

# Fire and Rescue Service Operational Guidance



# GRAs

generic risk assessments

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## **GRA 5.10**

Working at heights

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# **Generic Risk Assessment 5.10**

## Working at heights

October 2009



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## SECTION 1

# GRA 5.10 Working at heights

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## Scope

This generic risk assessment (GRA) examines the hazards, risks and control measures relating to Fire and Rescue Service (FRS) Operational personnel working at height.

'Working at heights' covers all work activities where there is a possibility that a fall involving a distance liable to cause injury could occur, even if it is at or below ground level. This is regardless of the work equipment being used, the duration the person is working at height or the height at which the work is performed.

The primary function of the Work at Height Regulations 2005 (the Regulations) is to legally require employers, including the FRS, to ensure that all work at height is risk assessed, properly planned, appropriately supervised and carried out in a manner which is, so far as is reasonably practicable, safe.

Activities relating to work at height, which involve other more specific, significant hazards, for example electricity, are covered in other GRAs.

Reference is made throughout the document to other GRAs and other technical sources.

As with all GRAs, this assessment provides a starting point for FRSs to conduct their own assessments, produce their own Standard Operating Procedures (SOPs) and written Safe Systems of Work (SSoW) within the context of local conditions and existing organisational arrangements.

## Significant hazards and risks

Falls from height can be the result of:

- working at height without appropriate equipment
- using equipment or practices not suitable for the task
- using work at height equipment incorrectly e.g. not in accordance with manufacturer's instructions, design or load capabilities
- the failure of equipment or anchor points
- collapse of structure
- poor planning, supervision, training or lack of competency
- adverse weather conditions
- complex natural environmental conditions

- rough and uneven ground
- complex built environmental conditions
- fatigue
- unpredictable behaviour of persons (note – rescues from height, with the exception of rescues of FRS employees, are not covered by this GRA).

The nature and extent of an injury resulting from a fall from height may be influenced by:

- height from which the person fell
- angle of impact
- suitability/weight of personal protective equipment (PPE)
- any equipment being carried
- landing surface
- impact with protrusions/objects during a fall.

The wide range of operational areas involved when working at height may include:

- roofs, which may be flat, sloping or fragile
- silos, plant and machinery
- various modes of transport/vehicles
- towers and masts
- fairground rides and theme park attractions
- confined spaces and damaged or collapsed structures
- cliffs, quarries, docks, bridges, piers and quays
- construction sites and scaffolds
- excavations
- using a ladder
- working on an aerial appliance, water tender etc.

Firefighters are often required to work at height where a number of other hazards could be present which, when combined, could result in serious accident or injury. The significant hazards may include:

- environmental conditions
- adverse weather conditions
- falling objects
- fragile surfaces
- unprotected edges
- confined spaces, oxygen enrichment or depletion
- unstable structures

- sources of electricity
- sources of non-ionising radiation on masts
- hazardous substances.

## **Environmental conditions**

FRS operations are undertaken in all sorts of environmental conditions. In particular, strong winds, precipitation and temperature variants can have an adverse impact on firefighter safety and influence operational outcomes when working at height. Inclement weather may therefore require additional safety measures to be taken. Careful consideration should also be given to the high probability of the wind speed being greater at the point of work than that which is prevailing on the ground.

The Regulations stipulate that Work at Height should only be carried out when the weather conditions do not jeopardise the health or safety of those involved in the work. Regulation 4(4) provides an exemption from this requirement for emergency services acting in an emergency, to enable work to proceed during the emergency or rescue phase of an incident. When the emergency phase has passed, the Regulations will apply as normal.

## **Falling objects**

Significant injuries can occur if persons are struck by falling objects. Due to the risk from falling objects, persons working at height or in areas below such work, need to be aware of their surroundings at all times. Inclement weather, especially high winds, can cause overloading and damage that result in objects such as chimney stacks, TV aerials and roofing materials becoming dislodged and falling; it can also cause sheet materials such as glass to plane a considerable distance.

## **Fragile surfaces**

A fragile surface is one that will not support the weight of an imposed load.

Typical examples of fragile materials are:

- plastic/perspex roof light sheets
- asbestos/fibre cement sheets
- metal sheets – particularly if corroded
- glass
- wood wool slabs and strammit board (compressed straw)
- fire damaged roofs
- materials weakened by structural collapse, the effects of heat or water.

## Suspension syncope (orthostatic shock, suspension trauma)

With the increased use of harnesses and rope systems for recreation and in the workplace, a medical condition associated with prolonged suspension has been identified. Known as suspension syncope, orthostatic shock or suspension trauma, the condition occurs where an immobile person is suspended from a rope system restricting normal blood flow.

The Health and Safety Executive assessed the validity of available research in its' recent review (Research Report RR708 – *Evidence based review of the current guidance on first aid measures for suspension trauma*<sup>1</sup>, 2009). It considered that there was well conducted research (with a low risk of bias) to support the following statements:

- Motionless head up suspension trauma can lead to presyncope in most normal subjects within one hour and in a fifth within 10 minutes.
- Factors that may affect casualties in suspension and lead to presyncope, syncope and/or unconsciousness include: dehydration, alcohol and prescribed medication.

Outside the scope of this review, other research has concluded that that the following factors may also affect casualties in suspension and lead to presyncope, syncope and/or unconsciousness including: exhaustion, hypothermia, hypoglycaemia, head trauma, shock, inclination of the body, hypovolemia and time delays in rescuing the casualty.

## Equipment

Work at height equipment is considered to be safety critical, in the sense that equipment failure could result in death or serious injury.

Ladders are a critical resource for use where firefighting, rescues or other operational activities need to be carried out at height as a matter of urgency.

## Key control measures

### Avoiding work at height and the hierarchy of controls

The most effective risk control measure to preventing falls is to avoid working at height in the first instance. This principle needs to be built into the planning processes at all levels in the FRS. Where working at height cannot be avoided consideration must be given to the following hierarchy of controls:

- Carrying out the task from an existing place of work that does not need additional controls e.g. ground level, mezzanine floors, staircases etc

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<sup>1</sup> [www.hse.gov.uk/research/rrhtm/rr708.htm](http://www.hse.gov.uk/research/rrhtm/rr708.htm)

- Carrying out the task from a safe working platform
- Collective fall prevention – barriers and guard rails
- Collective fall protection – nets, air bags and soft landing systems
- Individual fall prevention – Work restraint (sometimes known as travel restrictor): a system consisting of the equipment used to keep a person from reaching a fall point such as the edge of a roof, or the edge of an elevated work platform
- Individual fall protection – Full body harness and fall arrest system is a method to reduce the consequences should a fall occur. The entire system must be capable of withstanding the impact forces involved in a fall (including any additional weight being carried such as breathing apparatus, equipment etc.) and must be capable of minimising those forces to an acceptable level.

## Pre-planning

An essential element of management of risk is pre-planning. The integrated Risk Management Plan (IRMP) will identify FRS standards in terms of equipment and operational personnel required for safe systems of work to be employed.

FRSs should collate information on the risks in their area and make site specific risk information available to all relevant personnel prior to and upon arrival at incidents. This approach will help to ensure that work at height activity is planned, supervised and carried out safely.

The FRS should undertake an environmental scanning exercise to assist in gathering information to substantiate the risk assessment where work at height may be required:

- Generic risks may include:
  - large/tall buildings or industrial complexes
  - tower cranes
  - masts
  - pylons
  - scaffolding
  - tall chimneys
  - steep embankments or dams
  - quarries and cliffs
  - deep shafts or wells
  - agricultural or other silos, trees, etc.

Risk assessments should document and plan for reasonably foreseeable incidents where work at height may be required.

- Specific sites – such as:
  - known recreational or climbing venues
  - chair lifts
  - gondolas
  - cable cars
  - theme parks
  - potential suicide sites which may include the presence of one or more of the above generic risks.

There may be the need for site specific risk assessments. In such circumstances operational information should be developed specific to the site containing all the required information to ensure safety.

All managers with a responsibility for organising and planning for work at height must be competent. Specific work at height responsibilities e.g. training, equipment procurement etc. should be included in health and safety policies and where appropriate job descriptions.

## **Training**

All personnel operating at height must receive appropriate training before undertaking those duties. No FRS personnel should work at height without proper equipment or training.

All relevant national guidance should be utilised in the development of work at height training courses.

The training programme should include:

- knowledge, understanding of and the ability to apply the hierarchy of control measures in respect of working at height
- knowledge and understanding of the FRS working at height procedures
- refresher training enabling personnel to achieve and maintain the required levels within the national competency framework.

Training records should be kept to provide an effective audit trail.

The officer nominated to take overall management responsibility for work at height activities must receive such training as is necessary to provide the level of knowledge, skills and understanding required by the role.

It is essential that all operational personnel are suitably trained and assessed for competency in the use of their personal fall protection systems and work at height equipment as well as the pre-checking of that equipment. These personnel must also have an appropriate aptitude for working at a height along with sufficient professional and technical training, knowledge and actual experience to enable them to:

- carry out their assigned duties at the level of responsibility allocated to them
- understand fully any potential hazards related to the work and the equipment to be used
- detect any technical defects or omissions in that work and equipment, recognise any implications for health and safety from those defects or omissions, and be able to take remedial action to deal with these.

It is also essential that the FRS ensures that competent personnel undertake appropriate post-use inspection and testing.

## **Ongoing operational assessment of risk**

The Work at Height Regulations 2005 take into account that the FRS may have to undertake work at height in emergency situations and that the environmental conditions may be less than ideal. It is therefore imperative that all operational personnel are properly trained and they undertake effective assessment of developing operational risks throughout the incident, so that they can identify and deal with potential hazards as they arise.

Points to consider include:

- alternative ways of working – avoid work at height if possible
- emergency or non-emergency phase of the incident
- time imperatives for action and duration of activities
- competence of personnel relative to the complexity of the intended activities
- availability of suitable resources
- environmental conditions, including weather
- access and egress
- organisation of the work area
- communication requirements
- safety management systems
- emergency procedures including rescue of FRS personnel working at height
- control measures appropriate to the number of people exposed to the risk
- falling objects and control of hazard zones.

## Command and control

Effective command and control has to be established at the onset of the deployment. The incident commander (IC) should possess a detailed level of knowledge of work at height. In the absence of this detailed knowledge, the IC must have a competent person who can advise on operational practices and procedures.

It is essential that, where personnel are to be deployed to work at height, a plan is formulated to take account of the possibility of a fall and subsequent suspension in a fall arrest system. The rescue plan may require the use of aerial appliances, portable ladders or specialist rope rescue teams.

Where reasonably practicable, work at height should not be undertaken if there is a means to carry out the work safely, that does not need additional fall control measures. Where work is carried out at height, measures should be taken to prevent a fall. Where it is not practicable to prevent the risk of a fall, the distance and consequence of a fall must be minimised. Work at height involves a series of specific considerations, overlapping techniques and procedures and selection of equipment from a range of available options including:

### **Avoidance**

- avoid work at height if possible

### **Relatively safe place**

- aerial appliances
- working platforms.

### **Collective fall prevention by the use of:**

- guard rails and barriers
- edge protection and toe boards
- parapet wall and sills.

### **Individual fall prevention by the use of:**

- work restraint systems.

### **Collective fall protection by the use of safety:**

- air bags
- nets
- other soft landing systems.

### **Individual fall protection by the use of:**

- fall arrest equipment.

## **Systems of work to control:**

- falling objects and hazard zones
- anchors and anchor systems
- securing equipment and other items
- lifting, lowering and hauling equipment.

Further details on these risk control principles can be found in the Fire and Rescue Service Manual Volume 2 Fire Service Operations (Safe Work at Height).

## **Work at height equipment**

All equipment must be fit for purpose and all operators should be trained and assessed for competence. All work at height equipment should be subjected to a formal procedure for examination, inspection and maintenance before and after use and at defined periods (in line with legislation). The level of use and any contamination of equipment should inform the frequency of detailed inspections and any interim inspections. Records of use and inspection should be kept throughout the life of the equipment.

It is essential that all load-bearing elements of work at height equipment are given a visual and tactile inspection before each use to ensure that it is in a safe condition and operates correctly. Advice should be obtained from the manufacturer. Formal inspection procedures should be put in place by FRSs to ensure that personal fall protection equipment is given a detailed inspection (“thorough examination”) by a competent person before first use and at intervals not exceeding six months (or three months where the equipment is used in arduous conditions), and after circumstances liable to jeopardise safety have occurred.

Interim inspections of work at height equipment might be needed between programmed, detailed inspections. For example, where the risk assessment has identified that work at height equipment has, or may have been exposed to a hazard that could cause significant deterioration in the equipment, it should be inspected and appropriate records made. Examples of such hazards include paint, chemicals, acidic or alkaline environment. The need for and frequency of interim inspections will depend on the particular circumstances in which the equipment is to be used.

A record should be kept of all inspections of work at height equipment with the exception of the pre-use inspection carried out prior to use at operational incidents or during training.

## Portable ladders for access, egress and work platform

Ladders are an integral part of the FRS range of equipment that may be used for rescues or to mitigate the effects of an incident and prevent dangerous escalation. The use of ladders is recognised as being fundamental for FRS use now and in the future although their use must be compatible with the circumstances surrounding the incident and the expediency of response.

Portable ladders, including extension, step and roof ladders, are frequently required for FRS operational activities. Specific guidance on practical techniques for their use is included in *The Fire and Rescue Service Manual, Volume 4 Fire Service Training, Foundation Training and Development*.

When work is undertaken from a ladder, rather than using it solely as a means of access or egress, it can be categorised as a work platform. Ladders should only be used as work platforms where a risk assessment shows that the use of other work equipment is not a viable option because:

- the risk assessment establishes the activity is low risk
- the task is of a short duration, or
- there are unalterable features of the work site that preclude the use of more appropriate equipment
- time constraints prevent the use of other platforms.

When a ladder is used as a work platform, appropriate measures should be in place to prevent or mitigate the effects of a fall. Consideration should be given to setting up a fall prevention system (if time allows) or using a leg lock with a fall arrest system as back-up. A leg lock on its own should only be considered for short duration tasks.

Specific points to consider when assessing whether it is appropriate to use a ladder as a work platform can be found in the Fire and Rescue Service Manual Volume 2 Fire Service Operations (Safe Work at Height).

## Weather conditions

Wind, rain, snow, ice, heat and fog all have implications for work at height as additional hazards that need to be taken into account. For extreme climatic conditions suitable personal protective equipment (PPE) and crew rotation should be considered.

In order to fully appreciate the impact of weather conditions on the operating environment and the risks associated with them, personnel should undertake realistic training which is effectively controlled. Risk exposure should be balanced against the benefits that will accrue.

The nature and condition of all work areas will require careful assessment as this can impact on the safety measures required.

## Falling objects and hazard zones

All equipment that is being hauled aloft or being lowered is to be adequately secured. Where equipment is being used to cut or dismantle plant or machinery at height, suitable precautions must be taken to prevent injury from any material that falls.

For the purpose of this GRA and to afford clarification over the term 'hazard zone', this can be defined in two distinct ways.

### **A hazard zone is one which is established:**

- above or below any area where work at height is being undertaken, this would include acts such as hauling equipment aloft etc.
- when working near any unprotected edge or slope leading to any unprotected edge within three metres distance, which is also known as the danger area.

To minimise the risk of injury to FRS personnel, other emergency services and members of the public, hazard zones must be established, cordoned off and operated using strict control procedures where the following occurs:

- individuals are working at height and there is a risk of a fall likely to cause injury
- individuals are at risk of being struck by falling objects
- there is a risk of dislodging unstable materials.

Hazard zones should be established in accordance with guidance described in the *Fire and Rescue Service Manual Volume 2 Fire Service Operations (Safe Work at Height)*.

## Fragile surfaces

The stability of a surface must be determined before work begins. It can be difficult to distinguish between roof lights, roofing sheets and metal sheets particularly under certain environmental conditions; this has been a significant factor in past major accidents. All roofing sheets should be treated as fragile and should not be directly walked upon unless it can be determined that they are of adequate strength to support the load. Work must be arranged to ensure that personnel do not walk on or work near fragile surfaces. Further guidance can be found in the *Fire and Rescue Service Manual Volume 2 Fire Service Operations (Safe Work at Height)*.

## Suspension syncope (orthostatic shock, suspension trauma)

First responders should be able to recognise the symptoms of pre-syncope. These include light-headedness, nausea, sensations of flushing, tingling or numbness of the arms or legs, anxiety, visual disturbance or the feeling that they are about to faint.

If a person becomes suspended in a harness, e.g. due to a fall or collapse of a work platform, the following measures must be considered:

- implement the pre-determined rescue plan
- if crews at the scene do not have full rescue capability, call for additional resources
- request the attendance of the Ambulance Service (if not already in attendance)
- a casualty who is experiencing pre-syncope symptoms or who is unconscious whilst suspended in a harness, should be rescued as soon as is safely possible
- apply first aid measures as detailed in Research Report RR708 (HSE – *Evidence based review of the current guidance on first aid measures for suspension trauma*).

### Technical references

1	Work at Height Regulations 2005 (WAH Regulations) SI 2005/735
2	Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) SI 1998/2307 and ACoP and Guidance <i>Safe use of lifting equipment</i> 1998 (HSE L113)
3	Personal Protective Equipment at Work Regulations 1992 (PPE) SI 1992/2966 and amendments, and guidance document <i>Personal protective equipment at work</i> 1992 (HSE L25)
4	Provision and Use of Work Equipment Regulations 1998 (PUWER) SI 1998/2306 and ACoP <i>Safe use of work equipment</i> (HSE L22)
5	Fire and Rescue Service Manual Volume 2, Fire Service Operations, Safe Work at Height, 2006
6	The Chief Fire Officers Association, Work at Height Regulations 2005, Guidance for the Fire and Rescue Service
7	Research Report 70 8 – Evidence based review of the current guidance on first aid measures for suspension trauma – Prepared by Health and Safety Laboratory and the University of Birmingham for the Health and Safety Executive 2009

## SECTION 2 Summary of GRA 5.10

### Working at heights

Task – Pre-Incident

Ref. No.	Task	Hazard	Risk	Persons at risk	Control measures
1	Setting up and maintaining work at height activities Attending incidents where work at height is required	<ul style="list-style-type: none"> <li>Inadequate preparedness for operational type</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> <li>Major injury</li> </ul>	<ul style="list-style-type: none"> <li>FRS personnel</li> <li>Members of the Public</li> </ul>	<ul style="list-style-type: none"> <li>FRS to identify, risk assess and adequately control all reasonably foreseeable types of operational incident where work at height activities can be expected</li> <li>FRS to ensure that crews and supervisors are adequately trained and competent. Ensuring they undertake regular training and exercises for generic risks in their area</li> <li>FRS to ensure operational instructions are in place</li> <li>Specific sites – FRS to ensure that 7 (2) (d) inspections are carried out</li> <li>Where the FRS has a mutual aid agreement with another FRS, risk file information must be available to share</li> <li>FRS to ensure that adequate systems are in place to notify personnel about inclement weather at incidents e.g. high wind warning</li> <li>FRS to ensure the provision of appropriate safe work at height equipment</li> </ul>

Task – Pre-Incident (continued)

Ref. No.	Task	Hazard	Risk	Persons at risk	Control measures
					<ul style="list-style-type: none"> <li>FRS to ensure that they have formulated an effective plan to rescue personnel who have become suspended in fall arrest equipment following a fall</li> <li>FRS to ensure that appropriate pre-determined response procedures are in place</li> <li>FRS to ensure that an equipment management system is in place to comply with relevant legislation</li> </ul>

Task – Initial stages of the incident

Ref. No.	Task	Hazard	Risk	Persons at risk	Control measures
2	Attendance at incidents that require work at height	<ul style="list-style-type: none"> <li>Failure to establish a safe system of work</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> <li>Major injury</li> </ul>	<ul style="list-style-type: none"> <li>FRS personnel</li> <li>Members of the public</li> </ul>	<ul style="list-style-type: none"> <li>FRS must ensure that an appropriate response is mobilised to work at height incidents</li> <li>Incident Commander (IC) to establish appropriate Incident Command System (ICS) and risk assessment procedures</li> <li>IC to adopt a default to defensive mode until suitable safe system of work is established</li> <li>IC to formulate a rescue plan to account for the possibility of personnel being suspended in fall arrest equipment following a fall</li> </ul>

Task – Initial stages of the incident (continued)

Ref. No.	Task	Hazard	Risk	Persons at risk	Control measures
3	Working at height	<ul style="list-style-type: none"> <li>Falls from height</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> <li>Major injury</li> </ul>	<ul style="list-style-type: none"> <li>FRS personnel</li> </ul>	<ul style="list-style-type: none"> <li>All work at height should be avoided where it is reasonably practical to carry out the work safely otherwise than at height</li> <li>IC to ensure crews use appropriate procedures and equipment in accordance with their training</li> </ul>
4	Work at height or work below those working at height	<ul style="list-style-type: none"> <li>Falling objects</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> <li>Major injury</li> <li>Over three day injury</li> <li>Minor injury This comes over from the previous page</li> </ul>	<ul style="list-style-type: none"> <li>FRS personnel</li> <li>Other agencies</li> <li>Members of the public</li> </ul>	<ul style="list-style-type: none"> <li>IC to ensure that hazard zones and exclusion zones are established as required</li> <li>All persons inside the hazard zone must be fully briefed and correctly protected with appropriate PPE</li> <li>IC to ensure that where practicable arrangements are in place to prevent objects falling, whilst working at height</li> <li>Consider liaising with Police to manage exclusion zone</li> </ul>
5	Working on known or suspected fragile surfaces	<ul style="list-style-type: none"> <li>Fragile surfaces</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> <li>Major injury</li> <li>Over three day injury</li> </ul>	<ul style="list-style-type: none"> <li>FRS personnel</li> </ul>	<ul style="list-style-type: none"> <li>The IC should ensure that procedures are followed where fragile surfaces have been identified or suspected</li> <li>Consider consultation with structural engineers or other appropriate professional</li> <li>Consider the use of specialist equipment such as aerial platforms</li> </ul>

Task – Initial stages of the incident (*continued*)

Ref. No.	Task	Hazard	Risk	Persons at risk	Control measures
6	Using work at height equipment	<ul style="list-style-type: none"> <li>Equipment and/or systems failure</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> <li>Major injury</li> <li>Over three day injury</li> </ul>	<ul style="list-style-type: none"> <li>FRS personnel</li> </ul>	<ul style="list-style-type: none"> <li>The IC should ensure that all equipment is used in accordance with operating procedures</li> <li>If required, deploy the pre-determined rescue plan</li> </ul>
7	Rescue of FRS personnel	<ul style="list-style-type: none"> <li>Suspension syncope</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> <li>Major injury</li> <li>Over three day injury</li> </ul>	<ul style="list-style-type: none"> <li>FRS personnel</li> </ul>	<ul style="list-style-type: none"> <li>The IC will initiate a pre-determined rescue plan</li> <li>The IC will ensure that the casualty is provided with early medical intervention</li> <li>The IC shall be cognisant of the effects of suspension syncope in particular the need to limit suspension time</li> <li>First aid measures detailed in Research Report 708 are to be deployed</li> </ul>