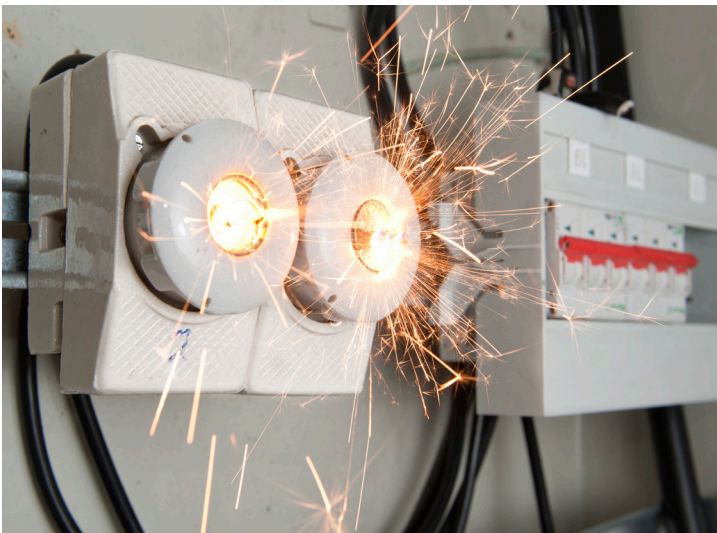


Electrical Safety

A perspective based on incidents

A Factfile provided by the Institution of **Engineering and Technology**



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Background

This paper was originally published in 2009 as a Discussion Paper. Since then IET Standards has researched and produced the Electrical Safety Management Code of Practice which is available from <http://www.theiet.org/resources/standards/esm-cop.cfm>. The code of practice is a comprehensive document for electrical safety management which enables performance assessment to be made. Notwithstanding this, this Factfile has relevance for showing the severity and seriousness of electrical safety issues based upon real data over a seven year period. It also identifies at a high level electrical safety issues to be considered within an organisation. The code of practice should be consulted for the definitive procedure to address these issues.

Introduction

Health and safety at work is as great a need today as it has ever been. We all must work hard to keep on top of the risks that can result in serious work-related incidents and deaths.

This paper describes the common types of electrical safety risks that exist today in the work place, what are the causes, suggests ways they may be mitigated, and gives evidence of the seriousness. This is based on incident occurrence data during the period January 2001 to December 2008 recorded by a Health and Safety Executive (HSE) Electrical Inspector in parts of East and South East England.

In the region there were 33 fatalities investigated (nationally electrical incidents are about 10% of all fatalities at work) and 94 major injuries in 151 serious incidents at work, during the period. This data is a sample of about a fifth of the reported incidents nationally. Analysis of the data highlights certain recurring types of incident having similar basic hazard, cause and consequence.

Electrical incident risks and consequences

Table 1 gives results from the HSE Inspector's analysis of the incidents, during the period, categorised by the equipment involved.

In considering this paper it should be remembered that risk is the likelihood that a hazard will actually cause its adverse effects, together with a measure of the effect.

Table 1

Hazard	Incident Causes and Consequences	Occurrence
Electrical Supply		
Overhead line contact	Non-compliance with safe systems of work in construction, agriculture and transport leading to shock and burns	16 incidents with 7 fatal and 5 serious injuries
Cable strike	Non-compliance with approved procedures for excavation in highways, footpaths and construction sites, leading to explosions and burns	10 incidents with 1 fatal and 6 serious injuries
Switchgear disruptive failure	High Voltage or Low Voltage insulation failure, poor maintenance and equipment mal-operation, leading to explosions, fires, burns	12 incidents with 1 fatal and 5 serious injuries
Low Voltage Fixed Installations		
LV fixed installation shock	Failure to isolate, inadvertent contact with exposed conductors and poor maintenance, leading to electric shock, burns and falls	18 incidents with 6 fatal and 10 serious injuries
Switchgear and equipment flashover	Use of non-insulated tools and non-compliance with approved procedures, including isolation, leading to explosions, fire and burns	20 incidents with 21 serious injuries
Equipment		
Equipment disruptive failure	Poor maintenance, battery failure and non-compliance with approved procedures, leading to explosions, fires, falls, serious injuries including blinding and burns	8 incidents with 1 fatal and 4 serious injuries
Machinery and control	Poor maintenance and design of safety measures, defeating of interlocks and non-compliance with procedures, leading to serious injuries	22 incidents with 9 fatal and 8 serious injuries
Equipment shock	Failure to isolate or maintain portable, transportable and permanently connected equipment and cables, leading to falls, fire, electric shock and burns	45 incidents with 8 fatal and 35 serious injuries

Fundamental causes

Investigations by the HSE Inspector show that the overwhelming majority of incidents have a pre-eminent fundamental cause related to:

- **Procedure** (55%)
- **Maintenance** (36%)
- **Design** (9%)

Procedure causes were non-compliance with, and unsuitability of, procedures and systems of work.

Maintenance causes were related to how inadequate resources and lack of competence can adversely affect performance of both the individual and equipment.

Design causes go back to poor, and unsuitable, standards of design for equipment and systems.

Responsible persons in an organisation

Health and safety at work is the responsibility of everyone within any organisation. Thus awareness of electrical risk should be raised with everyone within all organisations. The levels of responsibility and exposure to the consequences of these risks is summarised in **Table 2**.

Risk management

Each hierarchical level of responsibility has a different, but complementary, role for their contribution to mitigating these risks, and minimising the human and business costs of failure. Clarity of the challenge at each level is vital. **Table 3** outlines the means of achieving this clarity.

Managing the risks will allow people at all levels in an organisation to make their contribution to safety. They must understand the serious personal and other consequences of failure.

A 'conservative' approach to risk should be adopted through an organisational culture of challenging poor procedures and behaviours.

Table 2

Hierarchical Position	Responsibility
Worker	Self and others at risk of injury or death
Supervisor	Safety of workers and others (at risk of injury or death), and for ensuring the completion of work to prevent incidents
Technical Manager	Safety of workers and others (at risk of injury or death), and preventing professional, operational or policy failure
Executive Manager	Safety of workers and others (at risk of injury or death) and preventing organisational failure

Table 3

Task	Purpose
Analysis	Identification of aims and assessment of risks, planning and providing safe ways of working, including competent staff
Communication	Provision of information in an appropriate way, to ensure clear responsibility and organisation for the work
Influencing	Directing and resourcing the work with clear instruction and leadership, motivating to ensure good performance
Compliance	Controlling and evaluating the work to ensure the planned performance is achieved and that it effectively meets requirements

How safe is your organisation?

A practical eight step route to helping to determine, and improve, an organisation's safety is by getting **Workers**, **Supervisors** and **Managers** to consider the following.

1. Risk and Analysis

Systematically identify any circumstances where electrical hazards (examples in **Table 1**) might occur, the likelihood of an incident, and its effects i.e. assess the risks, using competent persons with suitable attitude, skills, knowledge and experience. This should be reviewed as circumstances change.

2. Standards and Systems

For identified significant risks consider whether the design, maintenance and procedures are suitable and sufficient to prevent incidents. A technical policy should ensure that safe systems of work are written and applied, using experience from the corporate memory and wider experience. Safe standards and expectations should be established.

3. Planning and Action

Plan using standards and systems. Implement action recognising significant risks and setting standards to mitigate and control those risks - see **Table 3**.

4. Roles and Responsibilities

Consider the organisation's hierarchy (see **Table 2**) and whether roles and responsibilities for the identified risks are clear so that the risks are managed - see **Table 3**.

5. Communication and Competence

Communication between all levels must be effective. There must be adequate information and instruction with all workers, supervisors and managers recognising their roles, limitations and responsibilities. This is essential for competent work.

6. Leadership and Culture

Managers and leaders should promote a strong safety culture - controlling and influencing behaviours to ensure commitment to safe processes and standards set. With the workforce empowered and encouraged to challenge unsafe procedures and practices. A good corporate culture will recognise and promote the contributions of the various levels within the organisation; in particular providing effective management, supervision and support with safety uncompromised by commercial or other workforce pressures.

7. Review and Correct

Correct any identified shortcomings in planning, records, competence, outcomes and accountability such that the risks are managed and incidents prevented.

8. Audit and Continual Improvement

Monitoring and auditing should be by competent persons capable of recognising technical deficiencies, with appropriate review and follow up to continually improve performance.

Nota Bene

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Further details and information on Health & Safety issues can be obtained from the UK Government's Health and Safety Executive: <http://www.hse.gov.uk/>.

Legal advice should be obtained on any specific issues.



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