Effective and regular communication between breathing apparatus teams, the bridgehead, the Incident Commander and the pump operator are essential to ensure best use is made of the available water supply. If available, branch flow control facilities can be used to improve distribution between all jets in use.

Long vertical lengths of charged hose will generate high pressures and consideration should be given to how such pressure can be safely released.

Some high rise buildings have fire sprinkler systems and, where fitted, a firefighter should be sent to the main stop valve to check that it is open. The system must only be switched off on instructions from the Incident Commander when the fire is extinguished, following consideration of the points outlined in Appendix 1.

The sprinkler system should not normally be turned off in order that the fire may be fought with jets or spray branches.

Please see Appendices 3 and 4 for further information regarding dry and wet rising mains.

Standard equipment

Fire and Rescue Authority operational procedure for high rise must state that personnel should take aloft the items of equipment identified during planning.

See the Planning section for further information.

Securing and using the firefighting lift

Where the height and location of the incident makes the use of a fire lift beneficial, it should be identified and a firefighter detailed to take control of, and remain in the lift.

Only 'designated' firefighting lifts are safe to use during an operational incident and therefore non-designated lifts should only be used for firefighting and rescue purposes if the Incident Commander's risk assessment or the contingency plan for the building supports this decision.

It should also be considered that some lifts may not access all floors.

Floor plans and information regarding building construction must be sought from a responsible person or other information sources, such as fire safety plans and 7(2)(d) inspection reports.

Personnel must exit the fire lift at least two floors below the floor where the fire is reported or believed to be. If the location of the fire is not known with a reasonable level of certainty, personnel must approach the believed or likely location of the incident with caution and using a protected staircase. This is to ensure that the risk of firefighters becoming involved in the fire without the protection of respiratory protective equipment and firefighting media is minimised.

The fire lift should then remain at the established bridgehead so that rescued persons can be quickly brought to ground floor level.

If the fire lift is not available, this will have resource implications and the Incident Commander will need to consider alternative tactics to get personnel and equipment to upper floors and to rescue casualties.

Please see Appendix 2 for further information regarding firefighting lifts.

Establishing a bridgehead

The bridgehead should be established in a firefighting lobby and not in a corridor (unless the building design results in the corridor performing the 'lobby' function). Incident commanders must use information from planning and their mobilising policy to determine the minimum number of personnel to be dispatched to the bridgehead.

When positioning a bridgehead, consideration must be given to smoke spread through doors that will be opened and which will have to remain open for firefighting purposes. The bridgehead will normally be two floors below the floor where fire or smoke has been reported (or the lowest floor, if there are fires on multiple floors). Planning arrangements or the specific design features of the building may allow for 'safe air' to be reliably maintained and the bridgehead located closer to the fire.

Incident Commanders should also refer to current guidance on vertical sectorisation in the *National Incident Command System*. The Incident Commander must nominate a Fire sector Commander who will proceed to the bridgehead and control operations. The seniority of the person nominated must be proportionate to the complexity of the task, size of the incident and scope of responsibility. For larger incidents, the Incident Commander should consider locating additional sector commanders at the bridgehead, in order to keep lines of communication as short as possible. Fire and Rescue Authorities must consider the need for systems that allow information to be recorded at the bridgehead and which are able to cope with the possibility that the bridgehead may need to be re-positioned.

Regular communication must be maintained to ensure that the Incident Commander is aware of the developing situation and can anticipate resource requirements effectively. This also helps to ensure that the Fire sector Commander is kept updated with information gathered by those who can help to identify any external fire and smoke spread.

Due to congestion, a staging area below the bridgehead may be required for additional resources before equipment and personnel are deployed from the bridgehead.

Consideration must be given to the effect that fire service operations and vertical and /or downward fire or smoke spread can have on the bridgehead. If it is necessary to re-position the bridgehead, all personnel must be informed and consideration given to withdrawing breathing apparatus teams.

Consideration must be given to 'turnaround times' and the additional air required to travel to the re-located bridgehead. Any decision to withdraw breathing apparatus teams must be balanced against the urgency of the task(s) breathing apparatus teams are performing.

Incident Commanders should consider providing means of identifying the 'pathway' between the initial and subsequent bridgehead location, to assist already committed teams to find their way to the breathing apparatus entry control point. Options include laying a breathing apparatus guideline from the new location to the original bridgehead or using self-adhesive signage for this purpose.

Committing teams

All specific tasking of teams must take place at the bridgehead by the Fire sector Commander, once the decision has been made by the Incident Commander to commit them to internal firefighting and rescue operations above the bridgehead.

Where specific information on the location of persons requiring rescue is available this must be confirmed with teams before they are committed and recorded. All available information should be used to identify the location and number of floors, flats and/or office/shops and their proximity to the fire compartment.

This information can include signage, building plans or plans based on the flat or floor layout of unaffected floors, provided these are consistent with the affected flat or floor.

A record of persons rescued and areas searched must be made to:

- assist with briefing additional teams
- prioritise further rescues
- avoid repeated searches of the same areas.

Any unnecessary delay committing teams can increase the likelihood of fire growth and fire spread occurring and, in turn, can increase the pressure on firefighters to act before sufficient resources are available. The Incident Commander must give early consideration to whether additional resources are required to assist in the evacuation of occupants or to replace teams that may have been diverted to this task.

A breathing apparatus team must only be committed with extinguishing equipment that has been assessed as suitable and able to provide sufficient weight of attack. This assessment should take into account the building's construction, the size of the affected compartment(s), anticipated fire loading and the risk windows or wall panels may fail and adversely affect conditions within the compartment.

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). Hose lines must be fully charged before entering any doorway to prevent them passing under a door flat, which could subsequently cause a flow restriction or prevent the door being opened when the jet is charged.

An additional breathing apparatus team with a second jet must protect personnel involved in rescue/firefighting operations as soon as possible. If signs and symptoms are present that indicate the risk of backdraft, flashover or other abnormal fire development, a second jet and breathing apparatus team must be present **before** the search and rescue/ firefighting team commence entry into the fire compartment. The second jet must be able to reach at least one hose length beyond the 'attack' jet. This enables the rescue of the committed team and removal to refuge without compromising water supply.

Branches should be supplied from the closest rising main outlet to the fire which has not been affected by fire or smoke. This will normally be from the floor below the fire floor or, if unavailable, from the nearest available outlet below that.

All personnel proceeding beyond the bridgehead must wear respiratory protective equipment, except in circumstances described below. If there is any possibility that fire suppression or total flooding systems may be installed on floors above the bridgehead, teams detailed to enter such floors must wear respiratory protective equipment.

In circumstances where teams need to work in an area above the bridgehead which is not affected by fire or smoke and the Incident Commander has confirmed that the building's construction and any fire engineered solutions have not been compromised, teams can be committed without respiratory protective equipment.

These teams must maintain communication and a Safety Officer must be deployed in the stairwell and be in contact with other Safety Officers and the Incident Commander outside the building. Teams not wearing respiratory protective equipment must be withdrawn as soon as it is believed there is a risk that fire or smoke is likely to spread to the unaffected area.

The Incident Commander must consider the resources necessary to reach the incident and undertake required tasks, taking into account the need for welfare, hydration and rotation of firefighters.

Where practicable and it is confirmed that persons are not involved, the tactical option to fight the fire externally from an aerial appliance may be considered.

Where necessary, the Incident Commander and other members of the command team should consider the need for lighting to assist with safe movement around the building and incident ground.

Safety cordons

Incident Commanders must consider the implementation of an appropriate sized hazard zone. This must take into account the size, height and construction of the building, as this will affect the footprint in which debris and other items may fall.

The hazard zone must enable the Incident Commander to:

- separate those at risk, including fire and rescue personnel, from the hazard

- support emergency services' operations

- protect the scene and prevent unauthorised access to evidence or property.

The Incident Commander should undertake early liaison with the police, who may be best placed to resource and manage cordons around a high rise incident.

Evacuation and fire survival guidance calls

Residential buildings are built to the building standards applicable at the time of construction. This may include older design guidance or earlier versions of Approved Document B, the guidance that supports the Building Regulations.

The Responsible Person for these premises types also needs to comply with the provisions of the *Regulatory Reform (Fire Safety) Order 2005*; and if necessary, have a suitable emergency evacuation plan, a management strategy and maintenance procedures in place identified through their fire risk assessment process.

The Incident Commander should follow the evacuation plan devised as part of the premises fire risk assessment when known, unless the fire situation dictates otherwise. Where a "Stay Put" policy is in place, it should be safe for occupants to remain within their own property in the event of a fire elsewhere in the building. Occupants (if they are able to) should self evacuate when the fire, heat or smoke is adversely affecting them in their property. This may be as the result of a fire that has started in their own property or from elsewhere in the building.

It should be noted that not all high rise residential buildings are designed or have been maintained to have a "Stay Put" policy in place.

Commercial or multi use buildings can also have a variety of evacuation strategies that may range between simultaneous, phased, staged or a combination of these. Incident Commanders should ensure their planning takes into account fully the building's evacuation strategy and this information should be obtained at an early stage of the incident.

The type of evacuation strategy, the progress of this evacuation and the number and type of people being evacuated can adversely affect firefighting operations.

The occupants of high rise buildings may not always act as firefighters expect or in accordance with the buildings designed evacuation plan. Some occupants may be unfamiliar with the building and its layout or they may be visitors. The Incident Commander should consider these factors as part of formulating their operational plan and assessing the resources needed to deal with the incident.

Evacuation can be made more resource intensive if the occupants have an impaired ability to make their own way to safety.

The Incident Commander should consider:

- the effect of firefighting tactics on evacuation (and vice versa)
- that widespread evacuation may divert personnel from the task(s) they were briefed to undertake and this may require additional resources
- using other emergency service personnel to assist with evacuation
- the need to establish a casualty receiving area.

Fire survival guidance

Fire Control rooms may receive numerous fire survival guidance calls during a high rise incident and these calls can provide vital information, which the Incident Commander can use to locate and prioritise persons requiring rescue. Considering the life threatening circumstances, fire survival calls are likely to be extremely stressful.

Control operators may obtain more accurate information as to the location of the fire and/or persons in need of rescue or reassurance than that gathered by an Incident Commander who is on scene.

A clear record should be made of all fire survival guidance calls and relevant information on the location and circumstances of the callers. This is both at the fire service control room and at the incident ground.

This will assist in the Incident Commander's confirmation of priorities and any subsequent reassessment of those priorities should information change as the incident develops.

The advice offered to callers to remain in their property during fire survival guidance calls must be re-evaluated throughout an incident. Where circumstances make it necessary, an Incident Commander may need to consider changing the advice given. For example, callers may need to be advised to leave their property or to be guided from it by firefighters. The Incident Commander should also consider making use of all available systems within the building to communicate with occupants.

Whenever fire survival guidance calls are being received, the Incident Commander must liaise closely with Fire Control.

Ventilation

Ventilation must only be undertaken on the instruction of the Incident Commander

All doors should be kept closed except when it is necessary for them to be opened to facilitate the movement of personnel and equipment.

Ventilation must not be undertaken until:

- the effects on personnel and occupants in the hazard zone have been assessed

- sufficient resources are in place to contain the fire, if there is a need to breach any built or engineered safety systems

- measures (such as covering jets) are in place to protect surrounding risks.

If the risk cannot be properly assessed or sufficient control measures implemented ventilation must only be undertaken in the post fire stage.

The Incident Commander must not make any changes to a high rise building's ventilation or fire safety systems without first taking appropriate advice, from either the 'responsible person' or appropriately trained Fire and Rescue Authority personnel.

Before operating any heating or ventilation systems or undertaking ventilation the Incident Commander must also identify:

- the path that fire, heat and smoke will follow to escape to open air or another compartment

- any adverse affect on fire development, such as the risk of causing a backdraught or flashover

- any adverse affect on evacuation in progress
- what impact wind may have if windows or doors are opened or should fail prematurely.

The Incident Commander should consider, on the basis of expert advice and building design, using any available building ventilation systems to minimise smoke logging in areas outside the Fire sector. Alternatively, tactical ventilation, including positive pressure fans if available, can be used to improve working conditions for firefighters and to help protect building occupants. It should be noted that some mechanical ventilation might have a variable speed capability.

Building design and fire safety measures

During a fire, the level of risk can be significantly increased if any of the building's design features are compromised or are not in place because the building is under construction or refurbishment.

Early unexpected failure, or non existence, of internal compartmentation within a flat can cause a fire to be far bigger than normally planned for.

The Incident Commander must determine what fixed installations and facilities for firefighters are available, check whether they are functioning and incorporate them as appropriate within the operational plan.

If any fire safety measures have been compromised, the Incident Commander must consider requesting additional resources to implement alternative tactics.

The Incident Commander must consider the impact of building materials and contents on fire spread; for example, some designs of plastic or aluminium window frames/panels can be subject to early failure, promoting fire growth and vertical and horizontal fire spread.

The failure of any external walls will create an increased risk of firefighters falling from height and, where this occurs, the Incident Commander must ensure appropriate procedures are in place to maintain a safe working area.

Automatic fire curtain systems may be present and can be applied in a variety of configurations. If an automatic fire curtain system is installed, the Incident Commander must ensure personnel are briefed on their location(s) and the risk they can pose to safe egress from the building, should they operate whilst a team is committed where they are installed.

Locations of automatic fire curtains may be identified through the provision of premises information for fire fighters. In some cases, personnel may not be aware of their presence until the installations activate, such as where fire curtains are found in residential apartments.

Manual emergency service overrides may be provided for some automatic fire curtain installations.

Anti-social behaviour

If fire and rescue personnel are subject to verbal or physical threat or abuse, the Incident Commander should consider requesting attendance of police, withdrawal and defensive firefighting tactics.

Communications

Where appropriate and available, the Incident Commander must consider the use of alternative radio channels to manage the volume of radio traffic.

Where there are communication difficulties, specialist equipment, such as a leaky feeder radio cable, Airwave radios or repeater equipment, can be used and the Incident Commander should also consider the use of internal or mobile telephones, public address systems or loudhailers to communicate with building occupants.

When radio communications with any team committed to the incident are lost, it must **not** automatically be assumed that any loss of communications is associated with transmission difficulties caused by the building. Every effort should be made to re-establish communications as quickly as possible.

If there is an unexpected or sustained loss of radio communications, an assessment of risk should be undertaken to consider whether breathing apparatus emergency procedures should be initiated and emergency teams deployed. Factors such as significant deterioration of circumstances should inform this risk assessment and communication with any nearby teams may also assist.

Safety Officer(s)

The early appointment of one or more competent Safety Officer(s) will help ensure that risks are either eliminated or reduced to an acceptable level.

The Incident Commander must confirm that the Safety Officer understands:

- their role and area of responsibility

- allocated tasks

- current information about hazards and risks

- lines of communication.

Those undertaking the Safety Officer role must:

- be competent to perform the role

- ensure personnel are wearing appropriate respiratory protective equipment and personal protective equipment

- monitor the physical condition of personnel and the general or specific safety conditions at the incident, in accordance with their brief

- take any urgent corrective action required to ensure safety of personnel

- update the Incident Commander or Safety sector commander regarding any change in circumstances

- not be engaged in any other aspect of operations, unless this is required to deal with a risk critical situation.

The role of a Safety Officer can be carried out by any of the fire service roles, but the complexity of the task, size of the incident and scope of responsibility must be considered by the Incident Commander when determining the competency level required.

Safety Officers must wear the recognised identification (such as a tabard) to indicate they are undertaking the Safety Officer role.

Fire and Rescue Authorities must ensure that training and other measures (such as aide-memoires) are in place and available to support those personnel likely to undertake this role.

The Incident Commander should, where justified by conditions, appoint a Safety Officer(s) as soon as practicable to monitor conditions in the staircase or shaft being used for the bridgehead and to observe all relevant external sides of the building.

The Safety Officer working outside the building must check for:

- falling debris

- cordon maintenance for fire and rescue personnel, other emergency service personnel and members of the public

- external spread of fire and smoke.

The Safety Officer role can be vital in communicating external fire development to the Incident Commander, the bridgehead and other relevant personnel.

Personal protective equipment

Fire and Rescue Authorities must ensure that any personal protective equipment provided is fit for purpose and meets all required safety standards. When choosing suitable protective garments, the standard of clothing worn beneath should also be taken into account. Consideration must also be given to the selection of suitable sizes and gender specific requirements of personal protective equipment.

Personal protective equipment must also take account of the need for firefighters to be visible against the operational background including night working and for the Incident Commander and other managerial and functional roles (defined in the National Incident Command System) to be distinguishable.

All personnel must use appropriate levels of personal protective equipment and respiratory protective equipment as determined by the safe system of work.

Consideration should be given by the Incident Commander to the need for personnel working in safe areas to relax their personal protective equipment to minimise the physiological impact and reduce their core temperature.

All personnel committed beyond the bridgehead must be wearing full personal protective equipment and respiratory protective equipment. The only exception to this would be when the Incident Commander has deemed it safe for fire and rescue personnel to work above the bridgehead without respiratory protective equipment.

Post incident

As appropriate to the nature and scale of the incident, the following measures should be considered to help eliminate or remove risks after an incident:

- Fire protection and structural safety must be assessed to ensure that it has not been compromised before handing over the building to the responsible person

- Arrangements should be made with the occupiers to reinstate, as far as practicable, all fixed installations, such as ventilation systems and fire alarms, to their normal working condition

- Any safety events, personal injuries, exposure to hazardous substances or near-misses must be recorded, investigated and reported in line with legislative requirements such as *Reporting of Injuries Diseases and Dangerous Occurrence Regulations 1995*

- A procedure should be in place to either remove all contamination from personal protective equipment or to ensure its safe and appropriate disposal. Fire and Rescue Authorities must also have arrangements in place to check that equipment maintains the agreed levels of integrity and protection for the wearer throughout its lifecycle

- As appropriate, occupational health support and surveillance follow up should be provided. Staff should be supported and monitored to identify whether they are experiencing any adverse affects and to check whether they would benefit from accessing counselling and support services

- Conduct a debrief to identify and record any 'lessons learned' from the incident. The timing, complexity and formality of the de-brief should be proportionate to the scale of the incident and in line with individual Fire and Rescue Authority's procedures

- Consider any changes required to safe systems of work, appliances or equipment in the light of any lessons learned from debriefs or from safety events

- Consider the need to review existing information held on a premises or location, or the need to add a new premises or location into future planning or inspection programmes

- Where the scale and nature of the incident makes it justified, arrangements must be made for personnel to make a contemporaneous written record of their actions. This information may be used to assist in any internal or external investigations or enquiries such as a Coroner's Court or public inquiry

- any fire safety contraventions identified at an incident must be followed up by the relevant Fire and Rescue Authority Fire Safety Enforcement team and/or reported to the appropriate authority (which may be the local authority or Health and Safety Executive) so that appropriate enforcement action can be taken.

Consideration must also be given to any community safety interventions which may be appropriate, such as promoting smoke alarm ownership or highlighting issues such as vandalism or anti-social behaviour to relevant partner agencies.

It should be noted that community groups specific to either individual high rise premises or estates are widespread and can be a useful means of contacting and informing occupants.

Technical references	
1	Fire Research Technical Report 1/2005 Operational Physiological Capabilities of Firefighters: Literature Review and Research Recommendations
2	Fire Research Technical Report 2/2005 Physiological Assessment of Firefighting, Search and Rescue in the built environment
3	Fire Research Technical Report 3/2005 Effect of reduced pressures on performance of firefighting branches in tall buildings
4	Fire Research Technical Report 4/2005 Hydraulic Calculation of Wet and Dry Risers, Hoses and Branches
5	Fire Research Technical Report 5/2005 Firefighting in under-ventilated compartments: Literature Review
6	Fire Research Technical Report 6/2005 Collection and Analysis of Human Behaviour Data appearing in the mass media – Evacuation of the World Trade Centre
7	Fire Research Technical Report 7/2005 Collection and Analysis of Emergency Services Data Relating to the Evacuation of the World Trade Centre Towers of 11 September 2001
8	Fire Research Series 13/2008 Understanding people's attitudes towards fire risk – Final report to Communities and Local Government
9	Fire Research Technical Report 18/2008 Core Temperature, Recovery and Re-deployment during a Firefighting, Search and Rescue Scenario
10	Fire Research Technical Report 19/2008 Incident Ground Communications Study – Current Situation Report
11	Fire Research Technical Report 20/2008 Incident Ground Communications Study – Technology Review Report
12	Fire Research Technical Report 21/2008 Incident Ground Communications Study – Incident Communications Final Report
13	Fire and Rescue Service Operational Guidance – Operational Risk Information Mark 2012 Ref ISBN 9781409833741
14	Local Government Association – Fire safety in Purpose-Built Blocks of Flats May 2012

SECTION 2

Summary of Generic Risk Assessment 3.2

Fighting fires – In high rise buildings

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
1	Firefighting and rescue operations	Height of the building	Operations constrained by the finite capacity of fire and rescue personnel and equipment Reliance on provision of purpose-designed facilities to support effective Fire and Rescue Authority intervention that are missing or defective	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits Dedicated facilities designed to aid fire fighting intervention Equipment designed for high rise incidents Firefighting lift commandeered and operator designated Operational procedure to set out contingency arrangements, if fixed installations are unavailable Sectorisation in accordance with national guidance.
2	Firefighting and rescue operations	Objects falling from height	Impact injuries to those entering or exiting building, working or assembling outside Debris ejected explosively and materials such as glass and curtain wall panels can 'plane' some distance from the building	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Initiate hazard zone around building Protect hose lines from falling debris Re-route hose lines around hazard zone Utilise other emergency services to aid movement of casualties/public to safe areas Cover external fire spread with jets/monitors Appoint Safety Officers around perimeter of building. Sectorisation in accordance with national guidance.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
3	Firefighting and rescue operations	Extended lines of communication	Difficulty with lines of communication and radio reception Operations may be a considerable distance from point of command and building construction may cause communication 'blind spots'	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits Leaky feeder radio cables, repeater equipment, internal telephones, public address systems and mobile telephones Alternative radio channels Utilise separate attack/evacuation stairways where appropriate Change locations or use intermediate radio operators.
4	Firefighting and rescue operations	Premises security	Access for firefighters may be delayed by security arrangements, such as door-code entry systems, security grilles and multi-lock door systems Progress slowed by multiple security devices along the route to a fire	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits Exercise scenarios to reflect reasonably foreseeable scenarios, such as movement of bridgehead, loss of firefighting lift, or dry rising main Additional resources may be required Appoint Safety Officers to monitor outside of building and conditions in firefighting shaft being used for bridgehead Appropriate level of manager to take charge of Fire sector at bridgehead Fire survival guidance procedure implemented Liaison with other agencies Police liaison traffic/crowd control Sectorisation in accordance with national guidance Standard equipment, such as breaking in gear, taken aloft.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
5	Firefighting and rescue operations	Complexity of internal layout	Teams may become disorientated, safe movement may be hindered and operations slowed due to: • lack of information on the internal layout • large or complex floor layouts • operation of fire engineering systems (such as fire curtains) • 'maisonette' dwellings may be encountered. Access may be up or down a staircase from the front door • scissor-style staircases	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local teams Planning including 7(2)(d) visits Manage bridgehead and staging areas Use of building plans and Regulatory Fire Safety records Use floor plans to brief teams Suitable and sufficient de-brief of teams Awareness of fire engineered solutions Effective lines of communication Use of equipment such as guidelines to assist teams to find relocated bridgehead Sectorisation in accordance with national guidance Fire survival guidance procedure implemented.
6	Firefighting and rescue operations	Activation of Heating Ventilation Air Conditioning systems	Unpredictable fire spread Unexpected fire/smoke behaviour	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Determine status of heating ventilation air conditioning systems Maintain operation of all heating ventilation air conditioning systems until specialist advice dictates otherwise Ventilate only on order of Incident Commander Cover surrounding risks.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
7	Firefighting and rescue operations	Floor and ceiling collapse	Intermediate and main floor and ceiling collapse within a high rise building	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Ensure training covers signs and symptoms of building collapse Attendance of Fire Safety Officer Attendance of structural surveyor Subject matter experts eg urban search and rescue Effective lines of communication Appoint Safety Officers Fire and Rescue Authority lighting Establish hazard zone.
8	Firefighting and rescue operations	Wall panel failure	Falls from height due to the failure of external walls, window frames or panels made of lightweight construction, such as plastic or aluminium	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits Working at height protocols and hazard awareness training regarding issues with open areas at heights due to failure of structures in a fire Exercises to reflect reasonably foreseeable scenarios, such as loss of wall panel High rise tactics practiced at training events Briefing and debriefing of teams Additional resources may be required Subject matter experts, such as structural surveyor, urban search and rescue and Fire Safety Officer Safety Officers to monitor outside of building Establish a hazard zone.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
9	Firefighting and rescue operations	Construction technique	Timber-frame buildings under construction can result in rapid fire and smoke spread and premature collapse Combustible material in voids and cavities may contribute to fire and smoke spread	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning including 7(2)(d) visits Utilise appropriate fire fighting tactics (consider defensive) Adequate resources in attendance/requested Appoint Safety Officers to monitor outside of building and conditions in firefighting shaft being used for bridgehead High rise tactics practiced at training events Awareness of construction techniques Operational procedure and exercises to include reasonably foreseeable scenarios, such as loss of lift or dry rising main Information from fire safety and other agencies on new buildings or changes to premises Subject matter experts, such as structural surveyor, urban search and rescue and Fire Safety Officer Consider additional evacuation if the building is occupied.
10	Firefighting and rescue operations	Information gathering	Difficulty for the Incident Commander and others working on ground level to be confident regarding location of incident and extent of fire and smoke spread External signs of fire and smoke may be difficult to see or be misleading Information obtained from occupants may be inaccurate	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local teams Planning including 7(2)(d) visits Teams informed of access issues Identification and awareness of rendezvous point, road closures and access routes Additional resources may be required Incident Commander must remain at ground floor level and implement the command function unless preplanning arrangements have identified a more appropriate location Use of command unit at larger incidents Sectorisation in accordance with national guidance Confirm accuracy of information by cross-checking information obtained from various sources.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
11	Firefighting and rescue operations	Cable entanglement	Entanglement in electrical or telecommunications cabling displaced from surface-mounted cable trunking	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local teams Operational procedure and training to include suitable reference to cable entanglement Planning including 7(2)(d) visits Provision and use of breathing apparatus set modifications or rescue equipment, such as cable cutters Suitable personnel tasking, appropriate briefing and debriefing of teams Early availability of emergency teams Declare firefighter emergency Fire survival guidance procedure implemented.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
12	Firefighting and rescue operations	Unavailability or malfunction of fixed installations, fire engineered solutions and firefighting facilities	Poor maintenance, poor management and/or vandalism may result in impaired or unavailability of fixed installations, fire engineered solutions and/or fire fighting facilities hindering operations Premises information box unavailable/information missing Unexpected operation of fire engineered solutions	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits Contingency plans included within operational procedure and training Augment supplies to fire fighting floors using 70mm hose Use of aerial appliance(s) Fixed installation defects reported to appropriate agency or authority Increase to predetermined attendance to meet specific circumstances, such as defective dry rising main Dry/wet rising main augmented Check to ensure sprinkler main stop valve in open position Sprinklers only turned off on instruction of Incident Commander Information from fire safety and other agencies on new buildings or changes to premises Management to reinforce guidance and requirement to identify high rise risk premises Defensive firefighting techniques Surrounding risks covered Emergency teams standing by.
13	Firefighting and rescue operations	Oxygen deficient or toxic atmospheres	The operation of fire suppression/total flooding systems may result in either an oxygen deficient or toxic atmosphere Spread of smoke	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Additional resources may be required Breathing apparatus and associated control measures Emergency teams Sufficient weight of attack Ventilation.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
14	Firefighting and rescue operations	Buildings under construction and refurbishment	Access difficulties Rapid fire and smoke spread Early collapse of building Lack of information on the internal layout Partial occupancy and people other than construction workers present Spread to adjacent buildings or areas Doors or partitions may not offer required fire protection or may hinder access if additional security is fitted	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits Protect surrounding risks Consider defensive fire fighting Management of access/egress routes Adequate resources are in attendance/requested Police assistance Utilise appropriate fire fighting tactics (consider defensive) Consultation and preventative work with partner agencies Fire survival guidance procedure implemented Extended hazard zone Use of ground monitors/aerial appliances Sectorisation in accordance with national guidance Standard equipment, such as breaking in gear, taken aloft Utilise Safety Officers to monitor fire and smoke spread.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
15	Firefighting and rescue operations	Fire and smoke spread	Vertical and/or horizontal fire and smoke spread less predictable than in other building types Fire and smoke spread can develop internally but also externally when fire breaks out of windows leading to rapid spread to other compartments and floors Vertical shafts and ducting can result in the unpredictable and rapid spread of fire and smoke over considerable distances Personnel may encounter fire and smoke spread through un-protected joints and small spaces between structural materials Fire spread to fire loading on balconies such as cylinders Bridgehead is compromised by worsening conditions Air currents may affect fire and smoke spread	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning including 7(2)(d) visits Briefing and debriefing of teams Incident Commander ensures appropriate manager in charge of bridgehead Ensure risk of fire and smoke spread included within operational procedure and training Bridgehead to be established in fire fighting lobby If necessary due to worsening conditions relocate bridgehead Incident Commander to be informed prior to breathing apparatus teams being committed Personnel proceeding beyond bridgehead must be wearing breathing apparatus unless Incident Commander confirms area to be searched is not affected by smoke/fire and buildings construction and fire engineered solutions not compromised Maintain regular and effective communication between Incident Commander, bridgehead and teams Fire survival guidance procedure implemented Ventilation Keep doorways closed unless necessary to open to allow passage of personnel or equipment Incident Commander to consider ventilation of stairways and corridors Appointment of Safety Officers to monitor conditions in stairways and shafts Utilise fire engineered solutions such as pressurisation of stairwells or smoke vents only on order of Incident Commander Sectorisation in accordance with national guidance Utilise attack/evacuation stairwells where appropriate.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
16	Firefighting and rescue operations	Fire on multiple floors	Fires may be encountered on more than one floor as a result of the factors identified above or deliberate fire setting	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Ensure this risk is included within operational procedure and training Incident Commander ensures appropriate manager in charge of bridgehead Bridgehead to be established in fire fighting lobby Incident Commander to be informed prior to breathing apparatus teams being committed Personnel proceeding beyond bridgehead must be wearing breathing apparatus unless Incident Commander confirms area to be searched is not affected by smoke/fire and buildings construction and fire engineered solutions not compromised Movement of bridgehead to area of 'clean air' as required Fire survival guidance procedure implemented Ventilation Keep doorways closed unless necessary to open to allow passage of personnel or equipment Consider need for evacuation outside Fire sector Incident Commander to consider ventilation of stairways and corridors Appointment of Safety Officers to monitor conditions in stairways and shafts Utilise fire engineered solutions such as pressurisation of stairwells or smoke vents only on order of Incident Commander Sectorisation in accordance with national guidance Utilise attack/evacuation stairwells where appropriate.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
17	Firefighting and rescue operations	Effect of wind	Strong winds entering a fire compartment can intensify the fire creating a 'blow torch' effect as well as increasing the likelihood of flashover and/or backdraught This can be in unpredictable directions resulting in rapid fire spread and the premature failure of structural features, such as fire doors Wind speeds are likely to increase as the building height increases	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits to identify likely impact of surrounding buildings Ensure this risk is included within operational procedure and training Additional resources may be required Consider evacuation of non affected areas Protect surrounding risks Consider defensive fire fighting Ensure sufficient weight of attack Awareness/training about wind/weather affecting high rise fire Sectorisation in accordance with national guidance Safety Officers to monitor external conditions ie compartment glazing, external fire spread Establish a hazard zone.
18	Firefighting and rescue operations	Limited ventilation in compartments with few or no openings	Build up of toxic gases, poor visibility, creation of backdraft/flashover conditions, horizontal and vertical fire/smoke spread	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning and training and tactics for preparation of high rise incidents Ensure ventilation included within operational procedure and training Ventilate only on order of Incident Commander Keep doorways closed unless necessary to open to allow passage of personnel or equipment Incident Commander to consider ventilation of stairways and corridors Appointment of Safety Officers to monitor conditions in stairways and shafts Utilise fire engineered solutions such as pressurisation of stairwells or smoke vents only on order of Incident Commander.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
19	Firefighting and rescue operations	Burning debris falling from height	Burning material falling from upper floors or propelled by wind can spread fire to lower floors by igniting combustible materials through open windows, on balconies and around the base of the building Burning debris may also fall from the building as a consequence of firefighting actions causing secondary fires Water supplies could be compromised if hose is damaged by falling debris	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning including 7(2)(d) visits Ensure risk included within operational procedure and training Additional resources may be required Consider appointing a Safety Officer to monitor outside of building Exercises to reflect reasonably foreseeable scenarios Management to reinforce guidance and requirement to identify high rise risk premises Community safety advice Building owner/management and fire safety advised of any significant hazards found at premises Appropriate evacuation of affected area Removal of identified unaffected fire loading Fire survival guidance procedure implemented Sectorisation in accordance with national guidance Establish a hazard zone.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
20	Firefighting and rescue operations	Poor housekeeping and high fire loads	Poor housekeeping, including the storage of combustible materials in escape routes and on balconies can obstruct doorways and escape routes, impede the progress of firefighting personnel and assist fire development in the event of a fire High fire loads may be encountered associated with 'hoarding' Deliberate placement of flammable materials or cylinders and/or arson	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits Liaison with housing providers and/or building management Consider appointment of Safety Officers to monitor conditions in stairways and shafts Remove materials not involved in fire. Fire Safety Officer Sufficient weight of attack Additional resources may be required.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
21	Firefighting and rescue operations	Smoke travel and 'Stack' effect	The 'stack' effect can increase fire/smoke spread throughout the building. This may result in the location and/or size of the fire being incorrectly identified Fires in refuse or refuse containers can create extensive smoke spread through chutes, other shafts and voids Relatively small fires involving refuse can be interpreted as more serious due to the volume of smoke generated and the potential for excessive smoke travel in different directions Rising smoke may cool and spread laterally.	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning including 7(2)(d) where necessary Ensure risk of fire and smoke spread included within operational procedure and training Additional resources may be required Appoint Safety Officers to monitor outside of building and conditions in firefighting shaft being used for bridgehead High rise tactics practiced at training events Exercise scenarios to reflect reasonably foreseeable scenarios, such as loss of firefighting lift or dry rising main Information from fire safety and other agencies on new buildings or changes to premises Fire Safety Officer Consider additional evacuation Fire survival guidance procedure implemented Movement of bridgehead to area of 'clean air' as required Keep doorways closed unless necessary to open to allow passage of personnel or equipment Incident Commander to consider ventilation of stairways and corridors Sectorisation in accordance with national guidance Utilise fire engineered solutions such as pressurisation of stairwells or only on order of Incident Commander.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
22	Firefighting and rescue operations	Premises unknown to attending personnel or un-notified refurbishment and changes to occupation	Evacuation protocols not communicated Delay in fire fighting/search and rescue Limited knowledge of layout/ engineered solutions Insufficient resources Rapid fire/smoke spread	Fire personnel Members of public involved Members of public not involved	Planning including 7(2)(d) visits Use all available sources to gather information on premises Information from fire safety and other agencies on new buildings or changes to premises Management to reinforce guidance and requirement to identify high rise risk premises Additional resources may be required Consider defensive firefighting techniques.
23	Firefighting and rescue operations	Evacuation of buildings	Firefighting and rescue operations can be affected by the type of evacuation being undertaken and/or the premises' evacuation plan Availability of firefighting lifts for use by Fire Personnel may be hindered due to public evacuation Evacuation of persons can divert team(s) from task(s) they are briefed to undertake 'Stay Put' policy may become untenable due to unexpected fire spread	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning including 7(2)(d) visits Ensure evacuation protocols and issues are included within operational procedure and training Follow the management evacuation plan unless fire situation dictates otherwise – consider vulnerable people Plan fire fighting action with consideration for evacuation protocols Utilise other emergency services to aid movement of casualties/ public to safe areas Utilise attack/evacuation stairwells where appropriate Fire survival guidance procedures implemented Sectorisation in accordance with national guidance Consider all means of contacting persons within building, such as intercom telephones, loud hailers etc.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
24	Firefighting and rescue operations	Unavailability of firefighting facilities	Any unavailability or failure of fire mains, firefighting lifts, ventilation systems and compartmentalisation will increase risks to firefighters and may increase the resources required to resolve an incident	Fire personnel Members of public involved Members of public not involved	Planning to include systems for ensuring information is available when required Ensure unavailability of firefighting facilities included within operational procedure and training Manual evacuation of casualties Additional resources may be required Aerial appliance to deliver equipment to upper floors All defects and unavailability is reported to appropriate agency or authority Increase to predetermined attendance to meet specific circumstances, such as defective firefighting lift Augment supplies provided by rising mains Sectorisation in accordance with national guidance Use of aerial appliance(s).
25	Firefighting and rescue operations	Locating the fire floor	The size and layout of some buildings and means of fire service access may make it difficult to determine the location and floor of origin of a fire from the ground Potential for personnel using firefighting lifts to proceed directly onto a floor involved in fire Information obtained from occupants (via control or at incident) may not be accurate	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identify fire floor prior to committing teams Manage firefighting lift and location of bridgehead Thermal image camera to determine floors affected by heat/fire Ensure only firefighting lift used at operational incidents with relevant safety precautions in place Use of aerial appliance for reconnaissance Confirm accuracy of any information received from occupant(s) Close liaison with Fire Control regarding Fire Survival Call information.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
26	Firefighting and rescue operations	Gathering resources	Time taken to gather adequate resources may compromise public and firefighter safety if a serious fire is in progress Time taken to assemble sufficient resources may allow conditions in the fire compartment to deteriorate and increase the risk of flashover or backdraught	Fire personnel Members of public involved Members of public not involved	Flexibility in operational procedure to enable a safe but rapid intervention to be made Identification of hazard by local personnel Planning including 7(2)(d) visits Pre-determined attendance sufficient to enable Fire and Rescue Authority's high rise operational procedure to be implemented Request additional resources to deal with any unexpected fire growth or the unavailability of fixed installations Exercise scenarios to reflect reasonably foreseeable scenarios Sectorisation in accordance with national guidance Management to reinforce guidance and requirement to identify high rise risk premises.
27	Firefighting and rescue operations	Water supplies	Insufficient water supply on upper floors due to the height of the incident, characteristics of the fire main and the limitations of fire service equipment High water pressure at pump	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning including 7(2)(d) visits Secure adequate water supply prior to committing teams Augment rising mains Hose lines protected from falling debris Alternative water supplies sourced to support hydrants Use water subject matter expert (tactical advisor/water officer) High volume pumps or aerial appliance to deliver water Defensive firefighting where situation dictates Dividing breeching and length of hose inserted to first length of delivery hose Sectorisation in accordance with national guidance Length of 70 mm hose and branch inserted into first floor dry rising main to release pressure post incident.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
28	Firefighting and rescue operations	Physiological demands and physical workload	The intensity of work in a fire compartment can lead to a dangerous increase in core body temperature Access to the fire may be limited to a single point making it difficult for teams to proceed without encountering hostile conditions Personnel may have to climb stairs in personal protective equipment and with equipment which may lead to exhaustion or collapse and may reduce respiratory protective equipment duration	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Rotation of teams Rehydration of teams Staging areas where personnel can manage metabolic stress Ambulance Service attendance Early consideration to whether further resources are necessary Temporary relaxation in personal protective equipment to reduce metabolic heat stress. Use of firefighting lifts Use of aerial appliances Sectorisation in accordance with national guidance Monitoring arrangements to check health and welfare of personnel.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
29	Firefighting and rescue operations	Congestion of access and egress routes within building	Congestion can arise as personnel moving into the building encounter occupants evacuating There is the potential for both the evacuation and firefighting/rescue operations to be impeded Equipment trip hazard on stairs	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) visits Identification and awareness of rendezvous point, road closures and access routes Awareness of any designated marshalling area Staging area below bridgehead Marshalling and Safety Officers Bridgehead/staging area/stairwell management Consider establishing separate 'attack' and 'evacuation' staircases Consideration given to access for aerials/specialist appliances Sectorisation in accordance with national guidance Use of other agencies to assist with evacuation Hose and equipment management Lighting.
30	Firefighting and rescue operations	Failure of electrical systems	Ingress of water into electrical system creates risk of electric system failure, electrocution, electric shock, loss of visibility and entrapment	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning and training Only use designated firefighting lifts for firefighting purposes Additional resources may be required Use of Safety Officers Damage control.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
31	Firefighting and rescue operations	Person(s) shut in a lift	Failure of lift or use of non-designated lifts can lead to firefighters and evacuees becoming trapped in a lift car A lift may be affected by smoke, fire, heat and water The diversion of resources necessary to rescue trapped lift occupants may have an adverse impact on firefighting Firefighting lift motor room becoming involved in fire	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Only use designated firefighting lifts for firefighting purposes Additional resources may be required Use of Safety Officers externally and within protected lobby to monitor conditions Declare fire fighter emergency Weight of attack Planning, training and tactics for preparation for lift failure Sectorisation in accordance with national guidance Incident Commander remove personnel from lift, lift motor room and isolate power supply if potential exists for lift motor room to become involved in fire.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
32	Firefighting and rescue operations	Breach of fire fighting lobbies	Fire and Rescue Authority operations may breach firefighting lobbies increasing risk to occupants and impacting on operations at and beyond the bridgehead The size of firefighting lobbies may be insufficient to contain the resources necessary to mount an effective attack Hose lines run along protected routes and stairways may creating trip hazards and allow the products of combustion to spread into unaffected areas of the building	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning including 7(2)(d) visits Ensure breeching firefighting lobbies included within operational procedure and training Additional resources may be required Aerial appliance to deliver water Defensive firefighting where situation dictates Ensure hose lines are charged before breeching lobby (to prevent flat hose lines passing under doors) Staircase and bridgehead management, including relocation of bridgehead if necessary Use of fire engineered solutions Fire Safety Officer Use of Safety Officers externally and within protected lobby to monitor conditions Sectorisation in accordance with national guidance Keep doorways closed unless necessary to open to allow passage of personnel or equipment Cover surrounding risk.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
33	Firefighting and rescue operations	Casualty retrieval	The removal of casualties to medical care can involve transportation over a considerable distance Personnel involved in carrying casualties down long stairways will be at increased risk of manual handling injury Time taken to deliver casualties to medical care may impact upon their potential for survival and recovery	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Ensure casualty retrieval is included within operational procedure and training Control to be taken of firefighting lift and lift car to remain at bridgehead to aid removal of casualties Additional resources may be required Use of aerial appliance Staircase management Keep doorways closed unless necessary to open to allow passage of equipment or personnel Sectorisation in accordance with national guidance Utilisation of other emergency service personnel.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
34	Firefighting and rescue operations	Anti-social behaviour, vandalism and unlawful activities	Verbal and physical attack, fire setting and vandalism may compromise the safety of firefighters Personnel may be the target of objects thrown or dropped from height and building facilities may be compromised due to vandalism Personnel may be exposed to unexpected hazards arising from unlawful activities, such as drug manufacture and storage Building facilities such as lifts, fire mains and fire doors may be compromised by vandalism	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Identification of hazard by local personnel Planning including 7(2)(d) Ensure antisocial behaviour, vandalism and unlawful activities are included within operational procedure and training Management of staircases and access/egress routes Adequate resources are in attendance/requested Police assistance Utilise appropriate fire fighting tactics (consider defensive) Consultation and preventative work with partner agencies Fire survival guidance procedure implemented All defects and unavailability of fixed installations are reported to appropriate agency or Authority Consider Increase to pre-determined attendance Augment rising mains Consider appointing an additional Safety Officer to monitor outside of building Tactics practised at high rise training events and exercise scenarios to reflect reasonably foreseeable scenarios Information from fire safety and other agencies Community safety advice to occupants Building owner/management and fire safety office advised about significant hazards Adequate weight of attack Cover surrounding risks Sectorisation in accordance with national guidance Consider defensive fire fighting tactics.

Ref No.	Activity	Hazard	Risk	Persons at risk	Control measures
35	Firefighting and rescue operations	Moral pressure and Human factors	Moral pressure to act immediately, even if the incident is beyond the Fire Rescue Authorities at the time Risk increased if Incident Commander identifies the potential for saveable life is not proportionate to the risks to personnel and either decides not to commit or to withdraw teams	Fire personnel Other emergency personnel Members of public involved Members of public not involved	Planning including 7(2)(d) visits Ensure included within operational procedure and training Additional resources may be required Utilise appropriate fire fighting tactics (consider defensive) Exercise scenarios to reflect reasonably foreseeable scenarios, such as high fire loading Community safety advice Fire survival guidance procedure implemented Liaison and consider use of other emergency service personnel to assist with evacuation Sectorisation in accordance with national guidance Use of Safety Officers externally and within protected lobby to monitor conditions.

APPENDIX 1

Automatic sprinkler systems

Sprinkler installations comprise a system of pipes erected at or near the ceiling of each floor and are connected (through a series of valves) to one or more dependable water supplies. Sprinklers perform three functions:

- detect fire
- attack fire
- provide an audible warning.

The following points should be borne in mind with a high rise building fitted with sprinklers.

On arrival a firefighter must be sent to the MAIN STOP valve so that:

- They can open the valve if they find it closed, (on the orders of the Incident Commander)
- They can ensure that the valve is NOT CLOSED except on the specific orders of the Incident Commander
- Where the water supply can be augmented, via a brigade inlet, the pump should be set in ready to increase the pressure should a large number of sprinkler heads be operated at the same time
- If extra water is needed, it should not be taken from the main supplying the sprinklers unless it is of a large size
- Always check the area where the sprinklers have activated to make sure the fire is OUT and not HIDDEN under stored items or debris
- If for any reason the water supply to the sprinklers cannot be turned off, consider damage control to avoid unnecessary water damage. Single sprinkler heads can be dealt with by tying the female coupling of 70mm hose under the sprinkler head and running the hose out of the building; and
- Sprinkler floor isolating valves may be fitted to the system to allow for maintenance or repair of part of the sprinkler system.

APPENDIX 2

Firefighting lifts

Firefighting lifts are provided in high rise buildings to enable firefighters and their equipment to reach the upper floors speedily and without undue fatigue.

Firefighting lifts are dedicated lifts that have a special electrical circuit and a fire control switch at the fire and rescue authority access level (usually at ground floor).

Wherever possible a firefighting lift is not smaller than an eight person lift and will carry a load of up to 850kg. The electrical supply to the lift is independent of the other circuits in the building.

Fire lifts should be clearly marked in accordance with the relevant BS EN Standard; however they must be identified during the planning phase and during 7(2)(d) visits.

Older lift installations may not offer all the facilities that modern firefighting lifts conforming to the latest BS EN standard and, in these instances, lift facilities and functions must be checked during the planning phase for appropriate use at an incident.

Early control of the firefighting lift(s) must be taken by switching the fire switch to the 'on' position. If any doubt exists as to which floors a lift serves, its use should be avoided.

The fire control switch varies according to the manufacturer, but is of a positive on/off type and is located adjacent to the firefighting lift. There are a number of different types such as a switch contained in a glass fronted box or metal fronted padlocked box, or of lift key type. In all cases the position of the control switch should be indicated by a suitable notice.

When the control switch is switched to the 'on' position it enables the following functions:

- If travelling upwards the lift car will stop and return to the access floor level, while if the car is travelling downwards, it will continue in travel and stop at the access floor level. At the access floor level the doors will then open and remain open. The buttons provided at each floor landing and inside the car will be inoperative during this period

- When the lift reaches the access floor level the landing call point buttons will remain inoperative but the car buttons will resume control. Because of this, a firefighter must be detailed as the fire lift operative to maintain control of the lift and is to remain in control until relieved of the duty. This firefighter should have a radio for communication with the bridgehead and the Incident Commander

- Modern lifts require the close door button to remain depressed until the door has closed fully and the open door button depressed until the door has opened fully. This is a safety mechanism to minimise the risk of firefighters becoming trapped in a fire in the lift lobby area

- When two lifts are side by side it is possible that both will be controlled by the fire control switch. This will be the case if, on the operation of the switch, both cars return to the access floor level and the doors open and remain open.

When a firefighting lift is used for emergency purposes care must be taken not to overload it and, when the emergency is over, the fire switch is to be returned to the off position, the cover closed and secured and one of the landing call buttons operated to check that the lift has been restored to normal working.

The use of passenger lifts that are not identified as a firefighting lift should be avoided and must not be used for firefighting purposes. Normal lifts do not have a dedicated power supply and will not be under the control of the fire service personnel. It is possible for a normal lift to be called to the floor involved in the fire and the doors to open automatically, exposing the occupants to potential harm.

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, fire and rescue personnel 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.

When fire spread is likely to involve a 'firefighting lift' or 'lift motor-room' the Incident Commander must ensure that all lift cars are taken out of service immediately and an alternative method of transport identified. The Incident Commander must re-assess the incident plan and ensure that all fire ground personnel are informed.

APPENDIX 3

Dry rising mains

A dry rising main consists of an empty pipe installed vertically in a building with a fire service inlet at the lower end and outlets at various levels throughout the building and must be installed in buildings over 18m in height.

A standard dry rising main will be supplied from a hydrant via the pump into two male inlets housed in an inlet box normally found at ground floor level. A dry rising main is able to provide 1,500 litres of water per minute.

The inlet box will have the words 'DRY RISER INLET' in 50mm lettering on the box door for identification. They have a 65mm instantaneous female outlet on each floor or in some cases alternate floors. Riser outlets should be located either in a protected lobby or approach stairway. The outlets should be secured in the closed position.

A drain valve is connected at the inlet and allows the system to be drained on completion of the incident. An air valve is normally fitted at the highest point in the riser to facilitate drainage by allowing air to enter the riser.

When charging a dry rising main the Incident Commander should ensure as soon as possible that all unused landing valves are in the closed position.

The advantages of using a dry rising main are that it:

- reduces the time taken to supply water to upper levels
- reduces the amount of hose required to reach the fire
- reduces frictional loss in the delivery supply
- lessens the amount of equipment needed
- reduces effort required by firefighters
- keeps stairways clear of hose.

Charged dry rising mains can generate high pressures at the pump delivery and possibly create difficulties in release of hose on makeup or when damaged lengths are changed. Where defective drain valves are encountered, sufficient hose with a branch should be inserted in the first dry rising mains outlet enabling pressure to be safely released to a convenient location prior to breaking couplings.

APPENDIX 4

Wet rising mains

Wet rising mains are fitted in all buildings over 60m in height (as of 2006 buildings over 50m in height) due to the excessive pressures required to pump water beyond this level.

Consideration of water pressure problems should be given to some pre 2006 buildings where dry rising mains above 50m are encountered.

Wet rising mains consist of vertical pipes similar to the dry rising main system with landing valves at each floor except the ground.

The pipe system is connected to a permanent water supply normally a tank fed from the town mains. Duplicate automatic pumps, one duty and one standby, supply this water to the system.

The tanks are fitted with an automatic warning system to indicate a low water level.

At protracted incidents the wet rising main tank may need to be augmented.

Wet rising mains are designed to supply 1,500 litres per minute for 45 minutes as a minimum. Due to the height of the building and the pressures used, water pressure reduction valves are fitted to the outlets at each floor.

Buildings constructed prior to 2006 will have outlet pressures of 4 to 5 Bars. Changes to BS 9990 in 2006 now recommend an outlet pressure of 8 Bars; this recommendation does not affect installations installed before this date.

APPENDIX 5

Firefighting shafts

Firefighting shafts are a means of enabling firefighters, to reach any point within a building in the shortest possible time. They provide a position of relative safety while firefighters carry out their rescue and firefighting roles.

It should be remembered that hose lines and other equipment laid through doorways from firefighting shafts may allow smoke and the products of combustion to travel into the protected stairwell, worsening conditions on upper floors and possibly increasing fire spread through the stack effect.

The detailed recommendations on the provision of firefighting shafts within buildings are contained within BS 9999:2008. In brief, a firefighting shaft will contain a firefighting stair, a firefighting lobby with a dry or wet fire main and a fire lift. Additionally there may be provision made to ventilate the firefighting shaft dependent on the building type. In large complexes with a variety of uses, firefighting shafts may serve separate parts of the complex. For example, in a complex consisting of high-rise offices over a shopping centre, the offices may be provided with a dedicated firefighting shaft that does not serve the shopping centre.