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CHIEF FIRE & RESCUE ADVISER

Fire and Rescue Service Operational Guidance

GRAs
generic risk assessments

GRA 2.2
Ice and unstable ground

Generic Risk Assessment 2.2

Ice and unstable ground

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The Generic Risk Assessments in this series only apply to England.

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SECTION 1

GRA 2.2 Ice and unstable ground

Scope

This generic risk assessment (GRA) examines the hazards, risks and controls relating to Fire and Rescue Service (FRS) personnel working on or near ice and unstable ground. Although the two types of incident may be very different, they are considered in the same GRA because of the similarities in the equipment and procedures used.

Ice is a fairly definitive term although this will almost always need to be considered in conjunction with working near, on or in water. When considering the term unstable ground this should include such substances as sand, mud, gravel, earth, slurry and food substances such as rice grain or flour. Other unstable ground environments will include collapsed structures involving rubble and debris.

This GRA does not cover frozen snow or blue ice as they are part of specialist mountain rescue techniques.

Activities involving other specific, significant hazards are covered in other GRAs in this series, this GRA should therefore be considered in conjunction with these.

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

All expanses of still water within a FRS area must be considered as possible sites for incidents involving ice. Coastal FRSs will have more potential for incidents involving mud and sand whilst other ‘unstable ground’ incidents could occur in any FRS area.

The hazard presenting the greatest risk when working on ice or unstable ground is the surface giving way with the result that personnel may suffer serious or even fatal injury from:

Drowning, asphyxiation and hypothermia

As it is not possible to determine the thickness and integrity of ice on the surface of a body of water there is a danger that FRS may mistakenly believe that it will hold their weight. If a fall through ice into water at very low temperature occurs, the casualty may become rapidly exhausted, suffer from hypothermia and/or drown.

FRS personnel could also become entangled in or under hidden sub-surface hazards such as branches, weeds, shopping trolleys etc.

Biological hazards

Biological hazards, in particular waterborne diseases, should be expected to be present at these types of incidents and there are a number of infections that can be contracted including:

- salmonella
- amoebic dysentery
- tetanus
- typhoid
- polio
- hepatitis
- weil's disease (leptospirosis).

Full details including symptoms can be found in the relevant national guidance.

Chemical contamination

Chemical contamination will usually be caused by industrial pollutants or agrochemicals which can cause both short and long term health risks.

Full details including symptoms can be found in the relevant national guidance.

Falling from height

Injuries resulting from falls are likely to occur when a supporting surface gives way without warning. This could be a fall from a considerable height if for example the incident occurs in a food storage container/building. However, a fall into a slurry tank may be of lesser height but could still result in a serious injury.

Being struck by falling equipment or crushed by in-filling material

In the event of the failure of a supporting surface personnel could be struck by items including their own rescue equipment or, in the case of food storage units, by in-filling material. Being trapped by in-filling material may lead to crush injuries and/or asphyxiation.

Slips, trips and falls

Due to the unstable and slippery nature of the surfaces likely to be encountered there is an increased risk of slips, trips and falls.

Manual handling

The risk of a manual handling injury may be increased at this type of incident if personnel have to adopt awkward postures whilst performing rescues or handling equipment. Other factors that affect the risk of manual handling injuries include low temperatures (as temperatures fall the risk of injury increases) and the increased rate of obesity amongst casualties.

Individuals being rescued

Individuals being rescued may be panicking and uncooperative, which in turn increases the risk to emergency service personnel.

Extremes of temperature

Due to the arduous physical nature of the task and the necessity, on occasions, to wear specialist personal protective equipment (PPE), there is an increased risk of personnel suffering heat related injuries/conditions.

Personnel could also suffer from injuries/conditions relating to extremely low temperature such as frost nip and frost bite.

Limited experience

Working on or near ice or on unstable ground are instances where the experience of the FRS is limited. A particular hazard is the infrequency of rescues performed in these conditions and the societal/moral pressure on FRS personnel to save life regardless of resources, training and experience.

Key control measures

The most effective risk control measure in preventing harm is, if practicable, to avoid committing FRS personnel into the hazard area in the first instance. This principle needs to be built into the pre-planning processes of the FRS.

When working on ice and unstable ground cannot be avoided, consideration must be given to suitable control measures that may include:

Pre-planning

The FRS should complete an assessment of their geographical area to identify the risks and associated hazards. When appropriate this will include undertaking 7.2(d) inspections.

Emphasis should be placed on evaluating areas of unstable ground and areas where ice may be an issue. Inherent in this evaluation should be the use of historical information identifying problem areas subject to repeated incidents. This information should be recorded and made readily available to responding personnel.

FRSs should use appropriate safe systems of work, training, supervision, equipment and specialist personal protective equipment (PPE) to ensure the safe operational conclusion of these types of incidents.

FRSs should undertake debriefs as appropriate and feed any significant learning points back into the development of safe systems of work, training programmes and equipment procurement.

Training

The level and nature of any training undertaken should be based upon an informed assessment of the operational need for each FRS. For example, the training needs for dealing with incidents like large areas of frozen water are different from those required to deal with estuarial waters, large expanses of mud at low tide, slurry pits, quarries and other similar incident types/sites. All training should follow the principles contained in national guidance documents.

The outcomes of any training must be evaluated and reviewed to ensure that the training is:

- appropriate
- effective
- current
- meets the identified operational need.

The training should be supported by Standard Operating Procedures/Safe Systems of Work, which detail the safest and most effective way of performing this type of rescue.

Recognition of the signs and dangers of ice and unstable ground can be gained by using presentation techniques. However, to gain a proper appreciation of the potential for harm and to practice the techniques necessary for control of the risks, a controlled exposure within a realistic training environment is beneficial.

Training programmes should include the use of appropriate specialist equipment and personal protective equipment (PPE).

Casualty management, including variations in body temperature and the management of physiological stress, should also form part of these training programmes.

Where appropriate, personnel should receive information, instruction and/or training on the following:

- working near, on or in water
- animal rescue
- first aid, effects of cold, hypothermia and heat stress
- confined spaces.

Pre-determined response

FRSs should ensure that the operational response to an incident will be sufficient to allow relevant safe systems of work to be implemented. A task analysis of the various scenarios at this type of incident will enable an FRS to plan an effective response. This along with information received regarding the incident type and any known site specific information will provide a risk based assessment of the pre-determined response.

As part of the pre-planning process the pre-determined response may also include the need for specialist vehicles equipment, techniques and assistance from other agencies.

Specialist assistance

FRSs should liaise with other agencies and FRSs regionally or nationally when appropriate. Services should consider entering into operational agreements with supporting agencies and be cognisant of existing memoranda of understanding. Agencies may include the:

- Ambulance Service
- Police (including Marine Unit, Air Support Unit, Underwater Search Team)
- Mountain/Mines Rescue
- Environment Agency
- Royal Society for the Prevention of Cruelty to Animals (RSPCA)
- RNLI and independent lifeboat organisations
- Coastguard (Land Based and Air Sea Rescue Helicopters)
- Inland Waterways Rescue Association members
- other FRS with specialist capability (i.e. Urban Search and Rescue, rope and/or water rescue).

Specialist equipment

When purchasing specialist equipment, FRSs need to consider the following:

- suitability of selected equipment (fit for purpose)
- compliance with relevant standards and legislation
- equipment performance and associated risk assessment
- stowage, maintenance and inspection/examination arrangements
- mobilising arrangements
- training of personnel
- manual handling implications.

An informed assessment of the risks within a Service area will allow FRSs to consider the provision, and use of any specialist equipment. Equipment may include:

- rescue boats/sleds
- inflatable rescue paths
- sand (air) lances
- lifting/moving rope systems
- carry sheets
- animal slings
- shoring (hydraulic/manual)
- throw lines and floating lines
- work at height equipment
- air inflation hose systems
- portable lighting e.g. head torches, suitable generators and lights.

Any onsite specialist equipment must only be operated by competent users.

Personal protective equipment (PPE)

FRSs need to consider the use of specific PPE which may include:

- dry suits (heavy duty and/or limited use)
- lifejackets
- buoyancy aids
- personal flotation devices
- footwear (if not attached to dry suit)
- thermal under suit
- thermal insulated gloves
- specific safety headwear
- harnesses.

PPE should also take account of the need for rescuers to be visible against the operational background including night working and for team leaders to be distinguishable within ICS.

FRS must ensure that any PPE provided is fit for purpose and meets all required safety standards. When choosing suitable protective garments, the standard of clothing worn beneath the specialist PPE should also be taken into account. Consideration should also be given to the selection of suitable sizes of PPE.

Command and control

The Incident Commander (IC) should adhere to the principles of the current incident command system. Prior to committing personnel to any hazard area, the IC must conduct a suitable and sufficient risk assessment taking into account all relevant factors. A thorough safety brief prior to deployment of personnel within the hazard zone must be carried out. The risk assessment and briefing should include:

- nature of incident
- access/exit routes
- rendezvous points and marshalling areas
- casualties involved (if not visible, last known location)
- how the incident has developed
- resources immediately available or responding including other agencies
- onsite and/or responding specialist knowledge and equipment
- safety systems of work
- communication systems
- potential risks to personnel
- additional potential hazards to personnel on site
- potential for sub-surface entanglement (if appropriate to incident).

The IC must ensure that the minimum amount of personnel are committed within the hazard zone and those that are, must be correctly trained, equipped, wearing the appropriate PPE and adequately supervised.

Within the hazard area the movement of members of the public or other agency personnel must be suitably regulated. Crews and members of other agencies must be restricted from going onto ice or unstable ground. Police assistance should be sought if required.

Depth (and flow) of water under ice

Where the depth of water below an ice covered surface is known to be hazardous or is unknown, the same procedures and principles must be adopted as working near, on or in water in accordance with the relevant national guidance or specialist advice.

Floating safety lines must be used with safe access and egress maintained throughout.

Specialist on scene advice and equipment should be utilised where available.

Hygiene and decontamination

Due to the known health risks at all water related incidents, personnel must be reminded of the importance of personal hygiene. All personnel should cover any cuts or broken skin (with a water proof material or barrier) before starting any work on or near water whether it is frozen or not. Personnel must not be allowed to eat, drink or smoke until they have thoroughly washed away any possible contaminants. Appropriate decontamination should be applied in accordance with FRS procedures. Personnel may need to shower on return to station.

Any equipment used must be cleaned thoroughly as soon as possible. FRSs should consider arrangements for dealing with contaminated equipment and PPE that may need specialist cleaning. FRSs should have in place suitable safe systems of work in place for the removal of contaminated clothing from the incident ground. FRSs may need to consider the provision of additional clothing and PPE at the scene.

Personnel should be reminded that they must not touch any dead animals especially rats without appropriate protective equipment.

Appropriate health surveillance procedures should be applied in accordance with FRS procedures and specialist advice. FRSs should consider regular health checks on all personnel.

Technical references	
1	Fire Service Manual – Volume 2 – Working Near, On or In Water
2	Fire and Service Manual – Volume 2 – Fire Service Operations, Safe Work at Height, 2006
3	6/97 Fire Brigade response Options Study Final Report

SECTION 2

Summary of GRA 2.2

Ice and unstable ground

Task – Pre-Incident

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
1	Operations involving ice and unstable surfaces	Inadequate preparedness for operational type	Fatality Major injury	FRS personnel Members of the public Other agencies	FRS to identify, risk assess, plan, train and adequately control all reasonably foreseeable types of operational incident where working on ice or unstable ground can be expected FRS to gather and record appropriate information FRS to ensure that crews and supervisors are adequately trained and competent. Ensuring they undertake regular training and exercises for generic and specifics risks in their area FRS to ensure operational instructions are in place FRS to ensure that adequate systems are in place to notify personnel about inclement weather e.g. the possibility of ice FRS to ensure the provision of appropriate equipment to support safe systems of work

Task – Pre-Incident *(continued)*

Ref. No.	Task	Hazard	Risk	Persons at risk	Control measures
					FRS to ensure that appropriate pre-determined response procedures are in place FRS to ensure that an equipment management system is in place to comply with relevant legislation FRS to consider an effective plan to rescue personnel FRS to ensure effective liaison between other agencies FRS should consider a voluntary programme of inoculations for personnel FRS to provide appropriate information, instruction and training on how to deal with moral pressure at incident scenes.

Task – Initial stages of the incident

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
2	Attendance at incidents involving ice and/or unstable ground	Failure to establish a safe system of work	Fatality Major injury	FRS personnel Members of the public Other agencies	FRS to ensure that sufficient resources are mobilised to this type of incident If appropriate resources have not arrived on scene (as part of the initial response) to establish a safe systems of work, the FRS should consider the use of a suitable RV point away from the incident FRS to ensure information gathered is available to responding personnel Incident Commander (IC) to establish appropriate Incident Command System (ICS) and risk assessment procedures IC to adopt a default to defensive mode until suitable safe system of work is established IC to deliver safety briefing on known/ anticipated hazards and control measures IC to consider deploying safety officer IC to give consideration to establishing cordons and ensuring appropriate supervision of zones

Task – As the incident develops

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
3	Attendance at incidents involving ice and/or unstable ground	Slips, trips and falls	Minor injuries Major injuries	FRS personnel Members of the public Other agencies	IC to ensure continuous use of ICS and risk assessment procedures IC to adopt a default to defensive mode until suitable safe system of work is established IC to ensure that a safe route to the incident area is established and maintained IC to ensure crews use appropriate procedures and equipment in accordance with their training IC to ensure crews are properly supervised in accordance with their training and level of competence.
4	Attendance at incidents involving ice and/or unstable ground	Falls from height	Fatality Major injury	FRS personnel Members of the public Other agencies	IC to ensure that hazard zones and exclusion zones are established as required All persons in the hazard zone must be fully briefed and correctly protected with appropriate PPE (including work at height equipment) Pre-determined rescue plan to be deployed.

Task – As the incident develops *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
5	Attendance at incidents involving ice and/or unstable ground	Crushed by in-filling substance or struck by equipment	Fatality Major injury	FRS personnel Members of the public Other agencies	IC to ensure that hazard zones and exclusion zones are established as required All persons in the hazard zone must be fully briefed and correctly protected with appropriate PPE IC to ensure that arrangements are in place to prevent substances/or equipment falling in Pre-determined rescue plan to be deployed.
6	Attendance at incidents involving ice and/or unstable ground	Equipment and/or systems failure	Fatality Major injury Minor injury	FRS personnel Members of the public Other agencies	The IC should ensure that all equipment is used in accordance with operating procedures Pre-determined rescue plan to be deployed.

Task – As the incident develops *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
7	Attendance at incidents involving ice and/or unstable ground	Exposure to extreme temperature Irrespirable atmosphere Drowning/asphyxiation Entanglement in sub-surface hazards	Fatality Major injury	FRS personnel Members of the public Other agencies	IC to ensure continuous use of ICS and risk assessment procedures IC to ensure crews use appropriate procedures and equipment in accordance with their training IC to ensure crews are properly supervised in accordance with their training and level of competence IC to ensure that hazard zones and exclusion zones are established as required Minimum personnel inside exclusion zone All persons in the hazard zone must be fully briefed and correctly protected with appropriate PPE Constant monitoring of individuals IC to monitor environmental conditions. IC to consider requesting ambulance on standby Welfare provisions Pre-determined rescue plan to be deployed.

Task – As the incident develops *(continued)*

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
8	Attendance at incidents involving ice and/or unstable ground	Exposure to hazardous substances (biohazard or chemical)	Fatality Major injury	FRS personnel Members of the public Other agencies	IC to ensure continuous use of ICS and risk assessment procedures IC to ensure crews use appropriate procedures and equipment in accordance with their training IC to ensure crews are properly supervised in accordance with their training and level of competence IC to ensure that hazard zones and exclusion zones are established as required Minimum personnel inside exclusion zone All persons in the hazard zone must be fully briefed and correctly protected with appropriate PPE Constant monitoring of individuals. IC to initiate suitable infection control measures IC to establish de-contamination and clinical waste procedures.

Task – Post incident

Ref. No.	Activity	Hazard	Risk	Persons at risk	Control measures
9	Post attendance of incidents involving ice and/ or unstable ground	Hypothermia including after drop Infection/poisoning Post traumatic stress disorder (PTSD)	Fatality Major injury	FRS personnel	Monitoring of any individuals involved in incident FRS to provide additional clothing and PPE if required Record exposure to hazardous substances Record any injuries Occupational health surveillance FRS to make counselling services available.