RISK ASSESSMENT PROCESS FOR COMPLEX INCIDENT RESCUES

John Doyle, Cleveland Fire Brigade

1. INTRODUCTION

1.1 The Fire Service acknowledges that their work will occasionally put them in hazardous situations, and in general this risk is accepted in order to protect the communities that they serve. However, the current Climate has put pressure on Brigades to establish methods of reducing the exposure of their workforce to risks and government has added to this duty by establishing the Fire Service a leading role at the incident ground for the safety of not only their own workforce but also the other Emergency Services and members of the public involved.

1.2 Brigade Management has recognised the benefits of operating successful Health and Safety policies and procedures, which can directly impact onto organisational issues such as

- **Moral**
  - As a caring employer Brigades should want to ensure the safety of their employees at all times.
  - As professional Bodies, Brigades aim to discharge their duties to the community to the highest possible standards.

- **Economic**
  - Good Health and Safety Management is always cost effective. The time and money invested in safety is always outweighed by the savings in the legal costs, compensation and the need to replace equipment.

- **Legal**
  - The Management of Health and Safety at Work Regulations 1992 places a duty on all employers to ensure, so far as is reasonably practicable, the health, safety and welfare of employees and others affected by their work activities. In order to achieve this they must carry out and record suitable and sufficient risk assessments then implement the control measures necessary to ensure an acceptable level of safety for all involved.

2. LEVELS OF OPERATIONAL RISK MANAGEMENT

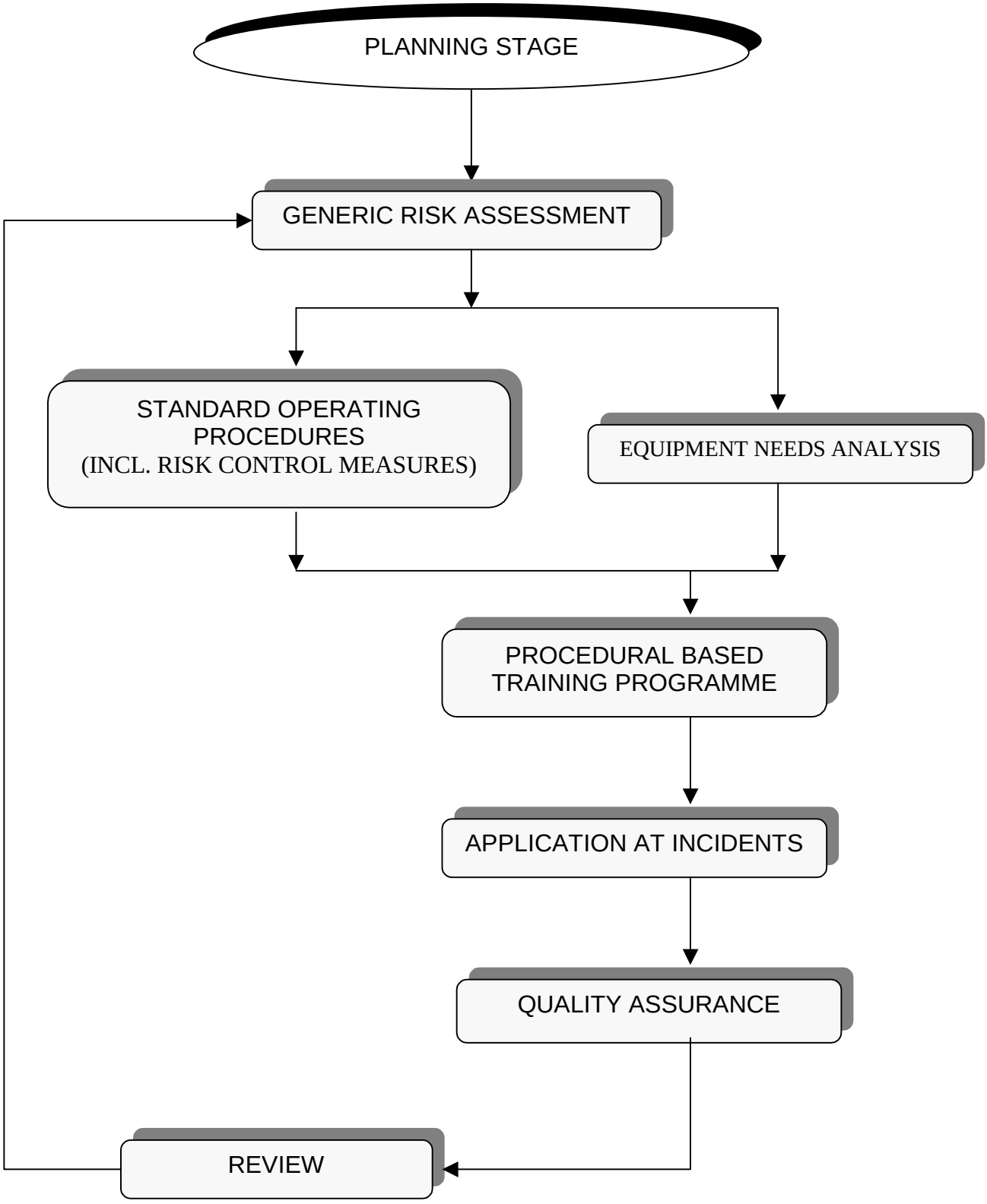
In order to provide an acceptable level of staff and public protection at complex operational incidents, Cleveland Fire Brigade have introduced a Risk Management System which operates with three levels of organisational control being:

i) Strategic Level

ii) Tactical Level

iii) Local Level

STRATEGIC RISK ASSESSMENT



Strategic Risk Assessment is a management function conducted at the planning stage in order to formulate safe systems of work. This process includes the functions listed below.

1 Risk Assessment/Standard Operating Procedures (R.A./S.O.P)

This form of risk assessment evaluates the generic hazards in a particular incident type (Appendix A example of specific R.A./S.O.P.) and stipulates the necessary control measures to reduce the risk to an acceptable level.

2 Risk Identification

Risks within the response/boundaries of any Brigade are dynamic, it is necessary therefore to identify key tasks, i.e. incident types which allow the process of

- Hazard Identification
- Risk Evaluation
- Control Measure recommendations

3 Equipment Needs Analysis

Should the RA/SOP identifying equipment requirements procurement will be progressed within a defined procedure which considers:-

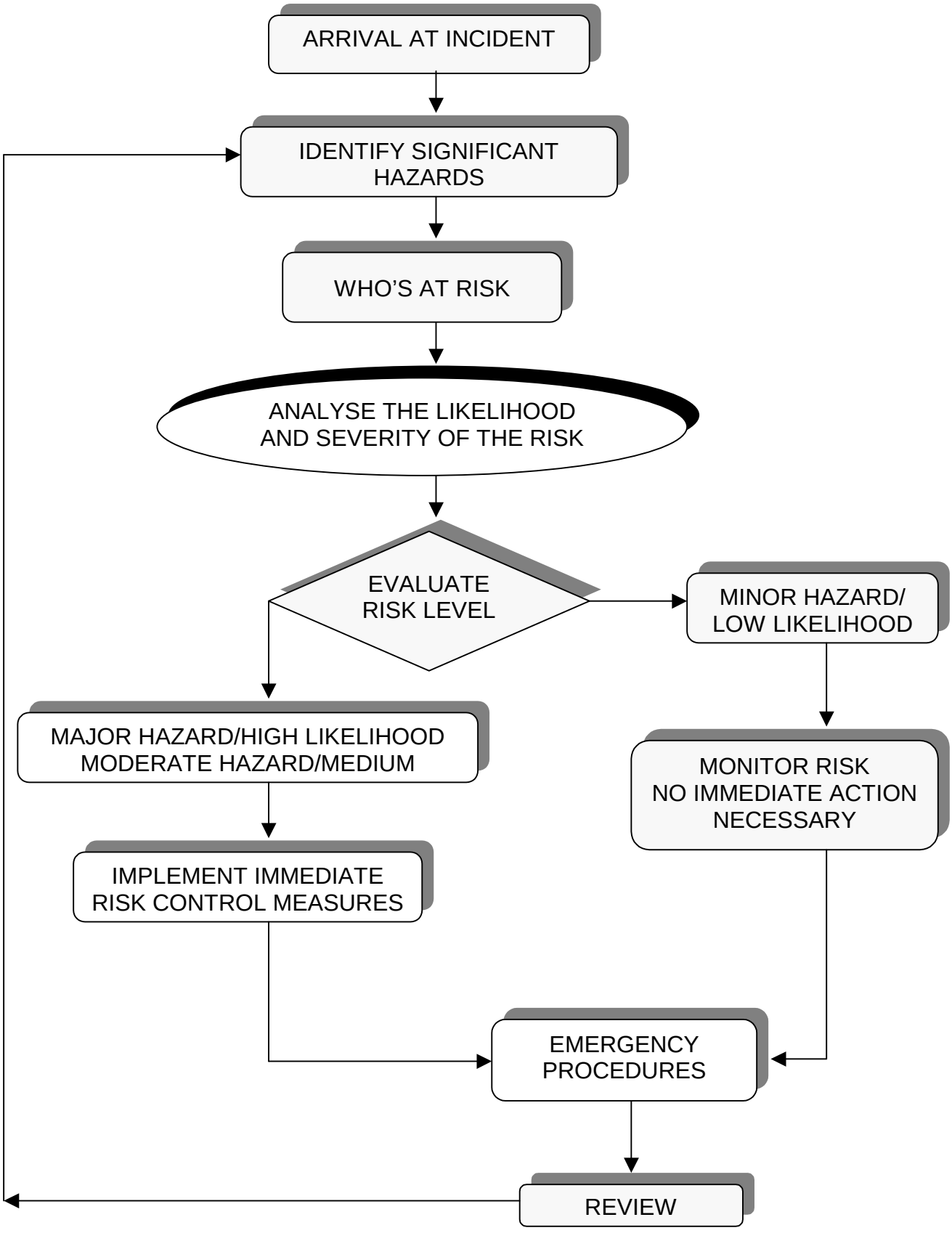
- Technical/Cost Implications
- Health and Safety Implications
- Training Implications

4 Procedural Based Training Programme

The skills and underpinning knowledge required by individuals is continually assessed to ensure the appropriate Quality of Tactical Risk Assessment is maintained. This assessment of competency can be undertaken by the use of either:

- Fireground Audit
- Procedural Based Training

TACTICAL RISK ASSESSMENT PROCESS



- Tactical Risk Assessment is carried out on the incident ground by the Incident Commander and subsequently by all other designated Commanders as the Incident Management structure develops.

- Tactical Risk Assessment is hazard driven in that it is an assessment of the risks arising out of the hazard at that incident which consequently dictates the particular tactics which are available to the Incident Commander which do not exceed tolerable risk to crews.

- Specific Strategic Risk Assessments will, of course, have identified the possible scenarios, consequences and safe systems of work for particular types of incidents. However, the Incident Commander is often faced with a dynamic incident which presents varying levels of risk and therefore, tactical risk assessment must be utilised to supplement strategic assessments.

1 Arrival at Incident

Upon the arrival of the initial attendance the first task of the Incident Commander must be to gather information, evaluate the situation and then decide the most appropriate course of action.

Although there are usually time constraints on decision making in an operational environment, this should not be used as a reason for accepting the unacceptable.

The maxim below demonstrates the correct attitude Officers should demonstrate with regard to Safety:

- **We may risk our lives a lot, in a highly calculated manner, to protect saveable lives.**

- **We may risk our lives a little, in a highly calculated manner, to protect saveable property.**

- **We will not risk our lives at all for lives or property that are already lost.**

If, after implementing all available control measures, the cost of proceeding with a task still outweighs the benefit **DO NOT PROCEED**, but consider viable alternatives.

2 Identifying Significant Hazards Present at Scene

A risk assessment may be defined as “an identification of the hazards present in or associated with tactical operations and an estimate of the degree of risk(s) involved”.

Hazard - Something which has the potential to cause harm (i.e.Flashover, ionising radiation, electricity, hazmats, unsafe structures, LPG cylinders in fire, moving vehicles).

Risk - The likelihood and severity of the harm being suffered by personnel at and around the scene. Additionally, the risk to the environment will also need consideration. (i.e. risk of electrocution, being struck by projectiles, being exposed to hazmats, becoming trapped in machinery/building collapse).

3 Identify all Persons at Risk

This may include:

- Operational personnel
- Members of the public in the vicinity
- Other Emergency Service personnel, civilian specialists
- Contractors/works personnel
- Media personnel

Consideration will need to be extended to environmental consequences

4 Analyse the Risk

This is an assessment of the likelihood and severity of the harm by considering the physical indicators at the scene.

The likelihood of the harm being suffered should be computed as HIGH, MEDIUM or LOW. The severity level of the harm, should it materialise, should be computed as MAJOR, MODERATE or MINOR.

5 Evaluate the Risk

The evaluation of risk, that is making a decision whether a hazard is adequately controlled, will obviously be affected by the results of the analysis of the risk.

The final judgement on the estimated level of risk presented by the hazards, i.e. intolerable, high, medium or low should consider the level of protection already provided for by established Brigade procedures (i.e. B.A. procedures).

6 Implement Risk Control Measures

Depending on the level of risk presented to personnel the Incident Commander will implement control measures to eliminate or to reduce the risk so far as is reasonably practicable to a tolerable level.

This may be accomplished by:

a) Eliminating the Risk

For example, by adopting a defensive mode in tactics. The isolation of electrical equipment. Use of monitors. Use of Aerial Appliances as opposed to men working on roofs.

b) Reducing the Risk

For example, by limiting the number and duration of working, of personnel committed into the risk area.

The deployment of personal protective equipment and clothing.

The designation of specific task Safety Officers.

c) Controlling Exposure to the Hazard by means of Physical Measures

For example, designate exclusion zones, work behind natural defense barriers.

In order to reduce the risk by means of procedural measures the Incident Commander will normally be able to directly apply the criteria laid down in the Brigade's Standard Operational Procedures. However, due to the complexity of operations or the dynamic rate of change of the incident, the Incident Commander may be required to improvise on existing Brigade procedures, in order to achieve his tactical goals.

In detailing the improvised safe system of work, the Incident Commander must take account of:

- The environmental conditions
- The number and make-up of the personnel who will be involved in the task,
- The type of equipment to be utilised, and
- the personal protective equipment available.

7 Review Assessments of Risk

Emergency incidents are fluid and unpredictable with rapid rates of change. Consequently, the risk assessment process must be continually reviewed to counteract any fluctuations in risk to personnel deployed at the incident.

Further, as the incident is brought progressively under control, the functional priorities of CFB operations diminish and therefore, the level of risk personnel are exposed to should, depending on the circumstances at each site, be reduced comparatively.

8 Emergency Controls

The very nature and function of operations at emergency incidents necessitate the exposure of personnel to risk. The level of risk exposure being dependent on the priorities existing at the scene.

The elimination or reduction of risks to personnel by control measures is qualified in Health and Safety legislation by the **"SO FAR AS IS REASONABLY PRACTICABLE"** concept.

Legal precedence has defined this term as a balance that has to be struck between the nature and extent of the risks that are present on the one hand, and the cost, convenience or time loss that must be countenanced on the other hand to eliminate or reduce those risks.

At emergency rescue operations cost implications are generally insignificant as personnel are well equipped with personal protective equipment and modern specialist equipment and appliances. However, at such incidents the luxury of convenience or time cannot be countenanced in order to execute the primary function of the Fire Service; and although all practicable and reasonable control measures are implemented, a high residual exposure of risk to personnel remains.

It must be stressed, however, that an absolute threshold on risk exposure exists and where the Incident Commanders tactical risk assessment identifies intolerably high risk exposure to personnel from specific tasks, the Incident Commander shall modify his tactical plan in order to reduce this risk.

Where residual risk to personnel remains high it is imperative that the Incident Commander establishes and implements procedures to deal with serious and imminent danger.

LOCAL RISK ASSESSMENT

- Operational Crew Commanders involved in the direct supervision and performance of specific tasks are ideally positioned, due to their proximity, to continually review the tactical risk assessment performed by the Incident Commander.

- Crew Commander have a duty to report any significant changes in scene conditions to the Incident Commander to enable him to re-evaluate the Control Measures implemented for that specific task. They will also assume a pro-active role by reacting immediately where the risk to crews escalates above a tolerable level or in the event of serious or imminent danger.

- All Firefighters deployed at the incident have a duty to take reasonable care for their own health and safety and that of other persons who may be affected by their actions. Additionally, they also have a duty to report conditions, which present a serious and immediate danger or any shortcomings in the Safety Control measures implemented at an incident of which they are aware.

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RISK ASSESSMENT AND STANDARD OPERATING PROCEDURE

INCIDENTS INVOLVING ROPE RESCUE

1. THE TASK

This management risk assessment applies to all Fire Brigade operations which involve or may involve activities conducted involving rope rescue.

The purpose of this risk assessment is not to detail every conceivable hazard presented by Brigade standard operational procedures, but to identify, evaluate and legislate for risks specifically inherent to work involving rope rescue.

This risk assessment appertains specifically to rope rescue operations conducted at the following locations :

Cliffs
Crags
Pylons
Silos
High Buildings
Cranes
Pot Holes
Excavations
Shafts
Tunnels

2. PERSON AT RISK

All Brigade personnel in attendance at such incident my be exposed to risk.
The Health and Safety of all non-Brigade personnel may also need consideration:

Members of the public in the vicinity/occupants
Other Emergency Services Personnel
Civilian Specialists
Contractors works personnel
Media personnel

3. THE HAZARDS

The significant hazards which may be present, depending on specific scene conditions and the nature of operational activities are:

(i) Fall from Heights

Significant hazards may exist to personnel presented by falls from a height, which can occur due to:

- Unrestrained fall from structure/cliff etc, due to a slip, trip or fall. This hazard increases with inclement weather, unsuitable working surfaces. poor visibility or incidents at night.

- Equipment failure during use can occur from equipment being exposed to moving machinery, falling debris, chemical degradation, excessive heat, incorrect stowage, abuse of equipment or lack of inspection at regular intervals. Additionally, damaged equipment being inadvertently used at an incident.
- Failure of belay points during use.

(ii) Impact Injury Hazard

Impact injuries may exist to personnel caused by falling debris, rocks or other objects.

(iii) Manual Handling

Risk of muscular skeletal injuries due to restricted movement of awkward postures associated with transferral of equipment or casualty handling.

(iv) Environmental Conditions

Extremes of seasonal change in atmospheric temperature (heat and subzero temperatures) may present hazards to personnel at protracted incidents. i.e. hypothermia, heat exhaustion etc.

(v) Biohazard

Biohazards from bodily fluids may be encountered where first aid is administered to casualties.

(vi) Other Hazards

Rope rescue scenarios are so varied that each may produce a unique set of hazards and the relevant Risk Assessment/Standard Operating Procedure and associated hazards should be considered appropriate to the incident type

4. RISK EVALUATION

The nature of the work conditions and restrictions, and the diversity of scenarios culminate in producing work involving rope rescue as a potentially high risk activity often of significant complexity.

The diversity and complexity of potential incident types and locations require a careful and deliberate tactical risk assessment to be conducted by Officer in Charge of incidents in liaison with Rope Rescue Instructors/Personnel in order to accurately evaluate residual risks at specific scenes.

Risk evaluation conducted in this assessment considers all potential risks generic to all operations involving rope rescue.

Pre-control measure implementation — Medium Risk to Intolerable Risk
Post-control measure implementation — Tolerable with High Risk Components

STANDARD OPERATIONAL PROCEDURE/CONTROL MEASURES

On Route

Turning Out, Proceeding, Arriving and Getting to Work Risk Assessment should be considered.

Action on Arrival

- The Officer in Charge (0/i/C) of the incident should liaise with rope rescue personnel and perform a careful and comprehensive tactical risk assessment prior to the deployment of any rope rescue personnel in order to initiate the relevant control measures.
  The specific activities, which ought to be risk assessed, are:
  Rescue Operations

- The 0/i/C should implement the appropriate level of Command and Control of the Incident Management System applicable to the incident.

- The 0/i/C should implement the appropriate supervisory and safety controls for rope rescue procedures as outlined in TB 1/90 and Brigade Standard Training notes.

Operational Considerations

- Early consideration should be given to the designation of a Safety Officer/Team.
- Consideration should be given to immediate lighting up of the area to facilitate operations and safety.
- A restricted area should be defined which should be physically marked/roped off to ensure that all Brigade and non-Brigade personnel stay within the safe area.
- All personnel who enter the restricted area should wear appropriate P.P.E. and safety equipment to prevent falling over the edge of operations.
- Rope rescue operators during any rescue should be attached to two separate ropes by two separate connectors. In the event of a failure reliance will be on the safety rope for both rescuer and casualty once he/she is secured into the system.
- Where possible/practicable two separate anchor points should be used to suspend each individual rope. Anchor points should be tested, where possible, prior to use.
- Only rope rescue operators should identify suitable anchor points using their skill and judgement. Anchor points can vary from webbing slings around trees or steelwork to steel stakes driven into the ground.
- All rope rescue operators should wear the appropriate P.P.E., i.e. helmet, head torch, boots, gloves, one-piece suit and thermals when applicable.
- The verbal warning ***"below"*** should be given whenever falling debris or other objects are taking place in order for effected personnel to take the relevant safety action.
- The role of Brigade personnel who are not rope rescue operators is one of assistance only for equipment needs and manpower when using certain pulley systems. No equipment or line is to be touched unless specified by a rope rescue operator, particularly when rescue operations have commenced. Gloves and where applicable safety spectacles/visor should be worn with full firekit.

Safety Considerations

- Non Brigade equipment should not be used for any rope rescue operations.
- Dropped equipment should not be used and should be tagged immediately to prevent inadvertent use.
- Damaged webbing or other equipment should be immediately tagged to prevent inadvertent use. Procedure should be followed to prevent any further use of irreparable equipment, e.g. cutting damaged webbing, etc.
- All personnel administering first aid should use the appropriate P.P.E. and resuscitation equipment to minimise any transmission of infection, i.e. surgical gloves and airway.
- The Officer in Charge should consider reliefs and refreshment for personnel at protracted incidents.
- Paramedic standby should be considered.

6. REVIEW

This risk assessment shall be reviewed following :

- The introduction of relevant legislation.
- The results of accident investigations.
- And, in any event, every 2 years.

AIDE MEMOIR - ROPE RESCUE

- Designate a specific Safety Officer.
- Illuminate incident scene as far as possible.
- Designate a restricted area.
- Personnel who enter restricted area should wear PPE appropriate to the risk.
- Second line working should not be compromised.
- Belay/anchor points should be assessed for integrity. (Identified by rope rescue operators.)
- Non operators act as assistants to provide manpower and equipment.
- Standard procedures in line with training should be utilised.
- Post incident inspections should be performed prior to subsequent deployments.

GENERIC RISK ASSESSMENT
RESCUES FROM HEIGHT

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.

Activities which involve related specific, significant hazards such as electricity, are covered in other Generic Risk Assessments (GRA's)

Reference is made throughout the document to these other GRA's as well as other technical sources.

As with all GRA's this assessment provides a starting point for brigades to conduct their own assessments within the context of local conditions and existing organisational arrangements.

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]

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 The Fire Service Manual and GRA *5.1* 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 in the UK by the BBC and independent broadcasters 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 preset 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 BS 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	BS EN *358*	Moderate Training Requirement
2 x round slings	BS EN *566*	
4 x carabiners	BS EN 362	
Kernmantel static rope	prEN 1891	
Rope Adjuster	BS 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	BS EN 361	Moderate Training Requirement
Shock Absorber	BS EN *355*	
2 x round slings	BS EN *566*	
4 **x** carabiners	BS EN 362	
Kernmantel static rope	prEN 1891	
Rope Adjuster	BS 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	BS EN 359	Minimum Training Requirement
2 x round slings	BS EN 566	
4 x carabiners	BS EN 362	
Kernmantel static rope	prEN 189 I	
Descender / Rope Adjuster (optional)	BS 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	BS EN 1497, BS EN 1498	Moderate Training Requirement
Rope Adjuster	BS EN 341	
2 x round slings	BS EN *566*	
6 x carabiners	BS EN 362	
I x pulley	-	
1 x rope clamp	-	

3.2.7 Safety Systems — additional considerations

Work Restraint systems using safety belts (BS 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 (BS 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 (BS 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 (BS 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

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