



SHROPSHIRE

Fire and Rescue Service

Contents	Page No
PURPOSE	1
STRATEGIC AIMS AND OBJECTIVES	1
ROLES, RESPONSIBILITIES AND REVIEW	1
THE ELECTRICITY AT WORK REGULATIONS 1989- IMPLICATIONS FOR THE FIRE SERVICE	2
INCIDENTS INVOLVING APPARATUS ON THE ELECTRICAL DISTRIBUTION NETWORK	4
HAZARDS FROM OVERHEAD POWER LINES	5
TECHNICAL REFERENCES	7

**BRIGADE ORDER
OPERATIONS
11**

PART 14

**INCIDENTS
INVOLVING
ELECTRICITY
INSTALLATIONS**

BRIGADE ORDER OPERATIONS 11

INCIDENTS INVOLVING ELECTRICITY INSTALLATIONS

PURPOSE

This Brigade Order gives background information and guidance to Brigade personnel when dealing with incidents where known or suspected live electrical circuits are present. It highlights some of the risks and identifies the appropriate safe systems of work which should be used whenever dealing with incidents of this type. The Order also provides further background and technical references for the Specific Incident Procedure.

STRATEGIC AIMS AND OBJECTIVES

Strategic Aim 2 “Protect life, property and the environment from fire and other emergencies”.

Strategic Aim 3 “Secure the highest level of safety and welfare for all staff and Authority members by providing effective supervision, training, equipment and systems of work.”

ROLES, RESPONSIBILITIES AND REVIEW

The **Head of Operational Response** is responsible for ensuring this Order is implemented across the Brigade.

The **Incident Commander in charge of operations** will be responsible for the day to day operation of the Order.

The **Head of Operational Response** and the **Health and Safety Officer** will review this Order biennially in **October** and as and when organisational changes take place.

Reference	Author	Status	Date	Page
OPS11PT14	J Cameron	New	10/06	1 of 7

THE ELECTRICITY AT WORK REGULATIONS 1989 - IMPLICATIONS FOR THE FIRE SERVICE

The Regulations extend detailed statutory control over the hazards from electricity to all employment.

The Regulations apply to all uses of electricity from a battery powered torch to the national grid.

This Order does not deal with the use of electricity on Fire Service premises or where it is used in Fire Service equipment. It is confined to the problems which may be encountered by operational crews at an incident. The relevant Regulations are:

Regulation 4(3) Which requires work activities, including 'work ... near a system shall be carried out in such a manner as not to give rise, so far as is reasonably practicable, to danger'. 'Danger' is a defined term in the Regulations and means risk of 'death or personal injury from electric shock, electric burn, electrical explosion or arcing, or from fire or explosion initiated by electrical energy . . .'. This last phrase should not be interpreted as including all injuries arising during firefighting operations following the outbreak of fire or explosion from an electrical cause, but merely those cases that arise from the fire or explosion itself.

Regulation 14 Which deals with work on or near live conductors and lays down three conditions which have to be met before this is carried on.

Regulation 15 Which requires the provision of adequate working space, access and lighting to prevent danger from an electrical cause.

Regulation 16 Which requires that persons who are working in or near electrical equipment should be competent to prevent danger or injury to themselves and to others.

Regulation 4.3 and Regulation 14 raise a number of issues for the Fire Service. The first Regulation applies to all work near electrical equipment. The Regulation applies where insulated or uninsulated live equipment is affected by the media used in fire fighting. The combined effect of the Regulations is that Brigades will need to have procedures to ensure that work near an electrical system is carried out in such a manner as not to give rise, so far as is reasonably practicable, to danger. If the conductors are live, suspected to be live, or not suitably covered with insulating material, they will have to meet the three conditions laid down in Regulation 14.

These are that:

- It is unreasonable in all the circumstances for the live conductors to be dead.
- It is reasonable in all the circumstances for Fire Service operations to be carried on near it while it is live.
- That suitable precautions (including where necessary the provision of suitable protective equipment) are taken to prevent injury.

Each of these conditions must be met in all cases but needs separate consideration in this Order.

The first bullet point above may well apply in the early stages of most incidents to which the Fire Service are called. It is clearly not reasonable for the conductor to be switched off until such time as the person controlling the conductor has been contacted and taken the appropriate action. Nevertheless as the incident proceeds it may become less and less unreasonable for the line not to be made dead.

The second and third bullet points above will require Officers in Charge at incidents to judge whether it is reasonable for firefighters to approach equipment which may be live, or to apply firefighting media to equipment which may be live, or to move, touch or otherwise approach, equipment as part of operations. It will clearly be appropriate in making this judgement to take into account as part of the circumstances that the Fire Service has been called to carry out its rescue and firefighting functions. It may well be reasonable for a firefighter to approach potentially live equipment for life saving purposes, including search for possible casualties but not be reasonable to approach for the purpose of reducing property loss.

Regulation 15 requires that adequate working space, adequate means of access and adequate lighting should be provided at all electrical equipment locations at which or near which work is being done in circumstances which may give rise to danger. Officers in Charge at incidents will need to bear this Regulation in mind and Officers in general will need to consider whether sufficient and suitable lighting is carried on appliances to be adequate to prevent injury when working on or near electrical equipment, particularly when that equipment is live.

Regulation 16 requires that no person should be engaged in a work activity where technical knowledge or experience is necessary to prevent danger from an electrical cause or, where appropriate, injury from an electrical cause, unless he possesses such knowledge or experience or is under such degree of supervision as may be appropriate having regard to the nature of the work.

Officers in Charge will need to consider the extent of the training of both firefighters and their supervisors on electrical matters to ensure that these Regulations are met.

INCIDENTS INVOLVING APPARATUS ON THE ELECTRICAL DISTRIBUTION NETWORK

Extreme caution is necessary when attending a fire situation associated with electrical apparatus on the Electrical Distribution Network. Voltages on this electrical system vary from 240V up to 132,000V (132-kV) and firefighters should appreciate that considerable danger is present. Contact with a conductor or under certain conditions, proximity to electrical equipment can cause a severe shock or even death.

On arrival at incidents involving electrical apparatus connected to the power supply distribution systems, the Incident Commander should request the attendance of an engineer from the Electricity Distribution Company and ensure that crew members of responding appliances do not:

- Enter any enclosure surrounding electrical apparatus.
- Climb any steel tower, structure or poles supporting overhead lines.
- Manipulate ladders or long objects in close proximity to any electrical apparatus or overhead line.
- Spray water or foam directly on to electrical apparatus.

It is vital that all firefighters fully understand the risks and dangers of working on or near the electricity supply network! All crews must be aware that switching 'OFF' the supply to overhead lines, cables, transformers and switchgear, does not necessarily render it 'SAFE'. Where electrical apparatus on the high voltage system i.e. above 1,000V is involved, a Manweb engineer will undertake the necessary operations to allow unrestricted working at the scene of the incident. This will be achieved in two stages:

Stage One

The apparatus will be made 'dead' by switching off the normal supply. **If the engineer agrees**, it may be possible at this stage to rescue human life or take action to contain the fire provided that the electrical apparatus is not disturbed. **No other action** must be taken at this stage.

Stage Two

The apparatus will be made 'SAFE' by disconnection from the supply and connecting all high voltage conductors to earth. The engineer will then issue a Manweb safety document to another engineer or to himself and the recipient of the document will issue an 'electrical isolation of Manweb equipment card' to the Incident Commander stating that it is safe for work to proceed on the apparatus without restriction.

The operations in the above two stages must be carried out by Manweb authorised engineers only.

Reference	Author	Status	Date	Page
OPS11PT14	J Cameron	New	10/06	4 of 7

When an incident occurs in a customer's premises at the low voltage supply terminals or on any other Manweb low voltage equipment, the rescue of human life without disconnection of the supply **MUST** be at the engineer's discretion. However, no extinguishing medium should be sprayed on the apparatus until isolation has been undertaken and an isolation of equipment card issued to the Incident Commander.

If a fire occurs on domestic, commercial or industrial premises and isolation of the electrical system is required by withdrawal of the Manweb main intake fuses, usually a Manweb service electrician will attend to the incident when isolation is required by the Fire Brigade. In this case, the service electrician will demonstrate to the Incident Commander that the fuses have been withdrawn and the Brigade can proceed to tackle the fire.

Overhead lines and pole mounted electrical apparatus present more electrical hazards than cables and ground mounted apparatus and the engineer may not agree to any work being carried out until the overhead line or pole equipment has been made 'safe'. This could apply even when persons are injured and life is at risk.

Incident Commanders will not be issued with a permit to work by the engineer until till they are satisfied that it is safe for crews to approach the affected area.

Note

A Permit to Work is a system used within industry and the document or "Permit" confirms that all the safety procedures have been complied with and that the system is now safe to work on.

HAZARDS FROM OVERHEAD POWER LINES

The Fire and Rescue Service Manuals provide information relating to electricity transmission and distribution lines. In addition Section 5.1 of the Fire Service Guide Volume 3 A Guide to Operational Risk Assessment provides further information about the dangers of working close to energised power lines and the potential of coming into direct contact with live circuits. The risk assessment also outlines the matters which should be considered by the Incident Commander in the initial stages of an incident and further matters to consider as the event develops as well as guidance on the control measures to be used and safe distances at which different sizes and types of water jets may and may not be used in relation to line voltage.

The dangers of attempting rescues or the use of metal, metal reinforced equipment or ladders in the vicinity of distribution line towers or under the transmission lines are also dealt with. All of these matters relate chiefly to the dangers of firefighters or their equipment coming in direct contact with, or too close to, live circuits.

A further possible hazard to firefighters may exist when operating under, or near, high voltage overhead power lines. Such power lines are constructed to provide a minimum safe ground clearance consistent with the operating voltages but when a fire occurs under or near them and is accompanied by dense smoke, or when flames

Reference	Author	Status	Date	Page
OPS11PT14	J Cameron	New	10/06	5 of 7

rise close to the conductors, there could be danger of flashover from a conductor to earth/ground or adjacent structures, trees or Fire Service equipment. This phenomenon could occur in urban or rural areas and particularly from fires involving smoke with a large carbon content e.g. rubber tyres, certain types of plastics, forest and heath fires.

Such a flashover could result in electrocution or burns to firefighters and damage to Fire Service equipment. This is in addition to the hazard of flashover when personnel or equipment come within close proximity of overhead power lines or electrical equipment.

The flashover hazard applies particularly in the case of 400,000, 275,000 and 132,000 volts overhead power lines and it is considered that the maximum danger zone may be regarded as a corridor about 10 metres either side of any such high voltage power lines. These high voltage power lines are usually carried on metal lattice work towers about 24 - 30 metres in height and are of double circuit construction which means that one circuit consisting of three conductors, or groups of conductors, is strung on each side of the tower. 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.

In the circumstances of dense smoke, or where flames rise to the conductors, as outlined above, firefighters should avoid positioning themselves or their equipment within the 'corridor' 10 metres either side of such overhead power lines but where, in very extreme cases, it is felt justified to switch out the circuit then a request should be made to the (appropriate) Grid Control Centre giving the following information:

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

When operating a turntable ladder, hydraulic platform or stern lights, the absolute minimum distance between any such equipment and the overhead power line system should be 7 metres. Operators should bear in mind that, in high winds conditions, both the cables and Fire Service equipment will be oscillating and due allowances must be made.

Under training conditions, a minimum distance of 15 metres must be kept between the overhead power line and Fire Service equipment.

A circuit route will normally take up to 10 minutes to be switched out and the Incident Commander of the incident should wait until the Grid Control Engineer has

Reference	Author	Status	Date	Page
OPS11PT14	J Cameron	New	10/06	6 of 7

confirmed, through Fire Control, that the circuits have been taken out of service before it can be assumed safe to work under or in the near vicinity of the lines.

Transmission lines operating below 132,000 volts may be carried either on steel towers or more usually on wood poles. These lines may therefore be erected with less ground clearances than the higher voltage lines and the possibility of flashover occurring cannot be ruled out. In view of the wide range of voltages and ground clearances likely to be encountered it is not possible to estimate a general maximum danger zone though normally it could be expected to be well within the corridor advised in respect of the higher voltage lines.

Requests for switching out of circuits should only be made as a last resort when it is absolutely vital to do so. This is because such action could result in the disconnection of power to quite large areas such as a small town or a substantial part of a large city, which could be extremely dangerous affecting, for example, hospitals, kidney machines and traffic lights. It will be appreciated that the resulting dangers may well be greater than those which exist at the particular fire.

For these reasons, the decision to request the switching out of power lines should only be made by the Incident Commander of the incident who should assess:

- The degree of danger at the scene of the fire.
- The alternative solution of keeping firefighters and equipment clear of possible risk.
- The full implications of a request to switch out circuits.

Fire Control maintain up to date information regarding the name and details of the relevant supply companies servicing the county and are able to contact the Grid Control Centres and Local Electricity Boards on request from the Incident Commander at the incident ground.

TECHNICAL REFERENCES

- Fire Service Manual – Electricity.
- Rescues Near Electrical Hazards – DCOL 14/1997.
- The Electricity at Work Regulations 1989.
- Specific Incident Procedure (SIP) – Overhead Transmission Lines and Electrical Sub-Stations.

Reference	Author	Status	Date	Page
OPS11PT14	J Cameron	New	10/06	7 of 7