



National
Operational
Guidance

Hazard

Electricity: Flooding incidents



NFCC
National Fire
Chiefs Council

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Hazard - Electricity: Flooding incidents

Hazard Knowledge

Damage to electrical installations can have a significant effect on the immediate tactical options for incident commanders and can pose significant hazards to personnel and public. A property's electricity supply may be affected by flood water or an element of the electrical transmission or distribution network may be affected.

Water can conduct electricity presenting a direct hazard to personnel and the public. Damage to electrical infrastructure could leave communities without electricity and have additional consequences that will affect the public and responding agencies.

Transmission system substations or overhead lines operate at significantly higher voltages (400kV or 275kV) than local distribution networks. Emergency services should keep away from transmission and distribution system substations and downed overhead line conductors that are affected by flooding until they receive notification from the owner or operator of the transmission system. Even in flood conditions it should be assumed all high voltage equipment remains live. Water pumping should be co-ordinated and controlled by the responsible person.

In most cases the primary conductors or equipment within substations are not affected by flooding. Secondary and ancillary services, such as the protection or control systems may be affected and pose a hazard. Hidden trenches also pose a significant risk of injury to staff and the emergency services when working in flooded substations.

Most infrastructure has some dependence on electrical supply and although back-up systems may be available, this may also be affected by flood waters. For example, many hospital back-up generators are in basements that can be affected by flooding.



Control measure - Isolate and make safe electricity supplies

Control measure knowledge

Electrical isolation to small premises can be achieved by isolating electricity at the consumer unit

(or fuse board) or by removing the supplier's main fuse, found on the supply side of the meter.

Removal of this fuse could be carried out by fire and rescue service personnel in extreme circumstances. Due to the possibility of small quantities of asbestos being present in older fuses, appropriate personal protective equipment (PPE) and respiratory protective equipment (RPE) should be worn.

All commercial premises will have electricity isolation points at the electrical intake. At larger sites, there may be isolation points that control areas of the site or separate pieces of machinery or equipment.

Fire and rescue service personnel will benefit from having access to risk information about equipment and its location such as:

- Substations
- Transformers
- Switchgear
- Emergency stops
- Consumer units (fuse boards)

If fire and rescue service personnel need to deal with three-phase power supplies, they may need to request assistance from the electricity supplier, unless there are on-site engineers competent in dealing with, and controlling, this hazard.

Health and Safety Executive - electrical definitions

It is critically important that fire and rescue service personnel understand electrical terminology when discussing isolation of electricity supplies with electricity distributors or any attending electrical engineers. Failing to understand this terminology may increase the risks encountered.

The definitions in the table below provide the explanation for words and terms used in this guidance, unless otherwise stated. Note that some of these terms are definitions from the [Electricity at Work Regulations \(1989\)](#):

Charged	Means that the item has acquired a charge either because it is live or because it has become charged by other means such as by static or induction charging, or has retained or regained a charge due to capacitance effects even though it may be disconnected from the rest of the system.
Dead	Not electrically 'live' or 'charged'



Designated competent person (also known in some industries as 'authorised person' or 'senior authorised person')	A competent person appointed by the employer, preferably in writing, to undertake certain specific responsibilities and duties, which may include issuing and receiving safety documents such as permits-to-work. The person must be competent by way of training, qualifications and/or experience and knowledge of the system to be worked on.
Disconnected	Equipment (or a part of an electrical system) that is not connected to any source of electrical energy
Electrical equipment	Includes anything used, intended to be used or installed for use, to generate, provide, transmit, transform, rectify, convert, conduct, distribute, control, store, measure or use electrical energy
High voltage	Voltages greater than 1000V AC or 1500V DC. Voltages below these values are low voltage.
Isolated	Equipment (or part of an electrical system) that is disconnected and separated by a safe distance (the isolating gap) from all sources of electrical energy in such a way that the disconnection is secure, i.e. it cannot be re-energised accidentally or inadvertently
Live	Equipment that is at a voltage by being connected to a source of electricity. Live parts that are insulated and exposed so they can be touched either directly or indirectly by a conducting object are hazardous if the voltage exceeds 50V AC or 120V DC in dry conditions.
Live work	Work on or near conductors that are accessible and live or charged. Live work includes live testing, such as using a test instrument to measure voltage on a live power distribution or control system.
Low voltage	Voltages up to 1000V AC or 1500V DC. Voltages above these values are high voltage.

Note: on a nuclear site, the designated competent person would be referred to as the duly authorised person.

The Energy Networks Association has produced [Safety Information for the Fire Service](#). This contains information on emergency situations involving electricity, along with important contact numbers for electricity companies. It contains a rescue flow chart that may assist with risk assessments.

Strategic actions

Fire and rescue services should:

- Liaise with local utility and fuel supply companies and maintain up-to-date emergency contact details in their fire control rooms
- Consider adopting memoranda of understanding (MoU) with their electricity suppliers to improve joint working at emergency incidents

Tactical actions

Incident commanders should:

- If required, isolate electricity supplies to domestic and commercial premises as soon as reasonably practicable, using appropriate isolation points
- Implement appropriate procedures to prevent electrical systems being switched on inadvertently, for example, using locks, signs or supervision
- Consider seeking specialist advice or assistance where isolating supply is problematic
- Consider the consequences of isolating electricity supplies
- Request and record permission from the designated competent person (authorised person or senior authorised person) before commencing fire and rescue service activities near high-voltage equipment
- Ensure that stored charge or stored energy is discharged
- Always assume the system is live until relevant power company engineers or other competent engineers confirm otherwise, for example, through a permit-to-work certificate



Control measure - Cordon controls

Control measure knowledge

Fire and rescue services have the power to restrict the access of people to premises or a place in an emergency. Commanders must consider the safety of personnel, members of other agencies and

the public. Cordons are an effective way of controlling resources and maintaining safety.

Where practical, the police will establish and maintain cordons at appropriate distances to allow the emergency services and other responding agencies to save life, protect the public and property, and care for casualties.

In some areas the police will have agreements enabling the fire and rescue services to manage gateways into the inner cordon, establish who should be granted access and keep a record of people entering and exiting.

Personnel from other agencies may need to work within cordons that are under the safety management of the fire and rescue service. Briefing arrangements for responders from other agencies should be jointly established, preferably in advance of an incident.

Pre-planning and exercising with partner agencies should aim to establish the roles and responsibilities for implementing and maintaining cordon control for multi-agency incidents.

Further information on cordons can be found in the Cabinet Office publication, [Emergency Response and Recovery](#).

After the initial cordon has been established to secure the scene the incident is usually divided into two distinct areas:

- Inner cordon
- Outer cordon

Inner cordon

The inner cordon denotes the hazard area and controls access to the immediate scene of operations. This provides an increased measure of protection for personnel working in that area. Incident commanders should restrict access to the lowest numbers needed for safe and effective operational activity. At small incidents this could be an existing physical barrier or a safety officer briefed to restrict access.

At incidents where a higher degree of control is required, those entering the inner cordon should report to a designated scene access control point and register their arrival. This ensures that they can be safely accounted for should there be any escalation of the incident, and affords an opportunity for briefing about the hazards, control measures, emergency arrangements and other issues. Nobody should be permitted to enter the inner cordon without an appropriate level of personal protective equipment (PPE). It is necessary to ensure that those leaving the inner cordon register their departure.

Incident commanders must account for people's safety and location. If an incident is using sectors

they can delegate this responsibility to the sector commander, who should be aware of the people and personnel who are active in their sector. An inner cordon gateway control system should be established and may include:

- Means of recording all people entering and exiting the inner cordon area
- Provision of safety briefing and agreed evacuation signals
- Checklists for personal protective equipment (PPE)
- Personnel to escort non-fire and rescue responders
- Details of working locations
- Tasks of other agencies

The fire and rescue service will be responsible for safety management within the inner cordon until responsibility for the scene is transferred to another body. Overall responsibility for the health and safety of personnel working within the inner cordon remains with individual agencies. Such agencies should ensure that personnel arrive at the scene with appropriate PPE and are adequately trained and briefed for the work they are to undertake within the cordon.

Information about the control of the inner cordon is detailed in the Cabinet Office publication, [Emergency Response and Recovery](#).



Figure: Where practical the inner cordon should be identified with the use of red and white barrier tape

Outer cordon

An outer cordon may be established around the vicinity of the incident to control access to a wide area. This will allow the emergency services and other agencies to work unhindered and in privacy. Access through the outer cordon for essential non-emergency service personnel should be by way of an access control point.

This cordon limits access to an area being used by the emergency services and other relevant agencies. The police will usually control outer cordons, and may also establish traffic cordons to prevent unauthorised vehicular access. The police will identify safe routes in and out of the cordon for emergency vehicles and other agencies. Rendezvous points and marshalling areas will usually be located within the outer cordon



Hot, warm and cold zones

At certain incident types, there may be a need to divide cordons into hot, warm and cold zones. This will depend on the level of risk faced by emergency responders and the range of corresponding control measures identified and implemented. The use of these zones should be agreed by all emergency responders. As example, for a CBRN(e) incident, JESIP provides the following definitions:

- Hot zone – The area where the initial release occurs or disperses to. It will be the area which may pose an immediate threat to the health and safety of all those located within it and is the area of greatest risk.
- Warm zone – An area uncontaminated by the initial release of a substance, which becomes contaminated by the movement of people or vehicles. The warm zone will be extended to include the area of decontamination activity. These areas cannot be guaranteed as free from contamination.
- Cold zone – The uncontaminated area between the inner cordon and the outer cordon where it has been assessed that there is no immediate threat to life.

Exclusion zone

Some hazards may present such a significant danger to the safety of personnel, other agencies and the public that no control measures will adequately reduce the risk. Incident commanders should consider establishing an exclusion zone within the inner cordon to which precludes access for all personnel and responders from other agencies.



Figure: Where practical exclusion zones should be identified with the use of black and yellow barrier tape

Air exclusion zones

It is important that fire and rescue services notify air traffic control as soon as possible if there is a possibility that an incident may represent a hazard to aircraft in the area. Air traffic control can then issue warnings and instructions to aircraft in the vicinity of the fire. If required, the police can request that air traffic control create an air exclusion zone around a fire, to prevent unauthorised aircraft or drones (classified as a type of unmanned aircraft system by the Civil Aviation Authority) from flying over, or near, the incident.

Strategic actions

Fire and rescue services should:

- Provide appropriate equipment and other resources to safely implement cordon control
- Establish the roles and responsibilities for implementing and maintaining cordon control with partner agencies for multi-agency incidents
- Jointly establish the briefing arrangements for when other agencies are working within inner cordons under the safety management of the fire and rescue service
- Consider pre-planning and exercising with partner agencies for cordon control arrangements

Tactical actions

Incident commanders should:

- Ensure that appropriate inner and outer cordons are established and communicated following an assessment of risk to all people present
- Control access to the inner cordon using methods proportionate to the type, size and complexity of the incident
- Establish a scene access control point to log all people operating within the inner cordon when appropriate
- Implement exclusion zones if intolerable risks to safety are identified
- Request police assistance to establish a traffic cordon or air exclusion zone if necessary