National Operational Guidance

Hazard

Landslides and debris flow

NFCC National Fire Chiefs Council

Developed and maintained by the NFCC

Contents

Hazard - Landslides and debris flow

Hazard Knowledge

Deforestation, heavy rainfall, undercutting of slopes, inappropriate construction and buildings with weak foundations can lead to the sudden failing of the integrity of slopes causing a landslide or debris flow.

Steeper slopes forming a V shaped valley with large boulders, 1 to 6 metres in diameter, or those exposed to excessive water flows are more prone to landslides. Areas with a history of landslides are also more prone; many at-risk sites have been identified and precautions put in place.

Landslides can be categorised into three types:

- Falls: large pieces of debris falling through the air or bouncing down steep slopes
- Slides: materials moving in contact with a slope. Slow moving slides on shallow slopes are possible.
- Flows: liquid or semi fluid movement of materials down a slope, typically fast moving

Debris flows and landslides are powerful enough to move cars, large trees and buildings within the flow. They can be over 20 metres wide and can move at 35mph, making them difficult to outrun or outmanoeuvre.

Landslides have a high casualty rate and also damage property, infrastructure and utilities. Temporary mortuary arrangements may be required.

Damage to utilities can cause secondary hazards such as fire and gas leaks. The impacts on road infrastructure may affect the response to an incident. Debris flows and landslides can result in building collapse, trappings or cause blockages that result in flooding.

The disturbance caused by a landslide may result in secondary movements and collapses.

See Hazard Unstable surfaces

Control measure - Plan reception centres

Control measure knowledge

Depending on the scale and nature of the incident, suitable locations and logistics for the safe reception of large numbers of people may need to be identified and arranged. Reception centres in the form of survivor reception centres, emergency rest centres and humanitarian assistance centres are designed to cater for the needs of all casualties and others involved.

Experience has shown that in the immediate aftermath of an incident many people will travel to the scene or to meeting points, such as travel terminals, if they believe their family or friends may have been involved in an emergency. Friends and relatives who may be feeling intense anxiety, shock or grief, need a sympathetic and understanding approach. Appropriate and effective liaison and control must be in place to ensure that information is accurate, consistent and non-contradictory.

Local authorities work with statutory and specialist agencies and the voluntary sector who can provide additional specialist assistance at a large scale incident or one which requires additional logistical and public support. Such agencies include:

- Voluntary Sector Civil Protection Forum
- Red Cross — emergency response
- Disaster Action
- Salvation Army Trust
- Samaritans
- St. John Ambulance / St. Andrews Ambulance (Scotland)
- Royal Voluntary Service — formerly Women's Royal Voluntary Service

For further information, see: Emergency Response and Recovery Non statutory guidance accompanying the Civil Contingencies Act 2004

Strategic actions

Fire and rescue services should:

- Make appropriate arrangements with local authorities and partner agencies for pre-planned public reception centres as part of the community risk assessment
- Develop local guidance and appropriate arrangements on the available support services for people affected by emergency incidents
- Ensure that incident commanders have an understanding of the processes and arrangements for local emergency public support services

Tactical actions

Incident commanders should:

- Carry out timely liaison with partner agencies on the establishment of reception centres
- Instigate local arrangements for emergency public support services

Control measure - Evacuation and shelter

Control measure knowledge

'Evacuation' is the immediate and urgent movement of people away from a threatened or existing hazard. The response of people to emergencies can vary from inaction to panic; a key factor in maintaining control and order when conducting evacuation is communication.

The need to evacuate or shelter people could be due to:

- An act of terrorism
- The actual or threatened release of hazardous substances
- Fire
- An unstable or collapsed structure
- The risk of explosion
- Severe weather, including widespread flooding
- Environmental contamination
- Transport incidents

When producing Site-Specific Risk Information (SSRI) and developing incident plans, the evacuation or shelter of large numbers of people should be considered. Planning should be carried out with statutory resilience forums who may be able to mobilise resources to assist during the emergency phase of an incident.

Personnel at the incident and in the fire control room should develop a joint understanding of risk when determining if there is a need for evacuation, shelter in place or 'stay put'. To achieve this effectively, robust communications should be established and maintained throughout the incident. For further information refer to: Have a communications strategy.

The decision to evacuate, and the size of the area to be evacuated, should be based on a joint

understanding of risk which is agreed by the Strategic Co-ordinating Group (SCG). As a decision to evacuate is likely to affect multiple agencies, they should all be consulted if possible. If this is not possible, all agencies involved should be informed as quickly as possible.

The police are normally the lead agency for evacuation, and are likely to make a decision to evacuate in consultation with the local authorities. However, the police can only recommend evacuation and have no power to force responsible adults to leave their homes, with the exception of evacuation of the inner cordon for a terrorist incident.

In any decision about whether or not to evacuate, the overriding priority should be the safety of the public and emergency responders. It is possible that evacuating people to the open may put them at greater risk; buildings may provide protection against some types of risks and the public may be safer seeking shelter in a suitable building.

Unless they are provided with specific instructions, people are likely to follow the most obvious or familiar egress route; this could result in a stampede, evacuating towards the hazard, or result in people being trampled.

Evacuation time comprises the time taken for individuals to move towards an exit, plus the time taken before movement is initiated – the time taken to recognise there is a danger and to decide on the most appropriate course of action. Communication and sharing of information should aim to enhance the effectiveness of evacuation. For further information refer to Warn, inform and advise people.

For further information, refer to the Cabinet Office publication, Understanding Crowd Behaviours: Supporting Evidence

Once implemented the evacuation plan should be regularly reviewed, to take into account:

- The development of the incident
- Changes in weather conditions
- Information gathered from emergency responders and the public
- The effectiveness or impact of the evacuation

Fires in buildings

Taller or larger buildings are likely to have scalable evacuation plans, with some people remaining in relatively safe areas of the building during firefighting operations.

To prevent access, egress and escape routes becoming compromised, compartmentation and suitable routes for firefighting teams should be identified and secured at the earliest opportunity. Building signage should not be relied on for suitable access and egress routes.

Access and egress routes should be suitably and sufficiently protected by:

- Using personnel with appropriate firefighting media
- Making use of the building's fixed installations
- Maintaining the structure and integrity of fire-protected areas

The primary objective of an evacuation strategy is to ensure that in the event of a fire, the people in the building can reach a place of ultimate safety outside the building. The evacuation procedures are an essential part of the overall fire strategy. There are two basic categories of evacuation procedure:

Total evacuation

Total evacuation of people to a place of ultimate safety, by either simultaneous or phased procedures:

- Simultaneous evacuation
    - The default approach, where it is unreasonable to expect people to remain in the building for a prolonged time when there is a fire
- Phased evacuation
    - A common approach adopted in high-rise premises where the storeys are separated by fire resisting construction, or in certain atrium buildings
    - The first people to be evacuated are all those on the storey most immediately affected by the fire, and those on other storeys with impaired ability to evacuate, unless their personal emergency evacuation plan (PEEP) has determined otherwise
    - The remaining storeys are then evacuated, usually two storeys at a time, at phased intervals

Progressive evacuation

Progressive evacuation of people, initially to a place of relative safety within the building where they can remain or, if necessary, complete the evacuation to ultimate safety as part of a managed system. There are two categories of progressive evacuation:

- Progressive horizontal evacuation
    - The process of evacuating people into an adjoining fire compartment on the same level, from which they can later evacuate to a place of ultimate safety
- Zoned evacuation
    - A common approach adopted in large retail developments, where an operational loss could be created by evacuating a large building for a relatively small fire
    - A zoned evacuation is achieved by moving people away from the affected zone to an adjacent zone; for example, in a shopping centre where people would be moved to the adjacent smoke control zone while the fire-affected zone was brought under control

Evacuation or escape strategies

Evacuation or escape strategies will vary; the responsible person should be able to provide information about them. Some buildings have a policy to simultaneously evacuate when hearing an alarm, others maintain a 'stay put' or 'defend in place' policy and some adopt a vertical phased approach.

The 'stay put' policy, as detailed in the Local Government Association's Fire safety in purpose-built blocks of flats may be considered appropriate, based on the levels of fire resistance for compartment walls and floors. The use of evacuation or escape strategies that are based on 'stay put' or 'defend in place' policies should be kept under review throughout the incident.

When determining the evacuation strategy the following factors should be considered and reviewed to maintain the safety of people:

- That there is a clear passageway to all evacuation routes
- The risks to people exiting along firefighting access routes
- Exposure to potential hazards
- Whether any people require assistance to evacuate
- If the evacuation routes are clearly marked, and are as short and direct as possible
- Whether there are enough exits and routes available for all people to evacuate
- If emergency doors open easily in the direction of evacuation
- Whether there is emergency lighting provided where needed
- If training has taken place about using the evacuation routes
- Whether a safe assembly point has been designated and communicated

Evacuation of medical facilities

Medical facilities are likely to contain patients, visitors and staff. These people will have varying levels of familiarity with their surroundings and the evacuation procedures. It is also likely that some people will be impaired by physical or mental disabilities.

Fire and rescue service personnel may be able to provide assistance to evacuate non-ambulant patients.

Medical facilities may have more than one evacuation strategy. This may include simultaneous evacuation, where people immediately go to a designated assembly point, 'horizontal phased' or 'vertical phased' evacuation.

Methods of horizontal phased evacuation are particularly useful when dealing with seriously ill or infirm people, who may require life support equipment, medical gases or strict environmental conditions for their well-being.

Hazardous materials

The aim should be to reduce the impact of a hazardous material on members of the public not originally involved in the incident, but who could potentially become involved as the material moves from the incident. This may be achieved by implementing an evacuation or shelter in place plan.

An assessment about which course of action is correct for protecting the public should be made by a hazardous materials adviser (HMA), and provided to the incident commander. For further information about the information that will influence this assessment refer to:

- Hazardous materials - Assess impact of release or spill
- Hazardous materials – Safe and controlled approach: Hazardous materials

For information regarding contaminated casualties, refer to Hazardous materials - Controlled evacuation of contaminated casualties.

Strategic actions

Fire and rescue services should:

- Liaise and consult with developers, owners, occupiers and responsible persons of buildings, to provide expert safety advice and to develop tactical guidance and support arrangements for the associated hazards and actions to take to confirm the occupier's evacuation policy or strategy
- Ensure that personnel have access to pre-determined evacuation plans for buildings or locations that have them
- Develop and test emergency plans and support arrangements for evacuating large numbers of affected people, in conjunction with statutory resilience forums and partner agencies
- Participate in pre-planning and exercises for evacuating medical facilities
- Provide on-scene mapping facilities to enable risk areas to be identified and actions to be planned and documented
- Consider liaising with partner agencies who have air monitoring capabilities, public communication responsibilities and specialist knowledge on issues relating to public health

Tactical actions

Incident commanders should:

- Determine whether people should be advised to evacuate, shelter in place or 'stay put'
- Establish communication arrangements to allow information to be gathered from and passed to fire control rooms
- Identify the most appropriate evacuation plan and record rationale for decision
- Establish the availability of pre-arranged evacuation strategies and policies
- When evacuation is necessary, identify the number of people affected and develop a plan
- Consider people who need assistance to evacuate, for example, disabilities or medical needs
- Establish a safe evacuation point and consider safe egress routes and refuge points or areas
- Assess the suitability of the location for people to shelter in place
- Review the use and effectiveness of evacuation, shelter in place or 'stay put' plans throughout the incident, to ensure they remain valid
- Consider the impact of the incident on the local community and consider a shelter in place strategy
- Ascertain the likely impact of people on emergency responders
- Make contact with the relevant authorities for advice on evacuation arrangements and progress

Control measure - Use geological monitoring equipment

Control measure knowledge

There may be occasions when the unstable or collapsed structure may be affected by some form of geological movement. This is rare in the UK but similar types of ground movement within the substrata in and around the area of an unstable structure could occur.

The reasons for this movement may not be known and may not be noticeable, but the history of the initial cause of the structure's instability or collapse may indicate a need to be aware of potential ground movement. For example, in areas of known mining, the cause may be assigned to the collapse of old workings and therefore the possibility of further movement will need to be considered.

Urban search and rescue (USAR) tactical advisors will have some knowledge of the equipment available for monitoring ground movement, i.e. geological monitoring, but access to this type of highly specialist equipment will be limited. Some external specialists, such as Mines Rescue, will have access to or knowledge of geological monitoring equipment. It may be appropriate to consider using this type of equipment and service, especially in the case of protracted incidents, but it will take time to source and implement.

Strategic actions

Fire and rescue services should:

- Identify contacts who may be able to provide geological monitoring at incidents involving collapsed structures, such as urban search and rescue (USAR) tactical advisors and Mines Rescue

Tactical actions

Incident commanders should:

- Consider requesting geological monitoring equipment in consultation with urban search and rescue (USAR) tactical advisors

Control measure - Specialist advice

Control measure knowledge

As it is not possible for an incident commander to have in-depth knowledge of all types of incidents, they may need to request specialist advice from a competent person, subject matter expert (SME) or a tactical adviser (Tac Ad) to deal with an incident safely and effectively.

The extent and urgency for requesting specialist advice will be dictated by the size, complexity and type of the incident. The amount, quantity and quality of information required will depend on the incident. Fire and rescue services need to provide operational and fire control personnel with accurate and current information.

Competent person

A competent person is someone who has sufficient training and experience or knowledge and other qualities to provide advice for an incident. The level of competence required will depend on the complexity of the situation and the type of advice required.

A competent person should be able to provide accurate and relevant information in their specific area of work. They should also be able to interpret and translate such understanding into information that would be useful to support operational priorities.

Subject matter expert

A subject-matter expert (SME) is a person who is an authority in a particular area or topic. Incident commanders should ensure, so far as practicable, that the individual is an expert in the relevant field.

Subject matter adviser

Subject matter advisers (SMA) are members of the fire and rescue service who regularly work with National Resilience capabilities. The SMA will provide detailed tactical capability advice to the incident commander. They can only be mobilised by the National Resilience Fire Control (NRFC).

Tactical adviser

Incident commanders can request the attendance of tactical advisers (TacAds); they are trained and recognised specialists with specific references within local or National Resilience capabilities. They are available to provide advice and support to any incident irrespective of location. However, their usual role is within their host fire and rescue service.

A tactical adviser has in-depth knowledge from a business and organisational perspective, which can significantly enhance performance when shared with others.

Tactical advisers are currently available from the following fields:

- National Inter-agency Liaison Officer (NILO)
- Urban search and rescue (USAR)
- High volume pumps (HVP)
- Flood response
- Hazardous materials
- Chemical, Biological, Radioactive, Nuclear (explosive) (CBRN(e))
- Radiation protection
- Marine
- Wildfires
- Waste fires
- Communications
- Fire investigation

If tactical advisers are present the incident commander still has ultimate responsibility for tactics, deployment and safety. Tactical advisers should not take command of an incident; they are there to advise and assist. They should ensure they understand the aims and objectives of the incident commander, and that any advice they provide is understood and recorded if appropriate.

Further information may be found in Incident command: Knowledge, skills and competence: Organisation at an incident.

Strategic actions

Fire and rescue services should:

- Develop arrangements and protocols with identified sources of specialist advice
- Maintain the details of sources of specialist advice and know how to request their attendance
- Ensure personnel are aware of the types of specialist advice available

Tactical actions

Incident commanders should:

- Consider requesting appropriate specialist advice

- Ensure specialist advisers are fully briefed on the aims and objectives for the incident
- Check for understanding of the advice received, and record if appropriate

Control measure - Make a safe and controlled approach: Landslides

Control measure knowledge

During approach and deployment at an incident involving a landslide the effect of vibration and vehicle or personnel movement should be considered.

Landslides will usually travel in the direction of a slope but this can include lateral movement and initial movement may be slow or difficult to perceive. Approach should be from an uphill position and areas deemed as unsafe should be identified and marked. Exclusion zones should be set up and avoidance routes identified. All personnel and vehicle movement should be minimised and the effects of movement on ground conditions should be monitored.

The risk of secondary movement or further collapse should be considered. Buildings in the area affected should be assessed for the risk of collapse. Evacuation and access routes should consider the effect of secondary collapse and affected areas should be avoided where possible.

Strategic actions

Fire and rescue services should:

- Establish multi-agency working protocols for geological hazards

Tactical actions

Incident commanders should:

- Consider direction of approach in relation to the hazard area at landslides

- Consider isolating equipment and vehicles when not in use near unstable surfaces

- Consider appointing safety officers or establishing aerial monitoring of geological hazards