GENERIC RISK ASSESSMENT
RESCUES FROM HEIGHT

1 SCOPE

This assessment examines the hazards, risks and controls that relate to conducting rescues at height specifically from cliffs, tower cranes, communication masts, satellite dishes and electrical pylons.

This Generic Risk Assessment provides a starting point for brigades to conduct their own assessments within the context of local conditions and existing organisational arrangements.

Activities which involve related specific, significant hazards such as electricity, are covered in other Generic Risk Assessments

2 SIGNIFICANT HAZARDS AND RISKS

There are occasions when brigades will be called upon to attend incidents that involve the rescue of person/s from height. The most common locations for this type of rescue are specified in Paragraph. I above.
Hazards, associated with rescuing persons from height, can be grouped into the following categories:

- Location
- Fatigue
- Electricity
- Non Ionising Radiation

2.1 Location

2.1.1 Height

The height of the incident presents a number of hazards including:

- the site itself is often exposed to the elements with high winds and low temperatures
- the risk of the casualty and service personnel suffering vertigo
- risk of falling off or being thrown/pushed off by the casualty
- the risk from falling objects
- inadequate length of normal service rescue lines
- lack of adjacent anchorage points

2.1.2 Access

Rescue sites can be in remote locations which increase access difficulties.

There are a number of problems associated when getting to work in remote locations e.g.:

- radio blackspots
- difficult terrain
- extended distances from appliance to the scene of operations
- extended attendance times (initial and reinforcement)

A feature of rescues conducted at height is that there is normally very limited access to the casualty.

2.1.3 Movement

The unexpected movement of structures or their component parts present additional serious risks e.g.:

- flexing of the masts and pylons due to wind stress
- satellite dishes under remote control traversing unexpectedly
- cranes where the risks of movement arise from;
    - the jib
    - the trolley
    - the cables
    - the whole crane stewing around with the wind

2.2 Fatigue

2.2.1 Rescuers may have to climb considerable distances or exert large amounts of energy whilst effecting a rescue at height. Fatigue can lead to local muscle tiredness or cramps and will adversely affect mental function. Both these symptoms will increase the risk of injury to individual fire fighters, their colleagues and members of the public.

2.3 Electricity

2.3.1 Specific Generic Risk Assessments deal with electricity transmission and distribution lines. They describe the dangers of electric shock by coming into direct contact with a live circuit and discuss safe approach distances.

A further hazard to fire fighters may exist when a fire occurs under, or in the vicinity of, high voltage overhead power lines. Such power lines are constructed to provide a minimum safe ground clearance consistent with the operating voltages. When a fire under or near them is accompanied by dense smoke, or when flames rise close to the conductors, there could be danger of flash-down from a conductor to earth/ground or adjacent structures, trees or fire brigade equipment. Such a flash-down could, of course, result in injury to fire fighters and damage to fire brigade equipment.

Circumstances may justify switching out the circuit. Any such request should be made to the appropriate Grid Control Centre giving information relating to:[5]

- Location
- Voltage
- Route letters and tower number
- Circuit colours

A plate is affixed on the side of the tower, normally facing the nearest road, stating the circuit voltage, route letter and tower number. Circuit colours are also shown on colour plates affixed to an adjacent side of the tower and these are easily visible from ground level. Towers in the immediate vicinity of a fire need not be approached because information taken from adjacent towers is adequate for identification purposes.

2.4 Non Ionising Radiation

There are various risks of injury from different types of non-ionising radiation:

- Radio frequency, and microwaves
  - excessive heating of any exposed parts of the body
- Infra-red
  - reddening of skin, burns, cataracts
- Visible radiation — all visible light sources
  - heating and destruction of tissue of the eye or skin
- High intensity beams — lasers are especially penetrating

2.4.1. Electric and magnetic fields

Occupational exposure to electric and magnetic fields arises from the use of electrical energy for industrial, commercial and medical purposes. This includes the transmission, distribution, and use of electrical power; broadcast and telecommunications. The frequency bands used for broadcasting range from those in the VLF band to those in the high microwave region.

2.4.2 Communications lasers

Although the lasers themselves are usually not very powerful (<1 mW), large bundles of fibres can easily carry a total power of about 0.1 W. A fibre optic communication link will be totally enclosed during normal usage, but safeguards must ensure that personnel are not exposed to the open end of a disconnected fibre.

The principal risks to personnel are temporary blinding and localised soft tissue burns.

2.4.3 Microwaves

Frequencies used by fixed site telecommunications services range from those in the VLF band to those in the high microwave region. Services include public and private communications networks, satellite ground-stations and control/telemetry services to remote Sites. The majority of these are microwave links.

Fire fighters may, in the course of their operational duties, find themselves temporarily working in front of a microwave transmitting antennas. This is most likely whilst they are working on ladders, turntable ladders, roofs and hydraulic platforms. They might also be called to an incident that involves a radio station.

A microwave transmitting antenna may look like a “dish” with a feed device in the centre, although many professional microwave antennas use a radome to cover the actual transmitting elements. Otherwise the antenna may be an open “yagi” — cross pieces on a centre bar, or as a shrouded yagi — where the antenna is hidden with a weatherproof cover.

The possibility of damage from the electromagnetic radiation transmitted from such antennas has been considered and, the primary risk is that should human tissue be exposed to microwave fields in excess of the recommended limits, then permanent damage may result to the tissue, particularly to the cornea of the eye.

Antennas on radio site masts, including Police, Fire Service, broadcasting and cellphone sites, may be assumed to be transmitting. Small “dish” antennas on domestic properties are most likely to be for satellite receivers. Otherwise, antennas on commercial properties, industrial premises, public buildings, etc. should be assumed to be transmitting.

It is estimated that the majority of all antenna dishes and yagis likely to be encountered do not have a transmitting capability, and present no risk. However, the many microwave antennas that are used for transmitting could present a potential hazard.

Personal radio frequency radiation monitors are now appearing on the market that are claimed will provide warning to users of over-exposure to electromagnetic radiation. If the monitors detect RF radiation higher than the present threshold (set by the safety standard adopted) then they will emit an audible or visual alarm.

Should a fire fighter observe that they are likely to be working in front of any microwave antenna, and assuming it to be transmitting, they should be aware that there may be risks with extended exposure to high power radio frequency fields.

1. In order to minimise the personal risk, the transmitting system should ideally be switched off. This however may not be practical and could interfere with secure and essential radio links.

2. Fire fighters should make every effort not to stand directly in front of a microwave antenna, and not to work near the antenna longer than necessary.

3. As a general guide, the larger a microwave transmitting dish, then the greater the power it radiates in the direction to which it is pointing.

4. Persons fitted with cardiac pacemakers or similar devices are advised to avoid working in the immediate vicinity of antenna installations.

Acute exposure to microwave radiation may result in localised burn injuries and longer-term

health effects.

3 KEY CONTROL MEASURES

The probability of a brigade being called on to carry out a rescue from height will depend on a number of local factors for example:

- the number of potential rescue sites within the area
- the levels of socio-economic activity
- the existence of other local specialist rescue organisations
- the degree of inter agency liaison pre-planning conducted

Brigades will need to assess the local loss potential and consider a response that is proportional to the risk. Some key measures include:

3.1 Pre Planning

3.1.1 Safe systems and equipment

Specialist techniques and equipment are often required to effect safely the rescue of a person injured or trapped at height. Brigades need to consider the provision, use and maintenance of suitable specialist equipment. This may range from aerial access appliances to work positioning/fall arrest systems

Selection of appropriate PPE

PPE designed to protect personnel from falls is produced to comply with specified standards that are defined in three distinct work categories.

- Work Positioning - Used to gain access to a work site by suspending the worker from a rope. As a general guide it can be considered that work positioning is being applied if the equipment is being used to *support* some or all of the worker's weight. This category includes the general area of undertaken by specialist rope rescue teams.

  To comply with the standard for work positioning, the waist belt would need to be replaced with a harness to EN *358* and optional rope adjuster included. Initial procedural guidance and training will need to be provided, but the use of this equipment must be more specifically controlled, so a moderate level of continuation training will be necessary. It should be noted that, although the sit-harness type of equipment can comply with the appropriate standard, it is not suitable for use with breathing apparatus, as the point of suspension is too low for stability.

WORK POSITIONING		
EQUIPMENT	STANDARDS	TRAINING
Work Positioning harness	EN *358*	Moderate Training Requirement
2 x round slings	EN *566*	
4 x carabiners	EN 362	
Kernmantel static rope	prEN 1891	
Rope Adjuster	EN 341	

- The further addition of a full body harness and shock absorber will provide a fall arrest capability. Initial procedural guidance and training along with a moderate level of continuation training will be required. This level of provision will also be appropriate for use with breathing apparatus.

FALL ARREST		
EQUIPMENT	STANDARDS	TRAINING
Full body harness	EN 361	Moderate Training Requirement
Shock Absorber	EN *355*	
2 x round slings	EN *566*	
4 **x** carabiners	EN 362	
Kernmantel static rope	prEN 1891	
Rope Adjuster	EN 341	

- The addition of a suitable recovery device to the equipment required for fall arrest will be required to enable a safe system of work to be established for fire fighters entering vertical shafts, wells, sewers, silos and other similar locations. Some rope control devices are available with built in provisions for recovery of the worker.

- Equipment provided to protect personnel from a fall must be attached to a secure anchorage. Where no appropriate anchorage is available in the immediate vicinity of the work area it may be necessary to utilise ground anchors or extended ropes attached to certified points on brigade vehicles.

- It is also recognised that the task may not fall within the normal area of expertise of the emergency services. Brigades who might be called upon to participate in such operations should arrange for fire crews to visit known sites and that good liaison is maintained with site owners or operators. There are also a range of logistical problems and other considerations which should be taken into account during preplanning. These include:

- the height of the site (communication masts can be up to 1,000 feet);
- remote locations in low risk fire cover areas
- difficult access for fire appliances
- the likelihood of poor weather conditions
- the time and effort required to reach a casualty

- possible limited access to casualty
- limited working area
- limited communications (e.g. mobile VHF radio schemes may encounter operating difficulties due to proximity effects “blocking” when used very close to masts and pylons)
- hauling rescue equipment aloft
- the possibility that scaffolding or other obstructions will make lowering the casualty very difficult

A general hierarchy of provision is apparent for equipment appropriate to the three work environments. The restraint standard provides the lowest level of protection, followed by work positioning and then fall-arrest. Equipment, which complies with the standard for fall-arrest will, in general, be suitable for restraint and work positioning.

- **Work Restraint** - Used to restrict an individual’s travel so that access is prevented to any point from which there is the risk of a fall occurring. A simple waist belt and means of attaching the belt to a suitable anchorage is all that is required to achieve work restraint.

The simplest level of equipment will cater for situations where work restraint is required. Some initial procedural guidance and training will need to be provided, but the simplicity of the equipment will demand minimum commitment to continuation training.

WORK RESTRAINT		
EQUIPMENT	STANDARDS	TRAINING
Waist belt	EN 359	Minimum Training Requirement
2 x round slings	EN 566	
4 x carabiners	EN 362	
Kernmantel static rope	prEN 189 I	
Descender / Rope Adjuster (optional)	EN 34 I	

- **Fall Arrest** - Used to arrest the fall of a worker who is required to work in a position where there is a risk of a fall. This requires a full body harness and shock absorber with a means of attachment to a suitable anchorage. An example of the use of this equipment is for the safety of personnel accessing ~ shaft via vertical ladders.

3.1.2 Pre-determined attendance

Brigades should consider their action on receipt to a call for assistance to a rescue at height. This will include the provision of specialist personnel (in the case of specialist rope rescue crews detailed guidance has been published by the home departments)’° and equipment and liaison with other specialist organisations such as the RAF and the High Rise Mast Network”.

3.1.3 Suitability of personnel

All personnel required to work in the type of rescue situations described in this GRA should be both medically and physically fit. This is essential because climbing an open structure and rescuing a casualty is physically demanding. Being fit will also help the rescuer to maintain an alert attitude in adverse weather conditions. Rescuers should be aware that if they are not fully fit they should not engage in rescues at height.

Personnel should be carefully screened to assess their aptitude and mental attitude for working at heights and in exposed situations. Not all personnel will be able to cope with the exposed feeling generated when on, for example, a mast structure. This must be discovered before the rescuer becomes ‘frozen’ and therefore a potential hazard.

Those brigades with occupational health schemes should make use of the facility when determining which personnel should be selected for rope rescue training and duties. Personnel should undergo relevant occupational health assessment before final selection. This should be followed by regular health assessments.

3.1.4 Training

Brigades must identify safe systems and levels of equipment to suit their local needs. There is no nationally recognised instructor’s training certificate covering the rescue work in which brigades may become involved.

Operational training relating to performing rescues at height will need to include such issues as:

- The nature of the hazards and risks
- Command and control
- The improvised use of equipment

For those brigades who maintain rope rescue teams there are several training options including the following:

- purchasing equipment and training from private companies specialising in this field
- identify equipment required and develop in-house training courses
- seeking training and advice from brigades already experienced in this field, and developing operators and instructors by sending personnel on suitable courses

3.1.5 Dealing with electricity and non-ionising radiation

The Fire Service Manual and GRA deal with electricity transmission and distribution lines. They describe the dangers of electric shock by coming into direct contact with a live circuit and discuss safe approach distances.

Where local experience indicates that there is a likelihood of personnel being called to undertake rescues from electricity pylons brigades will need to assess the level of risk and

methods of isolation with the local transmission company.

Circumstances may justify switching out the circuit, any such request should be made to the appropriate Grid Control Centre giving the information specified in 2.3.1 above.

In the case of microwave or satellite installations brigades, will need to consult with individual sites to establish the nature and degree of risk from non-ionsing radiation.

3.2. Command and Control

Due to the hazardous nature of rescues from height rescues strict control and monitoring of personnel at the incident must be observed. This could include non-fire service personnel e.g. police, ambulance, mountain rescue etc.

It is critical that effective control and organisation of the site is maintained throughout the duration of an incident. The Incident Commander will initially have to consider the problems associated with access to the working area. This is particularly important if a climb is necessary before a rescue can be effected. A clear plan should be agreed before personnel and equipment are committed, and all team members should be aware of the aims and objectives. Effective brigade systems will allow for the following site control measures to be adopted

3.2.1 Cordon

Only the minimum number of personnel should be allowed in the rescue area.

3.2.2 Equipment pool

After arriving as near the incident site as possible, equipment will require to be transported to the location. This may involve carrying the equipment a considerable distance across difficult terrain. Brigades need to consider the measures they need to take to avoid unnecessary manual handling risks, e.g. the provision of all terrain vehicles or specialised equipment packs

3.2.3 Rope anchorage

At the incident site, suitable anchorage points will require to be set up to secure any personnel who are to be lowered e.g. down a cliff face. Care should be taken that personnel supervising the anchorage points are not likely to be struck by falling objects or debris. They should also be wearing protective and suitable equipment to prevent hypothermia.

3.2.4 Rescue control Officer

This officers role is to be in a position to observe the whole incident. In order to achieve this, it may be necessary to he remote from the main rescue activity. The officer must control the rescue and
therefore will require to be in communication with both the casualty party and the support party and **‘on** site’ experts and other agencies..

3.2.5 Casualty party leader

This person will be responsible for reaching and securing the casualty, and assessing if expert medical advice is required or additional equipment necessary. On arrival at the rescue site steps should be taken to secure the casualty whilst his/her condition is being checked. At this stage it is important to prevent any transfer of body fluids from the casualty to the rescuers.

A decision will have to be taken as to the safest route to rescue the casualty e.g. in the case of a cliff rescue it may be safer to take the casualty to the top of the cliff.

3.2.6 Casualty recovery

It is essential that additional equipment provision is made for the recovery of casualties if the safety of brigade personnel is not to be compromised by them removing their own protective equipment. The use of a traditional lowering line clearly has a number of drawbacks:

- event of error by the users.
- Lowering lines are notoriously uncomfortable for the casualty and have the potential to aggravate existing injuries, or even cause further injury under a shock load.
- Personnel need to operate in the area of risk, right next to the opening from which the casualty is being recovered.
- It is difficult to reconcile a risk assessment of the activity with the equipment and procedures used.

A suitable alternative provision can be made by the use of static Kernmantel rope operated through a rope adjustment or hauling device, with a rescue strop. The advantages of such a system include:

- The system can include a fail-safe provision to prevent a free fall of the casualty in the event of error by the users.
- The rescue strop provides a comfortable and secure attachment for the casualty. The width of body contact areas will reduce the potential to aggravate injuries and reduce the possibility of further injury under a shock load.
- Personnel operating the system can stand remote from the opening through which the casualty is recovered.
- The equipment and work procedures can fully address the outcome of the risk assessment.

The level of equipment required is fairly limited where a casualty can be recovered by lowering, Where recovery involves raising the casualty the provision of a suitable hauling device will need to be considered. It may be appropriate for brigades to provide this as a central resource.

CASUALTY RECOVERY		
EQUIPMENT	STANDARDS	TRAINING
Rescue Strop	EN 1497, EN 1498	Moderate Training Requirement
Rope Adjuster	EN 341	
2 x round slings	EN *566*	
6 x carabiners	EN 362	
I x pulley	-	
1 x rope clamp	-	

3.2.7 Safety Systems — additional considerations

Work Restraint systems using safety belts (EN *359)* are intended to prevent individuals reaching an edge from which they can fall. Notwithstanding that belts may be certified for falls of not more than 0.6 metres, they should not be expected to sustain shock loads. Systems of work should therefore be set up in such a manner that they are designed to prevent workers reaching an edge from which they may fall.

- Fall arrest systems using a full body harness (EN 361) should be set up to ensure that the maximum distance of fall does not exceed 2 metres. When setting up fall arrest systems, consideration must also be given to the clear space beneath the work area and any additional extension of the shock absorber (EN *355).*
- Support personnel should be protected from falls over unguarded edges, including open access points to establishing safety edge: should be protected from falls over unguarded edges, including open Confined spaces. The following points should be considered when systems for support personnel working within *5* metres of an unguarded edge:
  - Horizontal safety lines which are intended for fall arrest use should be set up to run parallel to the drop, such that the maximum distance of fall does not exceed 1.2 metres. This is to prevent excessive load on the anchorage points at the end of the line.
  - A rope adjuster (EN 341) should be used to connect the harness to any vertical or angled safety lines intended to allow for free movement of the worker.
  - 1-horizontal or angled safety lines which are longer than 9 metres should be secured to intermediate anchorage points no more than 9 metres apart.
  - The use of safety lines rather than short lanyards attached to fixed points gives greater flexibility when working over large areas.

- When selecting ropes, static rope with a stretch of less than *5%* should be specified. Dynamic rope (e.g. climbing ropes) is considered unsuitable as it may stretch in excess of 20% under load.
- When access to shafts, wells sewers, silos and other similar confined spaces is required, fire fighters must always be provided with a harness attached to a suitably controlled safety rope. Personnel wearing breathing apparatus in this environment must be protected by a rope that is, at all times, under the control of a competent person outside the space. Further considerations include:
  - The harness should be attached in such a way that a fire fighter who gets into difficulties can be withdrawn in an upright position.

- In general, attachment should be via a dorsal attachment on the harness.
- Use of a high sternum attachment point on a harness may result in the BA facemask being dislodged.
- Suitable hauling equipment, which can withdraw the fire fighter in a controlled manner, should also be provided.

- Systems that provide for the safety of personnel working in breathing apparatus must be set up in such a way that a competent person in a safe environment controls the rope. Experience has shown that it is not practical for a BA wearer to operate the rope control device.

3.2.8 Safety Officer

A Safety Officer will be necessary if there is a danger to the public or rescue team from either falling debris or other external source.

The decision as to whether harnesses and associated equipment are required will need to be made by individual employers following their risk assessment of particular work environments. When the risk assessment indicates the need for such equipment to be provided, Regulations and associated guidance documents are specific.

In respect of work in Confined Spaces guidance on the provision and use of harnesses is specific. In respect of work in Silos and similar locations, DCOL 15/1997 directs that personnel must not enter without the protection of a harness and safety rope under the control of a competent person.

When selecting appropriate harnesses and associated equipment, due heed must be given to the relevant standards, see below, for this equipment.

3.2.9 Relevant Standards

EN 359	-	Safety Belts
EN 358	-	Work Positioning Systems
EN 361 / EN 363	-	Full Body Harness / Fall Arrest Systems
EN *795*	—	Anchorage Devices
EN 354	-	Lanyards
EN *355*	-	Energy Absorbers
EN 362	-	Connectors
EN 365	-	General requirements for instructions for use and marking
prEN 1891	-	Low Stretch Rope
EN 341	-	Descender / Rope Adjustment .Devices

NOTE:
PPE used in this work environment is categorised as Type III - i.e. it gives protection against mortal danger. As such it must:

- Be certified by an independent inspection body
- Be provided with a certificate of-conformity
- Display the ‘CE’ mark

GLOSSARY OF TERMS

Anchor Point	The *fixed* point to which the various elements of PPE or ropes are finally attached.
Ascender	Equipment, which when attached to a rope will permit movement in one direction only.
Edge Protection	The provision and placement of equipment to protect ropes and slings where they pass over sharp edges
Fall Arrest	The use of PPE to protect a worker who is required to work in a position where there is the risk of a free fall if controlled contact with the working surface is lost.
Impact Load	The force absorbed by the body of a worker when a fall is arrested.
Rope Adjuster	A mechanical device, generally relying on friction, which allows the movement of a rope under load to be easily controlled.
Safety Rope	A rope which under the control of a competent person and connected via a rope adjuster to an anchor point in such a way that it will support a worker who gets into difficulties. It may also be known as a back-up or secondary rope.
Shock Load	The additional load imposed on equipment and anchor points when the equipment stops a fall or sudden movement.
Shock Absorber	A device which limits the shock load on equipment and anchor points to less than 6kN. It may do this by deforming under a shock load. An additional function is to minimise the impact load absorbed by the body of the falling worker.
Static Rope	Rope which has limited stretch under load. The amount of stretch is generally less than *5* % at 80 kN.
Work Positioning	A System of work in which the worker's weight is supported (in whole or in part) by PPE attached via a rope and rope adjuster to an anchor point.
Work Restraint	A system of work which uses PPE to prevent a worker reaching a point from which there is a risk of falling a distance likely to cause personal injury.

Bullet Points

Considerations For Officer-In-Charge

Initital

- The location and physical and mental state of the casualty
- Are sufficient skills and equipment on site
- Are there additional specialist personnel or equipment required
- The stability of the rescue site
- Hazards posed by power and radiation

As the situation develops

- Nominate safety officer
- Nominate rescue officer
- Safe route required to be taken to site of incident.
- Are suitable anchorage points provided.
- Risk of falling objects/debris.
- Personnel NOT involved prohibited from entering danger zone.
- If public commonly use area utilise police to cordon off rescue area.
- Establish an equipment storage area
- Establish a casualty reception area
- Is there sufficient room for an aerial appliance to be used