



Code of Practice

for

Avoiding Danger from Overhead Electricity Lines



CODE OF PRACTICE FOR AVOIDING DANGER FROM OVERHEAD ELECTRICITY LINES

(FIRST EDITION – SEPTEMBER 2008)

Approved by the Health and Safety Authority



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Printed copies available from ESB Networks - email: ESBNetworks@esb.ie or phone 1850 372 757

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1.0 Introduction

1.1 Background

This Code of Practice (COP) has been prepared by ESB Networks with the assistance of the Health and Safety Authority.

The aim of this COP is to improve the level of safety of work near overhead electricity lines and, in doing so, to assist those who are involved in working in the vicinity of overhead electricity lines in avoiding the inherent dangers.

This COP does not address the safety issues arising from underground electricity cables or other underground services. A separate COP issued by the Health and Safety Authority titled “Code of Practice for Avoiding Danger from Underground Services” deals specifically with underground buried cables.

1.2 Status of the Code of Practice

This COP is the result of a joint initiative between ESB Networks and the Health and Safety Authority and has been approved by the Board of the Health and Safety Authority in accordance with Section 60(1)(b) of the Safety, Health and Welfare at Work Act 2005.

The COP is intended to provide practical guidance to Clients, Designers, Planners, Project Supervisors (Design Process and Construction Stage), Contractors, Safety Representatives and any personnel who are involved in carrying out work where they are at risk from overhead electricity lines.

A failure to observe any part of this COP will not itself render a person liable to civil or criminal proceedings. However, where the COP gives practical guidance on the observance of any of the relevant statutory provisions, compliance or non-compliance with those provisions may be admissible as evidence in criminal proceedings. The requirements of this COP are without prejudice to the general obligations placed on employers and others by the current Safety Health and Welfare at Work Act, Construction Regulations and other associated current occupational safety, health and welfare legislation.

1.3 Scope of the Code of Practice

This COP gives recommendations and practical guidance on how to carry out work safely in the vicinity of overhead lines. **The COP primarily covers construction related activities, which includes building and construction site works, road construction and resurfacing works, use of cranes, mobile elevating work platforms (MEWPs), concrete placing booms, lorry mounted cranes and other high reach plant, excavation equipment and the transporting of high loads by road.**

Work carried out in the vicinity of overhead lines includes work associated with both new and existing buildings and structures, excavation, road works, dumping of spoil, storage of materials, loading and unloading of materials etc.

The scope of this COP does not include general agricultural or forestry related activities but does include any construction activities on farms and in all other locations.

2.0 Dangers of Working Close to Overhead Electricity Lines

2.1 Dangers of Overhead Electricity Lines

People are killed and injured each year by accidental contact or near contact with overhead electricity lines. Most of these accidents occur when there is contact or near contact with overhead lines by cranes or excavators, by tipping trucks or truck mounted cranes, by mobile extendable machinery, or by metal equipment such as scaffolding, metal gutters, long metal handled concrete floats or metal ladders. Such accidents can be prevented by taking all practicable precautions to prevent accidental contact or near contact - which may cause electrical arcing from the overhead line.

Recommended methods and procedures are set out in this COP which, if adopted, will help in the elimination of these tragedies. In common with electrical utilities worldwide, ESB Networks' overhead electricity lines are generally bare conductors. In situations where one finds covered conductors, this covering is usually for mechanical protection of the overhead line and is not fully rated insulation, and must be treated with the same precautions as bare conductors.

2.2 Risk of Electricity Arcing (or jumping) from Overhead Electricity Lines

For High Voltage (HV) lines, there is a risk of electrical arcing even if a person or object does not actually come in direct contact with an exposed live part – see

Section 2.4.5 for the definition of different voltage levels. Arcing can be described as the phenomenon where electrical current jumps across an air gap and flows through the gap from the source of electrical power to another body in close proximity. The size of the gap across which electrical current can jump depends on many factors. Among the most relevant of these factors is the voltage of the source of electrical energy, the level of moisture and other impurities in the air gap and the nature of the body at the non-energised side of the gap and how well it is insulated from earth. This COP advises on the dimensions of Exclusion Zone limits for different voltages.

2.3 Range of Voltages on ESB Networks' Overhead Electricity Lines

The range of voltages of overhead electricity lines on ESB Networks Distribution and Transmission systems varies from 230 Volts to 400,000 Volts (400 kV). Contact or near contact with any of these lines including Low Voltage (LV) can be fatal. It is vital that the utmost caution be exercised when working in the vicinity of overhead electricity lines. Death is usually caused by a combination of lethal interference with the mechanism controlling muscles and heartbeat, and severe internal and external burning.



Fig 1 Path of electric current flowing to earth for a truck in contact or near contact with overhead line.

2.4 Definitions

2.4.1 Hazard Zone

The “Hazard Zone” is defined as an area in the vicinity of an overhead electricity line which must normally be isolated from the work site by the use of physical barriers, in order to minimise the risk of accidental contact or near contact with the overhead line by plant,

equipment, scaffolding or other materials while carrying out construction work – see Fig 2 below. The dimensions of the Hazard Zone are related to the voltage of the overhead line.

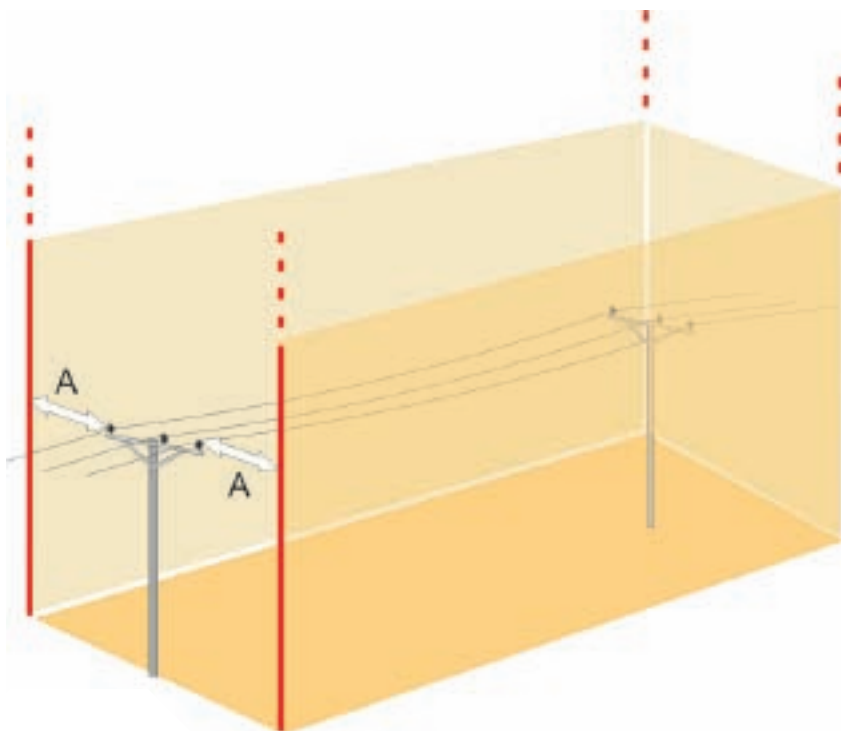


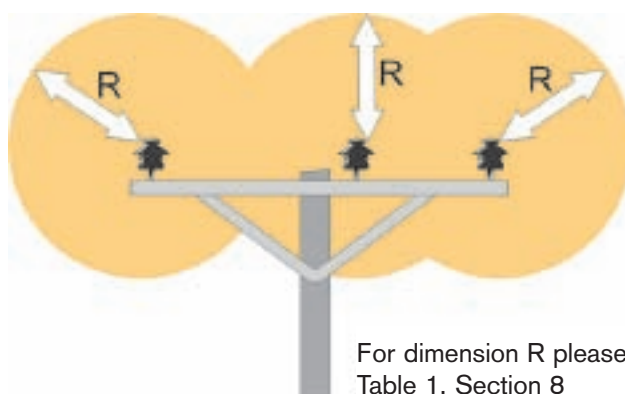
Fig 2. Hazard Zone

For dimension A please see Figs 5 and 6

2.4.2 Exclusion Zone

An “Exclusion Zone” is defined as a region around a live overhead electricity conductor which **must never be breached** in order to avoid electrical arcing or flashover. The concept of the Exclusion Zone around the 3 conducting wires of a single pole overhead line is illustrated in Fig 3.

The dimension “R” of the Exclusion Zone is related to the operating voltage of the overhead electricity line. The Exclusion Zones for Operating Plant (such as cranes, concrete placing booms, excavating equipment, mobile elevating work platforms (MEWPs), and other plant and materials) are specified in Table 1, Section 8.



For dimension R please see Table 1, Section 8

Fig 3. Exclusion Zone

2.4.3 No-Tip Zone

A “No-Tip Zone” is defined exclusively in the context of road strengthening and resurfacing works such as the Tarring and Chipping of existing roads. It is defined as the area within which no part of a “tipped truck” or other raised equipment may enter. See Figures 7, 7a and 7b for further details.

2.4.4 Crossing Point

A “Crossing Point” is a demarcated corridor crossing under an overhead electricity line with height restricted “Goalpost” type barriers and “Danger Warning Signs” at both the entry and exit positions of the crossing passageway. It is designed to limit both the location and the height of plant that can cross under the line to that of a safe height, as determined by the design of the goalposts and to alert the drivers/operators of vehicles and plant of the hazard of the overhead line before crossing under it. See Fig 6 for further details.

2.4.5 Voltage Levels

LV denotes Low Voltage which means any alternating current where the voltage is less than or equal to 1000 volts (1kV).

HV denotes High Voltage which means any alternating current where the voltage is greater than 1000 volts (1kV)

3.0 Role of the Client/Occupier

3.1 Introduction

The Safety, Health and Welfare at Work (Construction) Regulations set statutory requirements which must be observed during the initiation, planning and implementation of construction projects.

A “Client” is defined as a person or organisation on whose behalf a construction project (with the exception of a single domestic house for one’s own use) is carried out. Under the Safety, Health and Welfare at Work (Construction) Regulations, the client must appoint a Project Supervisor Design Process (PSDP) and a Project Supervisor Construction Stage (PSCS) for certain construction projects. These Project Supervisors coordinate the management of health and safety with regard to the design and construction of a project.

The Client has a legal duty to reasonably satisfy himself that the Project Supervisors he is appointing to carry out the work are competent to do so, and will dedicate sufficient resources to the project to comply with their legal safety obligations.

For example, you are a CLIENT and must perform specific duties if you:

- are a developer and are building a scheme of houses
- are a pub owner and carry out repair and maintenance work to your premises
- build a cattle shed or a milking parlour on your farm
- build a house for sale or letting or guest keeping
- extend a shop or supermarket

You are not classified as a “client” under the Construction Regulations if you commission the construction of or an extension to your domestic dwelling though in this instance, you may have duties under the legislation as an employer or as a person who has control to an extent of a workplace.

Other statutory duties affecting designers, contractors and employees apply to all projects irrespective of the purpose of the project.

It should be noted that work near High Voltage electricity lines (i.e. lines at voltages greater than 1.0

kV) is classified by the Construction Regulations as a “particular risk”. This recognises the serious safety risks from contact or near contact with any line at such a voltage. Even if the construction work involved could be classified as routine maintenance, cleaning, decoration or repair, there is still a duty to appoint a PSDP and a PSCS to coordinate the design and execution of the project where there is such a “particular risk” involved.

3.2 Information from Clients

Clients or their agents have a duty to pass on any relevant information relating to overhead lines that may be in their possession to the PSDP or the PSCS. This information should be as up to date as possible. The client should also make available a copy of any Safety File that is relevant to the construction work that is about to be undertaken.

3.3 Other duties

If the construction work is scheduled to last in excess of 30 days or 500 person days, the Client must promptly notify the Health and Safety Authority (using the AF1 form) of the appointments of the PSDP and PSCS (if the appointment of the PSCS has been effected at this stage). Promptly in this context means as soon as possible after the appointment of the PSDP and prior to or as soon as possible after the commencement of the detailed design process, and prior to the commencement of the construction work in the case of the PSCS.

With regard to matters pertaining to health and safety, the Client has a duty to cooperate with the two Project Supervisors not to jeopardise the safety and health of anyone working on site or anyone who may be affected by the construction work or the finished structure. This duty is particularly required with regard to timescales required by the Client for the completion of the project or elements of the project. Any timescales agreed upon must be achievable without compromising health and safety.

In particular, the Client may be required to fund certain works in relation to overhead electricity lines at an early stage in a project to bring about line diversions (or other engineering works required at early stages in projects) in order that risks are addressed in accordance with the “principles of prevention” as set down in the current Safety, Health and Welfare at Work Act – refer to Appendix 1 of this Code.

4.0 Role of the Project Supervisor for the Design Process and Designers

4.1 Definition of Designer

The term “design” covers the preparation of drawings, design details, specifications and bills of quantities. A “designer” is defined as any person who is involved in such work.

4.2 The Project Supervisor Design Process (PSDP)

All designers’ work should be coordinated by a Project Supervisor for the Design Process (PSDP). The PSDP has a duty to prepare and provide to the client a Preliminary Safety and Health Plan if the project is expected to last more than 30 days/500 person days, or if it contains a “particular risk”, as defined in the Safety, Health and Welfare at Work (Construction) Regulations. One such “particular risk” is working near High Voltage overhead electricity lines (i.e. lines at voltages greater than 1.0 kV).

The client then supplies the Preliminary Safety and Health Plan to any person or company tendering for or negotiating their appointment as PSCS.

The preliminary Safety and Health Plan must contain an overall description of the project, its proposed timescale, and appropriate information relating to other work on site. It must also specify any work related to the project that will involve “particular risks”.

Unforeseen circumstances may arise during the execution of the project, which may result in a design change. This may in turn have safety, health and welfare implications. The PSDP has a duty to coordinate the designers in relation to the safety, health and welfare implications of any change in the original design.

4.3 Overhead Electricity Lines as a Design Issue

If overhead electricity lines are a feature of any site where construction is planned, dealing with these is a design issue and must be coordinated initially by the PSDP.

The following is based on an example from the Health and Safety Authority Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations, to illustrate the coordination between the designers and the PSDP (and including in this case the Electricity Networks Operator) to eliminate a risk prior to commencement of construction work.

Example of PSDP coordination and cooperation:

At an early stage in the design process, a designer identified a 10 kV electricity line traversing part of a site near where a three storey apartment scheme was to be built. The foundations required piling and the roof trusses would be craned in. The area adjacent to the line was an area likely to be used for site office and welfare facilities and to site the crane during lifts. The designer informed the PSDP that there was risk of contact with the lines during placement of the site buildings and during piling and craning operations. The Electricity Networks Operator informed the PSDP that only minimum switch-outs of the line could be assured during the construction phase. The PSDP decided that the best option was to have the lines moved. The period of the contract meant that the PSCS, when appointed, might not be able to get the Electricity Networks Operator to move the lines before piling operations started on site. The PSDP requested the Electricity Networks Operator to divert the lines, giving adequate notice to ensure that the lines could be moved before site works commenced. The Electricity Networks Operator, having been given adequate notice, ensured that the lines were moved in time. The Client appointed a PSCS before the line removal commenced and the PSCS coordinated the removal with the Electricity Networks Operator and the ground-works sub-contractor.

4.4 Use of Plans and Site Visits during Design

Where possible, the relevant designer(s) should obtain up-to-date maps and records of all overhead electricity lines in order to enable the risks posed by those lines to be assessed during the early stages of the design process – see Appendix 6 for details on obtaining maps. In addition, the relevant designer(s) should also inspect the site to assess the situation in relation to overhead lines. Which design options are relevant in each case will be decided through coordination with the PSDP. If overhead lines are present on site and if these lines will have an adverse effect on safety during construction, the PSDP should ensure that contact is initiated with ESB Networks in order to formulate a strategy to prevent inadvertent contact or near contact with the overhead lines during construction.

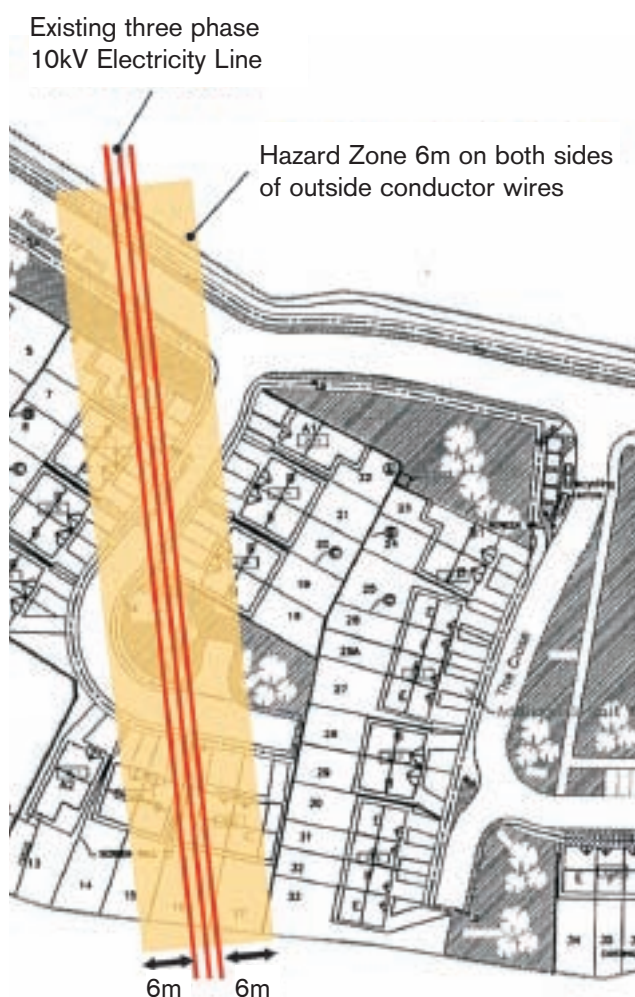


Fig 4. Overhead Line and “Hazard Zone” overlaid on a map of proposed development

This strategy might involve:

- Early diversion or under grounding of the lines – where possible
- Agreeing on power outages at critical junctures with ESB Networks – where possible
- The use of barriers, bunting, height restricting goalpost and warning signs while the lines are still in situ
- A combination of all of the above to reduce the risk to the lowest reasonably practicable level.

4.5 Temporary Works and Design

A key feature of the PSDP's responsibility is the coordination of the design of temporary works on site. In the context of overhead electricity lines, temporary works will generally consist of the erection of barriers, bunting, height restricting goalposts and warning signs where plant or vehicles may cross under lines and other structures to prevent unsafe encroachment into “Hazard Zones”. In coordinating the design of temporary works, the PSDP should ensure that relevant designers include on their drawings the routes of all overhead lines that – (a) crossover the site or (b) crossover the access routes to the site or (c) are adjacent to the site boundaries.

The voltage of the overhead lines should also be shown as well as the “Hazard Zones” where barriers should be erected and maintained to prevent unsafe access to the lines – see example in Fig 4. Drawings should also address the level of construction work, **if any**, that may be permitted in these “Hazard Zones” while the lines are still present and energised, provided the safety of site personnel, visitors and the general public is assured.

Designers should take into account any ancillary work that may be required including the construction of roadways, and the excavation work that may be required to change from overhead networks to underground cables. The potential impact of any excavations or other site works on the integrity and stability of the overhead line support structures, including stay wires, must also be taken into account. Early identification and planning are essential if hazards are to be controlled.

5.0 Role of the Project Supervisor Construction Stage, the Contractor, the Employee and Others

5.1 Project Supervisor Construction Stage (PSCS)

The role of the Project Supervisor Construction Stage (PSCS) is to manage the construction of the project from a health and safety perspective. The PSCS must also develop the Safety and Health Plan, (Construction Stage) which should outline how the management of the safety, health and welfare of on-site personnel is to be achieved. In addition, the PSCS must facilitate safe access to the site and coordinate the overall implementation of safe working procedures.

If overhead electricity lines traverse a site where construction is planned or in progress, the PSCS must ensure that this hazard is addressed both on paper and on the ground. In accordance with the “Principles of Prevention” the PSCS must aim to have the hazard removed as soon as possible where this option is feasible. In such situations, the PSCS should ensure that the construction work is sequenced so as to facilitate line removal or line diversion as early as possible in the construction process. This might involve the early installation of underground ducts, the laying of kerbs and footpaths and roadways and facilitating the positioning of items such as mini-pillars to allow ESB Networks to plan and put in place an alternative network to replace the line that is causing the hazard. Often the replacement of the overhead line will be done as part of the electrical supply to the development under construction, so sequencing of the work can be of key importance. Coordination between the contractors carrying out the civil works and ESB Networks to ensure that the level of risk is as low as reasonably practicable is primarily the responsibility of the PSCS.

If lines have not been diverted or must be retained in their existing locations then other strategies must be employed by the PSCS to minimise the danger associated with them. These strategies may include:

- Switching out and earthing the lines where this is possible
- Use of barriers, bunting, height restricting goalposts and warning signs
- In certain limited cases, the use of a dedicated observer and/or the use of electro-mechanical limiting devices which limit the height to which equipment can be raised or the extent to which it can be extended.

These strategies are covered in more detail in the following Sections of this Code of Practice.

A key issue that must be coordinated by the PSCS is the standard of maintenance of barriers, bunting, height restricting goalposts and warning signs while they remain in place and the monitoring of the site activities to ensure that restricted areas are observed. This code recommends a daily visual check and a weekly recorded check on all these protective measures to ensure that they remain in place and are in adequate condition to function effectively in their intended protective role. Appendix 2 gives a suggested format, in Form OHL1, for documenting checks on barriers, bunting, goalposts and warning signs. These checks should be organised through the PSCS and records of these checks should be maintained by the PSCS.

In setting out locations of barriers, goalposts, bunting and other preventative measures, the PSCS must, in accordance with the Construction Regulations, ensure that traffic routes and pedestrian routes are organised so that pedestrians, in particular, are not placed at undue risks by the movement of traffic around them. This is achieved by the segregation of traffic from pedestrians where feasible.

5.2 The Contractor

All contractors on site must cooperate with the PSCS to allow the PSCS comply with his statutory obligations and all contractors have a duty to cooperate with each other on issues concerning health and safety.

The contractor must also supply accurate information in a timely fashion to the PSDP to allow for the preparation of the Safety File. In the context of overhead electricity lines the relevant contractor must supply accurate “As-Built” drawings of underground cable ducts showing the location, depth and size of ducts to allow for the safe undergrounding of overhead electricity lines on site where this scenario applies.

The duty to maintain the specific aspects of the safe systems of work as outlined in the remainder of this document will generally fall on one or more of the relevant contractors who have control over the aspect of the work in question. However, the PSCS has a statutory right to issue directions.

All contractors must carry out site-specific risk assessments. They should also ensure that their employees have adequate training and that any plant or machinery is, so far as is reasonably practicable, safe and does not pose a risk to safety or health. They must put in place measures to ensure that the health and safety of personnel who are employed by them are not adversely affected by work being carried out by the contractor.

This document sets out practical measures by which the safety, health and welfare of employees and non-employees may be protected while work is being carried out in the vicinity of overhead electricity lines.

Some contractors by the nature of their work have a higher risk exposure from contact or near contact with electricity lines. These include ground workers, road workers, piling contractors, plant drivers/operators, guttering installers, scaffolders and roofers.

5.3 Employees and Others at Work

All workers on site must take reasonable care to protect their own safety and the safety of others who might be affected by their actions. They should report without delay any defects in the safety and health regime that might endanger anyone in the workplace. This might include missing signage, broken barriers or goalposts or plant and machinery coming into close proximity to overhead lines. Workers themselves must not engage in any behaviour likely to endanger health and safety on site, and must ensure that they are not under the influence of alcohol or any other intoxicant which might place them or their colleagues at risk.

An employee must also attend training and assessments as might reasonably be prescribed by their employers with regard to health and safety, and they must not misrepresent the level of training which they have attended.

In the context of overhead electricity lines, an employee must never use plant or equipment such that it enters an "Exclusion Zone". If an employee is in the vicinity of plant or equipment that has any part of it in an Exclusion Zone, they must immediately move away from any such plant or equipment. If an operator is in the cab of a machine that has touched or is close to an overhead electricity line, the operator should aim to move away without pulling the line down. If the operator cannot move away without dragging the line, then the operator should remain in the cab, warn all others on the ground to stand clear and contact ESB Networks. If there is an immediate risk from fire or other hazard, the operator should jump clear and move away taking small steps. Nobody should approach the vehicle again until the line has been confirmed safe by ESB Networks. (See Emergency Procedure set out in Appendix 5 for further details).

6.0 Role of the Electrical Networks Owner/Operator

6.1 Consultation

If construction activities are being planned for a site and there is an overhead electricity line running (a) over the site, (b) near the site boundaries or (c) over access roads to the site, it is essential that the PSDP or PSCS or Contractor or person undertaking the work consult with ESB Networks. (See Appendix 6 for contact details). This consultation should take place at the planning stage, so that the proposed work can be discussed in relation to any overhead electricity line that is on or near the proposed site. Such an approach will best ensure an adequate time span to agree and arrange for appropriate control measures to be put in place e.g. line diversion or undergrounding; line switch-out and earthing; other measures such as guarding as described in Section 7.

Copies of ESB Networks map records should also be obtained at the planning stage. (See Appendix 6 for contact details for obtaining maps)

6.2 Diversion of Overhead Lines

At an early stage in the design, the PSDP should ensure that the option of diverting any overhead lines is investigated. This process should be recorded as part of the design risk assessments. Where the diversion of an overhead line is a practical option, ESB Networks should be contacted as early as possible e.g. at the planning stage as suggested above. Time spans for the diversion of LV/10kV/20kV lines can be several months due to wayleave serving, work load, etc, and that for higher voltage lines can be as much as one year and more due to planning permission submissions, wayleave serving, workload, etc. In certain circumstances, it is impossible to design a suitable line diversion due to the lack of an alternative route. In addition, if the work in proximity to a line is of a particular nature, e.g. not involving the erection of permanent structures over ground, a line diversion may not be an appropriate or justifiable means of dealing with the problem. Generally, diversions of overhead lines at voltages of 110kV, 220kV, and 400kV are not feasible.

6.3 Switch-out of Overhead lines

If supply conditions permit the switch-out of an overhead electricity line, it becomes a matter of arrangement between the Contractor and the local ESB Networks' Office. Ample advance warning concerning any requirement of this nature is essential to allow time for changes to be made in existing feeding methods and for informing customers whose supply or quality of supply would be affected by the switch-out, etc.

In many instances, such outages can be granted only for a short period e.g. 2 to 3 hours, due to loss of supply to customers over the switch-out periods, and at times this option is not available at all because of the necessity to maintain an uninterrupted supply to particular types of customers. In general, switching out the line is not a practical solution in situations where work in proximity to overhead lines is ongoing over a period of time.

Where the switch-out of an overhead line is agreed, the contractor shall wait for confirmation by ESB Networks that the line is "switched-out and earthed" and not assume that it is "switched-out" at a pre-arranged time. The contractor shall be contactable at all time during the "switch-out" period in case ESB Networks need to switch the line back on.

6.4 Co-operation of the Electrical Networks Owner/Operator

The Electrical Networks Owner/Operator should make all reasonable efforts to facilitate Clients, Designers and Contractors in enabling them to manage the safety risks arising from work activities close to overhead electricity lines.

6.4.1 Provision of Map Records

The timely provision of available map records by ESB Networks to parties who are planning construction works in the vicinity of electricity networks is an important service. These maps may be used in conjunction with site visits and other information to verify the location of overhead lines and to determine the voltages of overhead lines.

ESB map records covering all voltage levels are issued from a central location. Maps may be requested by letter, fax or email – see Appendix 6 for contact details.

Map requests should include the following information

- (i) A site map/area map with geographic reference
- (ii) A return postal address
- (iii) A relevant telephone contact number

Map records will be delivered by post within 10 days of receipt of request. In emergency cases, maps can be collected by special arrangement by calling 01 7026558 or 01 7026185.

Parties who have a frequent need for electricity map records, and who are licensed holders of electronic Ordnance Survey map data can register with ESB Networks for access to an electronic version of the electricity networks map records.

6.4.2 Alterations and Diversions to Overhead Electricity Lines

Requests for alterations and diversions to existing overhead electricity lines should be submitted in writing together with a copy of a site plan showing any proposed developments to the relevant local ESB Networks office or by email to esbnetworks@esb.ie. Address details for the local ESB Networks offices can be obtained from ESB Networks web site (www.esb.ie/esbnetworks) or by calling 1850 372 757.

6.4.3 General Information Requests

General information requests, including requests for advice and assistance in dealing with overhead electricity line conflicts, should be addressed to the local ESB Networks office (see 6.4.2 above) or sent by email to esbnetworks@esb.ie. Requests can also be made by telephone to ESB Networks at 1850 372 757. These requests will be forwarded via ESB Networks internal calls referral system to the relevant local contact person who will respond to your call.

6.4.4 Emergency Response

ESB Networks provides a 24 hour emergency response for emergencies which include contact with or damage to overhead electricity lines, underground cables or other plant. **The emergency contact number is 1850 372 999.**

7.0 Construction Sites where an Overhead Electricity Line presents a Hazard

Where switching out or diverting the overhead electricity line is not practicable or where initial site works must be carried out before the line can be diverted or undergrounded, then other protective measures must be put in place to prevent accidents when working in the vicinity of live overhead electricity lines. The precautions required will depend on the nature of the work and the voltage of the overhead lines.

There are three broad categories of work on such construction sites:

- (a) **Sites where there will be no work or passage of plant under or in the Hazard Zone of a live overhead line.** Here suitable barriers, bunting and warning signs are required to prevent inadvertent breach of the Hazard Zone. (See Section 2.4.1 for the definition of the Hazard Zone and Figures 5 and 6 for the dimensions of the Hazard Zone for different voltages of overhead line).
- (b) **Sites where plant will pass under a live overhead line.** Here, defined "Crossing Points" must be established under the line in addition to the provision of barriers, bunting and warning signs. Where more than one Crossing Point exists, each Crossing Point shall be identified by a unique identification number for maintenance purposes.
- (c) **Sites where work will be carried out in the Hazard Zone of a live overhead line.** Here further precautions must be taken in addition to the provision of barriers, bunting, warning signs and Crossing Points where relevant.

7.1 Sites where there will be no work or passage of plant under or in the Hazard Zone of a Live Overhead Line

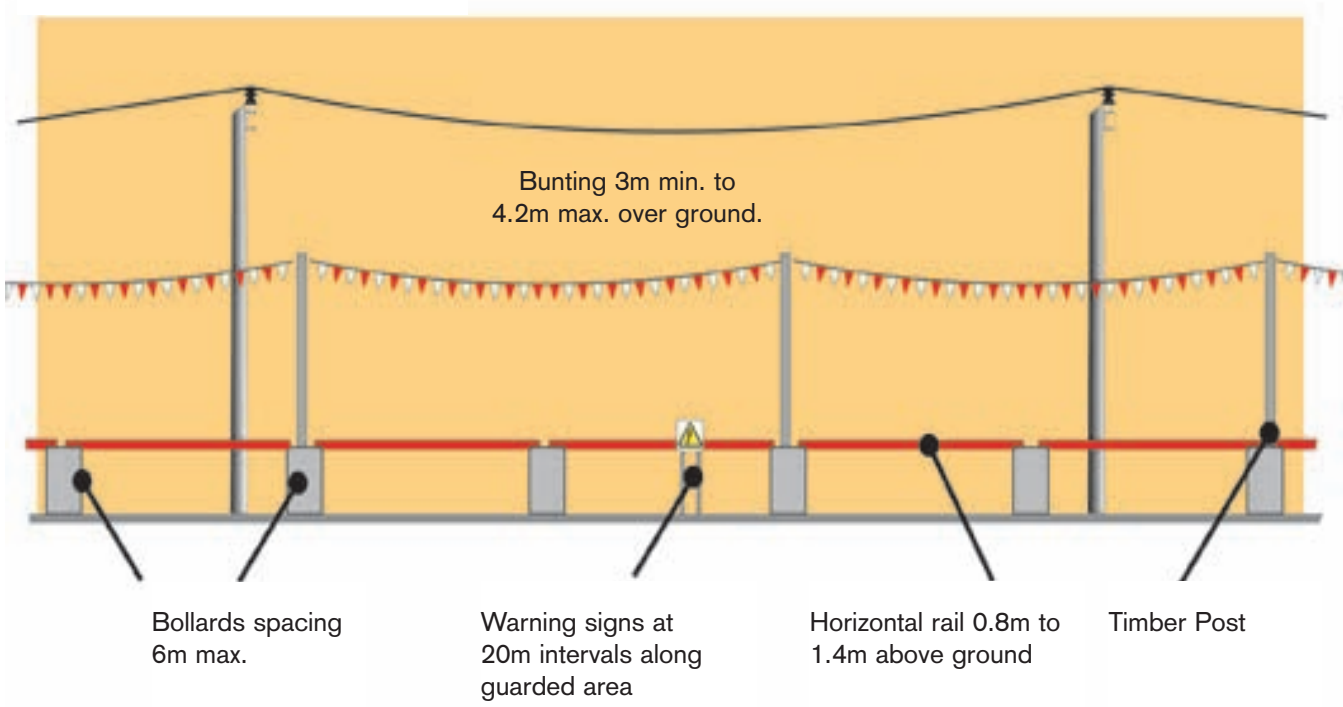
On sites where machinery or plant may accidentally enter the "Hazard Zone" of a live overhead electricity line, the Contractor must erect a barrier on the work side at an appropriate distance from the line – see Fig 5. The barrier should run parallel to the overhead line at a minimum horizontal distance of 6 metres on plan from the **nearest conductor** for LV, 10kV, 20kV and 38kV overhead electricity lines. This distance should be increased to a minimum of 10 metres for overhead lines at voltages of 110kV, 220kV and 400kV. **The distance must be measured from the nearest conductor to the barrier and not from the centre of the pole or mast, or middle conductor.**

The voltage of the overhead line may be determined by consulting ESB Networks or by referring to the relevant map records available from ESB Networks (see Appendix 6 for contact details). The distances specified above may be increased depending on the nature, frequency and duration of the work. The barrier should consist of a solid non-conducting high visibility material. The barrier should be supplemented by standard electricity hazard Warning Signs which should be spaced at intervals of not more than 20 metres apart along the route.

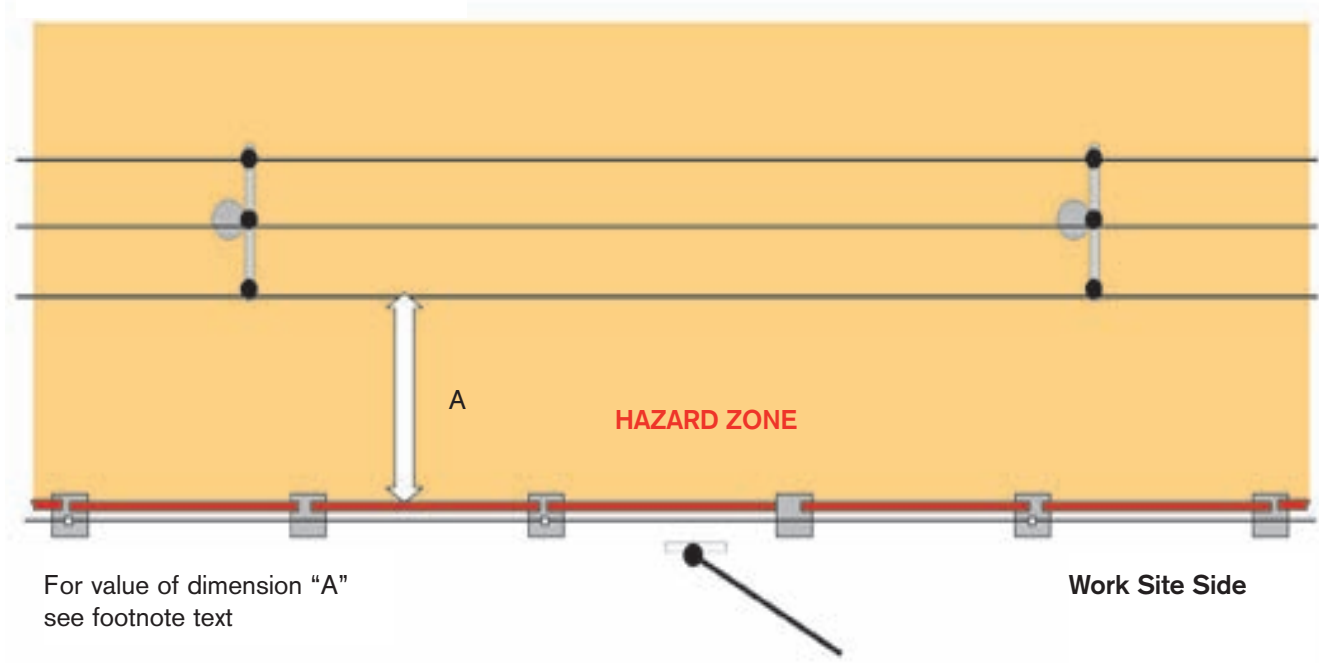
Materials being used, moved or handled outside the barriers (i.e. outside the Hazard Zone) must not inadvertently breach the Hazard Zone e.g. erecting guttering or handling roofing timbers or other materials. All scaffolding must be erected outside the "Hazard Zone".

If machinery, ladders, scaffolding or other equipment are being used outside the Hazard Zone and this equipment could, in falling or other action, inadvertently breach the relevant Exclusion Zone for the particular overhead line voltage involved (see Section 2.4.2 and Table 1, Section 8), then a task specific Risk Assessment and Work Method Statement should outline the control measures to be used to eliminate this risk. This Risk Assessment and Method Statement should be available on site at all stages during construction.

Elevation



Plan



For value of dimension "A" see footnote text

Dimension A = 6m minimum for LV, 10kV, 20kV, 38kV

Dimension B = 10m minimum for 110kV, 220kV, 400kV

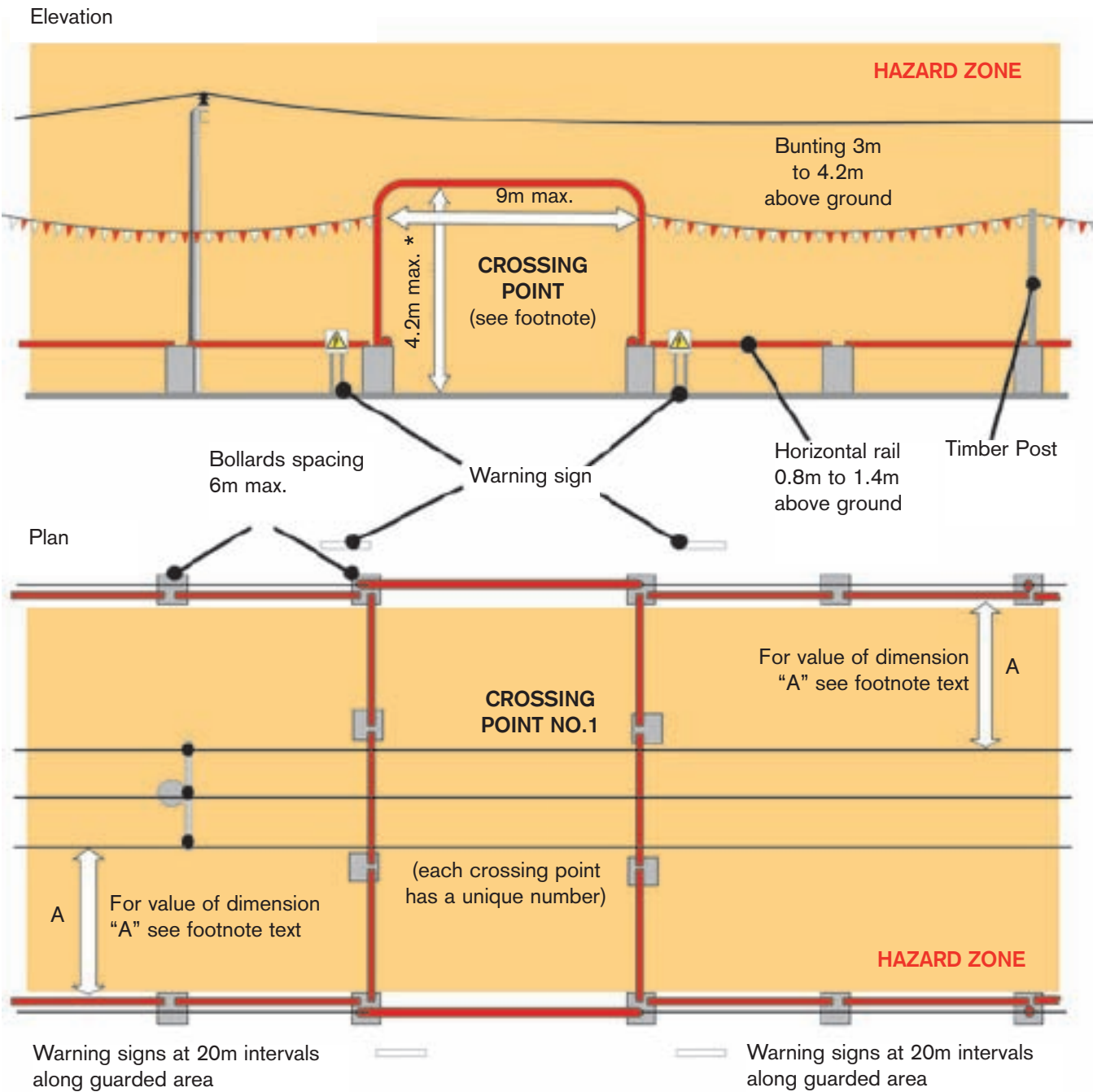
Fig 5. Site where Plant will not pass under power lines

7.2 Sites where plant will pass under a Live Overhead Line

Where movement of plant is necessary under a live overhead electricity line, the Contractor should erect height restricting goalposts made from rigid non-conducting high visibility material at the entrance to the Crossing Point on each side of the line – see Fig 6. The goalposts should be erected outside the Hazard Zone and in line with the protection barriers. The maximum height of the crossbar **must not exceed 4.2 metres** measured relative to the original site ground level, except where a greater height has been specifically approved by ESB Networks for the particular crossing location – see foot note on Fig 6. The width of the Crossing corridor should be as narrow as possible and should not exceed 9 metres. Suitable rigid barriers (0.8 to 1.4 metres in height) should be placed on both sides of the Crossing Point corridor to prevent deviation from the corridor. Bunting must not be erected along the sides of the passageway as this may compromise safety clearances where it crosses under the line. Two Warning Signs should be placed near the goalposts at each entrance to the Crossing Point and at spacings of not more than 20 metres along the route of the barriers.

It should be noted that the clearances of overhead electricity lines can vary from time to time based on changing conditions related to several factors. These include external physical loading conditions such as wind loading, ice/snow loading or changes in ambient temperature. Variations in the amount of electrical current flowing in the line at any time will cause variations in the temperature of the line conductors, which in turn will cause variations in the line sags and ground clearances. Other factors such as damaged poles, staywires, crossarms etc. and any changes in ground levels close to the line will also affect clearances. When planning for the carrying out of work in the vicinity of overhead electricity lines, any concerns arising with regard to the condition of the line, changes in ground levels, reduced clearances etc. should be referred to ESB Networks.

Where practical, the Crossing Point locations should be selected to be closer to the supporting poles/towers than to the middle of the overhead line span as this will give greater clearances at the Crossing Points and reduce the variations in clearances that will arise from changes in loading conditions etc.



Dimension A = 6m minimum for LV, 10kV, 20kV, 38kV

Dimension A = 10m minimum for 110kV, 220kV, 400kV

Fig 6. Site where Plant will pass under power lines

* At the crossing portal, maximum height of crossbar must not exceed 4.2m except where it has been specifically approved by ESB Networks for that particular crossing location. This height must be measured relative to the original site ground levels.

7.3 Sites where work will be carried out in the Hazard Zone of a Live Overhead Electricity Line

Work in the Hazard Zone of live overhead electricity lines including the use of specified equipment may be allowed **in certain very limited circumstances**. In such situations the voltage of the overhead line must be verified as this is necessary to determine the Exclusion Zone for the particular voltage of line involved. (See Section 2.4.2 for the definition of the Exclusion Zone and Table 1, Section 8 for the specified dimensions for different voltage lines). The voltage of the overhead line may be determined by consulting ESB Networks or by referring to the relevant map records available from ESB Networks (see Appendix 6 for contact details).

The work that may be carried out can be categorised as follows:

- (a) Work not requiring prior consultation with ESB Networks (other than line voltage verification).
- (b) Work that can only be carried out following consultation with ESB Networks.

Work involving the digging and pouring of foundations for buildings within the Hazard Zone of live overhead lines which are intended to be diverted or under-grounded must not be commenced until the lines are removed. This work is specifically excluded from the classification of work permitted under (a) and (b) above.

7.3.1 Work not requiring prior consultation with ESB Networks

Work may be carried out in the Hazard Zone if the work does not involve the use of plant, equipment or activities which could cause the Exclusion Zone for the relevant voltage to be breached.

Depending on the equipment and the height of the line, this might include the use of:

- A bulldozer
- Small front tipping dumpers
- Mini diggers

Prior to deciding what work can be carried out in these circumstances, the Contractor must ensure that a site specific written Risk Assessment and Work Method Statement has been carried out covering issues such as:

- Height of the line (taking into account possible sag)
- Maximum potential height that can be reached by the equipment (ignoring any mechanical, electronic or electromechanical height limiters that may be fitted to the equipment)
- Possible impact of changing ground levels within the Hazard Zone on the height of the line
- Possible impact on line support structures such as poles, towers, stay wires etc.

The Contractor must plan the work such that it will not impinge on the structural integrity of the poles or towers supporting the electricity lines. In order to access the "Hazard Zone", for this specific work, the barriers delineating this zone may have to be temporarily removed. These barriers however, must be re-erected as soon as possible to prevent other vehicles or plant accessing the Hazard Zone.

The safe management of the work is the responsibility of the Contractor. If in doubt, however, consult ESB Networks for advice.

7.3.2 Work requiring prior consultation with ESB Networks

Work involving plant, equipment or activities which could lead to the inadvertent breaching of the Exclusion Zone for the relevant voltage may only be carried out in **extremely limited circumstances** and must involve a high degree of safety management of the activity to ensure that the Exclusion Zone will not be breached. ESB Networks must be consulted, with a view to switching out the line while work in the Hazard Zone is progressing. However, this might not always be feasible due to electricity demand.

Work of this nature should be confined to:

- (a) The installation of ducts to facilitate the under-grounding of the overhead electricity line or the installation of other underground services.
- (b) Work which has been agreed with ESB Networks and which arises in the event that the line is not to be diverted or under-grounded during the construction process.

Where it is not practicable to switch-out and earth the line, the following are the minimum precautions that must be adhered to while working in the Hazard Zone:

- A written Risk Assessment and Work Method Statement must be prepared in consultation with the persons about to undertake the work. See 7.3.1 for some of the factors to be considered.
- A daily Permit to Work system must be initiated by the contractor and be operational.
- The work equipment, such as excavators, must be operated with certified mechanical, electronic or electromechanical limiters to prevent any part of the equipment breaching the relevant Exclusion Zone. The limits to which the equipment can operate must be clarified in the Risk Assessment taking into account features such as line sag and changing ground levels. On site, these limits should be set and fixed by a competent person and verified by testing. Unauthorised tampering with the limits must be prevented by the use of appropriate management systems.
- A dedicated observer must be in place for each item of plant and equipment. The dedicated observer must be in communication with the machine operator at all times and must not undertake any other work activity while work in the Hazard Zone is in progress.

7.4 Special Arrangements that may be feasible for some Low Voltage Overhead Lines

In the particular case of LV overhead lines, especially in urban environments, it may be feasible for ESB Networks to replace bare open wire conductors with insulated aerial bundled conductors or to temporarily insulate the conductors by applying approved temporary shrouding and other protection to the conductors to facilitate certain work activities within the Hazard Zone of such lines. In such situations it is necessary to consult with ESB Networks to agree site specific arrangements and control measures for each individual conflict.

In situations where LV overhead line conductors have been temporarily shrouded or appear to be insulated, this does not mean that they are safe to touch. The effectiveness of the shrouding or insulation will depend on conditions such as the prevailing weather conditions.

Where insulation or shrouding has been provided by ESB Networks as a means of temporarily reducing the risk of inadvertent contact by a third party working near a live LV overhead line, such third party should ensure that if the protection is damaged or dislodged that all work within 3 metres of the damaged area is stopped and that ESB Networks is notified immediately.

All control measures specified by ESB Networks should be implemented and all relevant employees and subcontractors should be aware of the safety requirements.

7.5 Maintenance of barriers and warning notices

In all cases where overhead electricity lines are on site or in the vicinity of where work is proceeding, the PSCS must ensure that a care and maintenance system is in place in order to ensure that barriers, bunting, warning signs, goalposts etc. remain effective for the duration of the work. A system of daily visual checks and weekly recorded checks must be put in place. A follow-up process must be put in place to ensure that defects in the integrity of barriers, bunting, warning signs, goalposts etc. are notified to the responsible person and corrected without delay. Regular site safety audits should include checks on barriers, signage etc. as well as the behaviour of site personnel and their use of plant in close proximity to overhead lines. See Appendix 2 for sample checklist (Form OHL1).

8.0 Operating Cranes and Similar High Reach Plant near Overhead Electricity Lines

8.1 Introduction

The use of cranes and similar operating high reach plant near overhead electricity lines presents a range of hazards and risks that require careful management in order that the work may proceed in a safe manner. The normal hazards associated with lifting heavy and awkward loads are exacerbated when working near live overhead lines, and there have been many fatalities over recent years involving cranes and similar high reach plant.

Where cranes and similar high reach plant are to be used in the vicinity of Overhead Electricity Lines the following steps are essential:

The operation must be:

- (a) Properly planned by a competent person
- (b) Appropriately supervised by a competent person
- (c) Carried out in a safe manner

8.2 Scope

This section is specially developed for persons operating high reach plant such as:

- cranes
- concrete placing booms
- mobile elevating work platforms (MEWPs)
- other high reach plant such as lorry mounted cranes

8.3 Planning Requirements

8.3.1 All Overhead Electricity Lines in the vicinity of a proposed work location should be identified in advance of taking any crane or high reach plant including an MEWP on to a workplace. The voltages of any such overhead lines should be established either by consulting ESB Networks or by referring to the relevant map records available from ESB Networks (see Appendix 6 for contact details). Overhead Electricity Lines must always be treated as live unless otherwise confirmed as being “switched out and earthed” by ESB Networks.

8.3.2 When selecting the position for the set-up of cranes or high reach plant it is most desirable that the plant is positioned so that it is further than its maximum falling distance from the nearest point of the Hazard Zone for the particular voltage of Overhead Electricity Line involved. See Section 2.4 for definition of the Hazard Zone and Figures. 5 and 6 in Section 7 for Hazard Zone dimensions.

8.3.3 Where it is not possible to achieve the clearances recommended under 8.3.2 then every effort should be made at both the planning and set-up stages, to locate the crane or high reach plant so that it is positioned in a location where no part of it or any load being lifted has the potential to breach or move into the Hazard Zone for the particular voltage of Overhead Electricity Line involved. This should apply both while setting up and during operation.

8.3.4 In situations where it is not possible to achieve the requirements specified in 8.3.3 it may be permissible to set-up and operate the crane or high reach plant closer to the Overhead Electricity Line **in certain very limited circumstances** (e.g. where it is not feasible to “switch-out” the line and where alternative options are not practicable). Any such closer set-up (i.e. where the Hazard Zone may be breached) must however incorporate a higher degree of safety management. The “Special Precautions” outlined in Section 8.7 must be implemented in these situations and there must also be prior consultation with ESB Networks. However, the critical safety requirements on Exclusion Zones as set out in 8.4 must always be observed. See Section 2.4 for the definition of the Exclusion Zone.

TABLE 1 - EXCLUSION ZONES IN METRES FOR OPERATING PLANT NEAR OVERHEAD ELECTRICITY LINES

| Nominal Phase to Phase Voltage of Overhead Line | Exclusion Zone (metres) |
|---|-------------------------|
| Insulated LV conductors in consultation with ESB Networks <i>(Insulation to be verified in all cases by ESB Networks prior to the commencement of the work)</i> | 1.0 |
| Bare LV and bare and covered 10kV, 20kV & 38kV | 3.0 |
| 110kV | 4.5 |
| 220kV | 6.0 |
| 400 kV | 8.0 |

8.4 Critical Safety Requirements on Exclusion Zones for Overhead Electricity Lines

A person must not operate any crane or any other plant or equipment in a way that any of the following comes within or breaches the Exclusion Zone(s) as specified in Table 1 above:

- any part of the crane or plant
- the load being moved
- a person operating or working in a mobile elevating work platform (MEWP)
- any hand tools or other equipment held by any person involved with the operation.

8.5 Risk Assessment at a Work Site with Overhead Electricity Lines

In situations where a hazard involving Overhead Electricity Lines has been identified, the contractor must ensure that a site specific written Risk Assessment and Work Method Statement is prepared to determine the risk of breaching the Exclusion Zone and the control measures necessary to manage that risk.

In assessing the risk, the following factors should be considered (this is not an exhaustive list):

- The type of crane or other high reach plant that it is intended to use. Different plant types have different operating characteristics that dictate varying requirements for safe operating distances from Overhead Electricity Lines.
- The type and voltage rating of the Overhead Electricity Line.
- The weight, size and shape of the load, particularly the surface area facing the wind and the likely effect of the wind in causing the load to move towards the Overhead Line.
- The length of the Overhead Line span and the distance of the plant from the Overhead Line support structures. Wind can cause the line conductors to swing laterally and reduce the clearances. This can be quite significant and will be greatest on long spans and at centre span positions.
- The nature of the load and how the load is secured and whether any part of the load may inadvertently move during the operation and breach the Exclusion Zone.
- Unexpected movement of the terrain, ground or surface upon which the crane or plant is located, possibly resulting in a corresponding surge or sudden movement towards the Overhead Electricity Lines.
- Functional behaviors of the plant or load that could result in inadvertent breaching of the Exclusion Zone.
- Whether, in exceptional circumstances, the load may need to be carried above the Overhead Electricity Lines and may accidentally fall onto the line.
- Possibility of crane or plant becoming live through voltage induced by adjacent Electricity Lines.
- Visibility and general lighting conditions and weather conditions that may pertain when crane or plant is being operated.

8.6 Control Measures

Appropriate control measures to manage the risks associated with operating cranes or other high reach plant in the vicinity of overhead lines must be set out in the Risk Assessment and Work Method Statement. Copies of these must be available and briefed to the plant operator, and the plant operator must be familiar with the risks and controls set out in them before operating the relevant plant.

In implementing control measures, it will be necessary to take special precautions when it is not possible or practicable to totally prevent exposure to the hazard of live overhead electricity lines. See Section 8.7.

8.7 Special Precautions to be taken where the Hazard Zone may be breached.

In certain very limited circumstances where it may be necessary to set-up and operate a crane or other high reach plant in a position where the Hazard Zone of an Overhead Electricity Line may be breached by the plant or load or any person on an MEWP (e.g. lifting a load over a line), and where it is not feasible to “switch-out and earth” the line for the duration of the operation, then the following special precautions must be implemented:

- A written Risk Assessment and Work Method Statement must be prepared to ensure that the Exclusion Zone for the overhead line is not breached.
- A daily Permit to Work System must be initiated by the Contractor and be operational on site.
- A dedicated observer must be in place for each item of plant – see 8.7.1.
- Where possible appropriate warning and/or limiting devices to warn the operator and to prevent any part of the crane or plant from entering the Exclusion Zone must be used.
- Personnel in contact with the crane, plant or load must be limited and controlled as set out in 8.7.2.

It should be noted that even though the operating plant might be operating in a location where it could potentially slew into the Exclusion Zone, any encroachment into the Exclusion Zone is still strictly forbidden.

8.7.1 Use of Dedicated Observer

The following special provisions shall apply where a dedicated observer is required:

- (a) The operator’s employer or self-employed operator is responsible for appointing a dedicated observer.
- (b) The operator shall not operate a crane or plant without the dedicated observer in situations where a dedicated observer is required.
- (c) The dedicated observer shall:
 - Warn the operator if any part of the crane or plant or load is about to enter the Exclusion Zone. Encroachment into the Exclusion Zone is strictly forbidden.
 - Be appropriately trained to perform the role.
 - Be able to communicate effectively with the operator of the crane or plant at all times. Specialist equipment may be necessary where there is a barrier to communication.
 - Be satisfied that there is adequate visibility or adequate lighting provided to perform his/her role.
 - Be fully aware of the extremities of the Exclusion Zone and have an appropriate means of preventing encroachment e.g. by placing appropriate markers such as red and white bunting or red tapes in a safe position which can be easily viewed by the dedicated observer and the crane operator.
 - Not be required to carry out any other duty at the time.
 - Not be required to observe more than one crane or item of high reach plant at a time.
 - Not be located on the work basket of a MEWP that he is controlling.

8.7.2 Personnel in contact with the Crane, Load or Plant

With the exception of persons directly involved in the work being carried out, all other personnel on site must keep clear of Cranes, Loads and Plant being moved.

Only the following persons shall be allowed to touch any part of the crane, plant or load being moved:

- (a) The operator in the following situations
- While remaining in the cabin instead of standing on the ground beside the plant.
 - Using radio operated remote control and standing well clear of the plant. **(Remote control using directly connected control leads must not be used in these situations).**
- (b) Appropriately trained personnel who are essential to the particular operation of the crane or plant e.g. crane Slinger/Signaller or other worker helping to set up the crane or plant, provided these persons are not required to have direct or continuous contact with any part of the crane, plant or load – personnel using guide ropes are in direct/continuous contact.

Where contact has to be made with any part of the crane, plant or load such personnel should verify that all parts of the crane, plant and load and the slinging gear are outside the Exclusion Zone and;

- (i) Such contact should be via a non-conductive object e.g. an appropriately insulated* pole or guide rope used to control load movement.
- (ii) Insulated* crane hooks should be used where practicable.
- (iii) Effectively maintained insulating gloves* should be worn (where the voltage of any of the overhead electric lines does not exceed 1000 volts).

* Insulation must at least be effective against the maximum voltage of the particular overhead electric line. The employer or self-employed person operating the crane is responsible for ensuring the effectiveness of the insulation in accordance with relevant international standards.

8.8 General Good Practice Guidelines

- Always assume that overhead electricity lines are “live” unless it has been verified by ESB Networks that they have been “switched-out and earthed”.
- Operate cranes and other high reach plant at a slower than normal rate when in the vicinity of overhead electricity lines.
- Exercise caution when traveling over uneven ground that could cause a crane or other high reach plant to weave or jolt close to overhead electricity lines.
- Keep all personnel well away from a crane or other high reach plant whenever close to overhead electricity lines.
- Exercise caution near long spans of overhead electricity lines since wind can cause significant sway in the conductors and reduce the clearance between the plant and the line.
- All long objects should be carried horizontally below shoulder level in the vicinity of overhead lines.
- Know what emergency procedures to follow in the event of contact with a live overhead electricity line - see Appendix 5.

9.0 Road Strengthening and Resurfacing Works

9.1 Introduction

This Section refers to road strengthening and resurfacing works only and does not cover new road construction activity.

Every year several thousands of kilometres of road requires maintenance in the form of resurfacing. A common hazard on such roadways is live overhead electricity lines which very often cross roadways at varying angles and sometimes can run close to and/or parallel to roadways for sections of the road. This Section outlines a Safe System of Work which can be used in most situations where road strengthening and resurfacing works are being carried out. In situations where it may not be practicable to use the system described then an alternative Safe System should be used. A written Risk Assessment and Work Method Statement should be prepared and controls put in place to prevent contact or near contact with live overhead electricity lines.

In certain limited situations it may be necessary to have an electricity line “switched-out and earthed” before proceeding with the work.

9.2 Procedure for Strengthening and Resurfacing on Roads with Overhead Electricity Lines Crossing

At a minimum, the safety controls must include:

1. Preliminary survey to identify all overhead electricity lines and the extent of the “No-Tip Zones”.
2. The appointing of a competent person to control the work in the vicinity of all overhead electricity line crossing/conflict locations. This person must be in direct communication with the operators of Tipper Trucks, Pavers, Chipping Spreaders etc. whilst working in the vicinity of and passing through the “No-Tip Zone” at each conflict with an overhead line.
3. The Skip on the Tipper Truck must be fully lowered whilst any part of the truck is in the “No-Tip Zone”.
4. The “No-Tip Zone” must include all areas that are within a minimum **horizontal** distance of 3 metres (as measured in plan view) from the nearest live overhead electricity line conductor on lines that cross roadways. (Refer to Figures 7, 7a and 7b for the setting out of the “No-Tip-Zones” for different angles of crossing).

Pre Patrol

1. Conduct Preliminary Site Survey before work is scheduled to commence.
2. Identify and assign a unique Identification Number to each overhead line crossing/conflict location.
3. Mark the extremities of “No-Tip Zone” on the road with indelible paint for each overhead line crossing location together with its unique Identity Number.

Site Activity

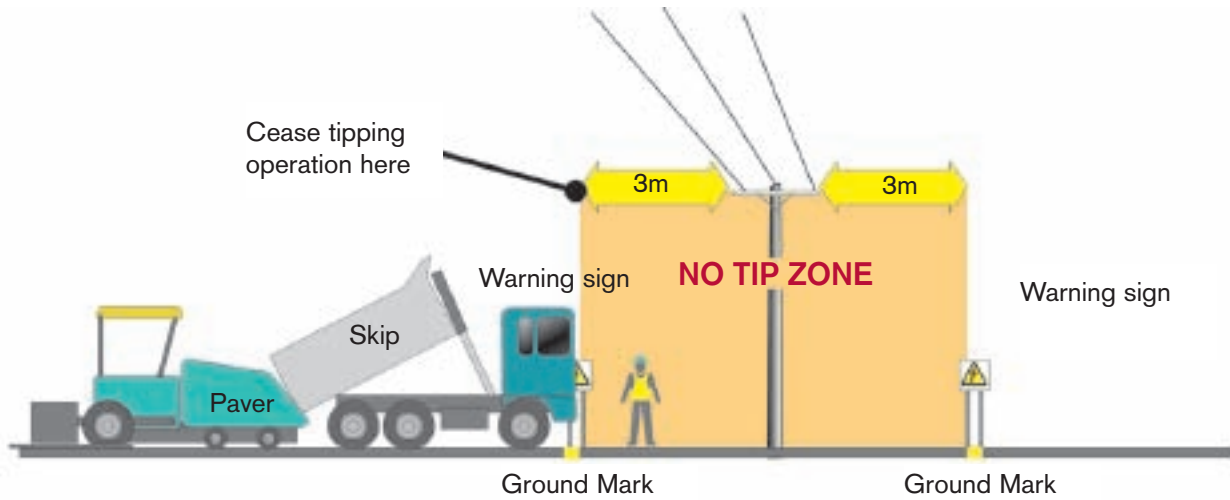
1. On day of the Works, verify the existing site situation with the Preliminary Survey – including the marking as per item 3 of Pre Patrol above.
2. An on site Electrical Hazard Risk Assessment (EHRA) should be completed for each overhead electricity line crossing/conflict situation on a daily basis. See Appendix 3 for EHRA Template.
3. The dedicated control person must ensure that the safety measures are implemented.
4. Warning Signs should be placed at both the Entry and Exit of the “No-Tip Zone”. See figures 7, 7a and 7b for determining the minimum extent of the “No-Tip-Zone”.
5. The Skip of the Tipper Truck should be lowered when front of truck cab reaches the marked commencement of the “No-Tip Zone”.
6. The Tipper Truck should then proceed forward until the rear of Truck is sufficiently past the marked exit extremity of the “No-Tip Zone” so that no part of the truck Skip when tipped comes within the “No-Tip Zone”.
7. Any further filling of material into the paver should now be carried out by the paver moving forward past the marked exit from the “No-Tip Zone” and receiving material from the Tipper Truck at this point or by other safe means e.g. by use of low level front tipping dumper.
8. The Tipper Truck should **not** reverse back into the “No-Tip Zone” with the Tipper Skip raised.
9. Regular on-site safety audits should be carried out to ensure compliance with the above control measures (See Appendix 4 for Safety Audit Form Template).

Steps 5, 6 and 7 (as well as Figures 7, 7a and 7b) describe the process when using a paver to lay asphalt/macadam. Similar steps apply when using a “chipping spreader” to lay chippings on sprayed tar except that the truck will be towed backwards through the “No-Tip Zone” by the spreader in this case.

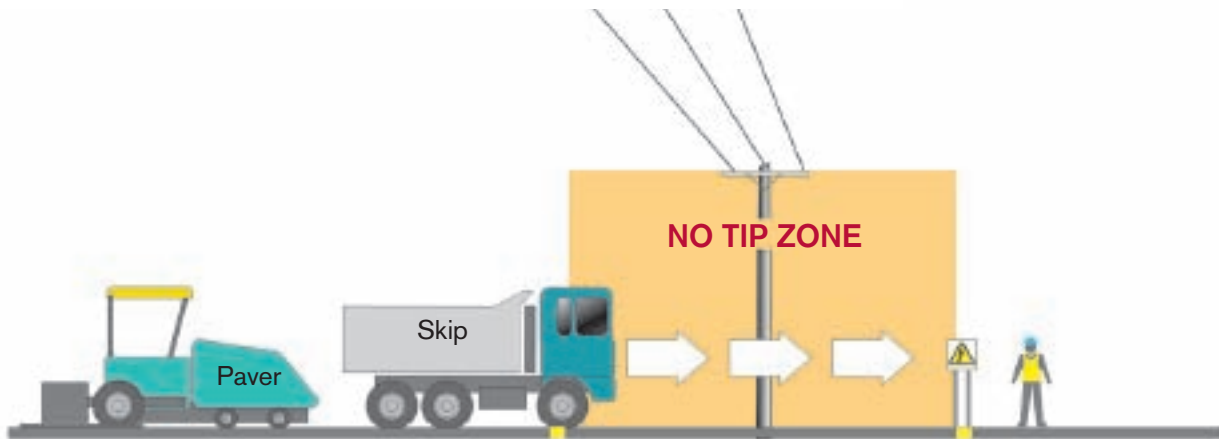
Where a Planer or other elevated equipment is being used as part of the operation of Road Strengthening or Resurfacing, a similar procedure to that described above must also be operated. In this case however, precautions must be taken to ensure that no part of the Planer or other elevated equipment or any person positioned on such equipment, is more than 4.2 metres above the road surface level while inside the “No-Tip Zone”.

In situations where it is not practicable to apply the Safe System of Work described above, then an alternative safe system should be used. Any such alternative Safe System of Work should provide for risk control measures that are at least equivalent to those described above.

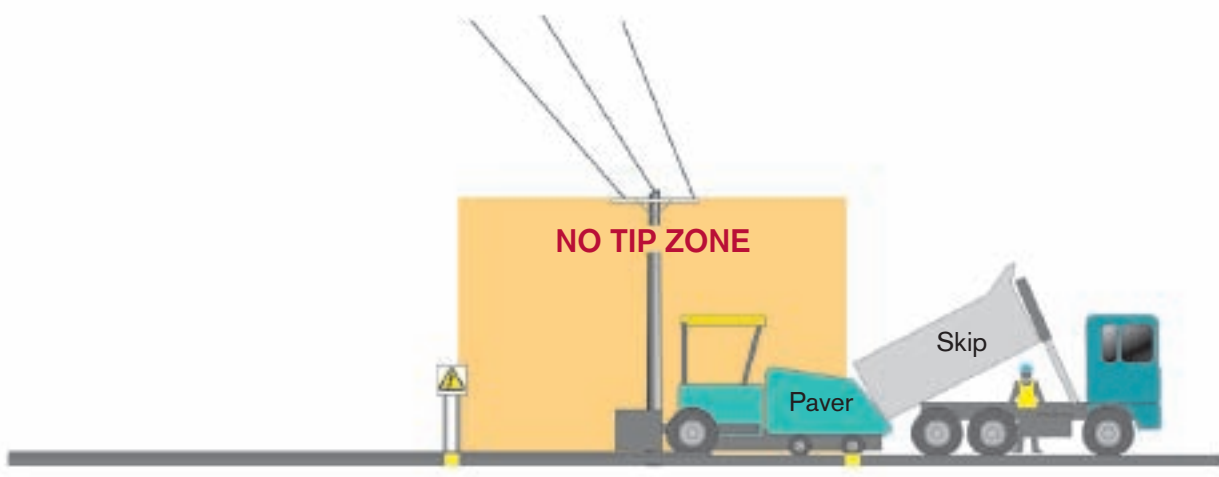
An example of an alternative Safe System of Work is a system which incorporates the use of height restricting goal posts to control the height of plant passing close to or underneath live overhead electricity lines. Other control measures which should also form part of this alternative Safe System of Work include the placing of Warning Signs at each conflict location, use of an Electrical Hazard Risk Assessment for each specific conflict and the use of a competent dedicated observer to control the works in the vicinity of overhead lines. The maximum height of the goal posts must not be greater than 4.2 metres above the original road surface level, unless it has been specifically determined that a greater height is permissible for the conflict involved. The determination of the maximum permissible height for goal posts must take account of the minimum height of the overhead electricity line and the appropriate radial exclusion zone clearance for the voltage of the line involved. The minimum clearances given in Section 9.3.1 for the different voltage lines may be used as the exclusion zone values (instead of the values given in Section 8, Table 1) for the purpose of road strengthening and resurfacing works only. The risks associated with carrying out the erection of the goal posts must also be controlled.



Step One: Load the paver hopper with cab outside the “No-Tip” zone



Step Two: Lower the tipper skip (or any other high or elevated plant, e.g. Planer) while stationary, then pass through the “No-Tip” zone



Step Three: Continue normal operation when truck is completely clear of “No-Top” zone.

Fig 7. Safe System of Work for road resurfacing only where crossing angle is at 90 degrees with road. (See Figs 7a and 7b for other angles of crossing)

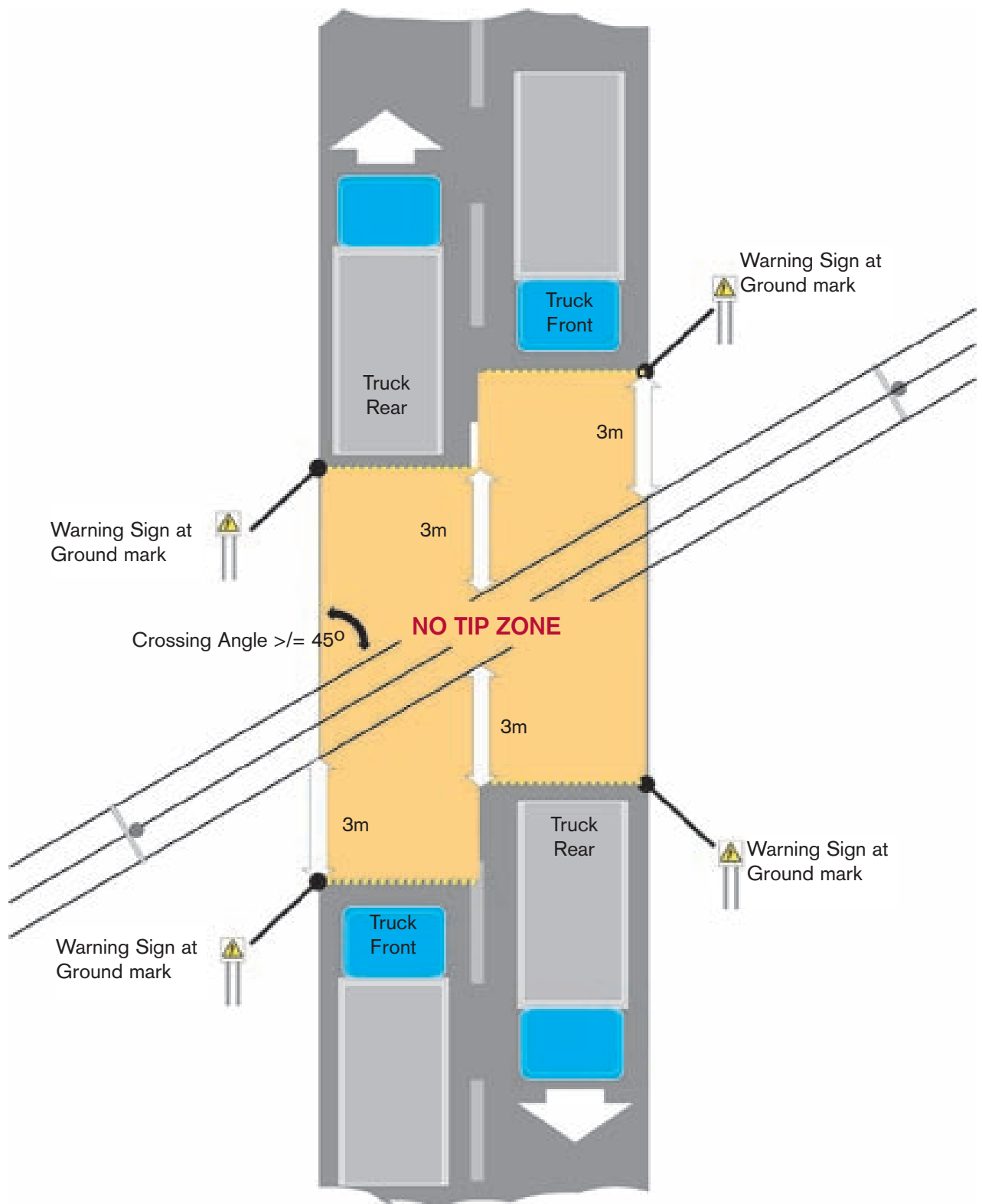


Fig 7a. Safe System of Work for road resurfacing only where crossing angle is ≥ 45 degrees with road

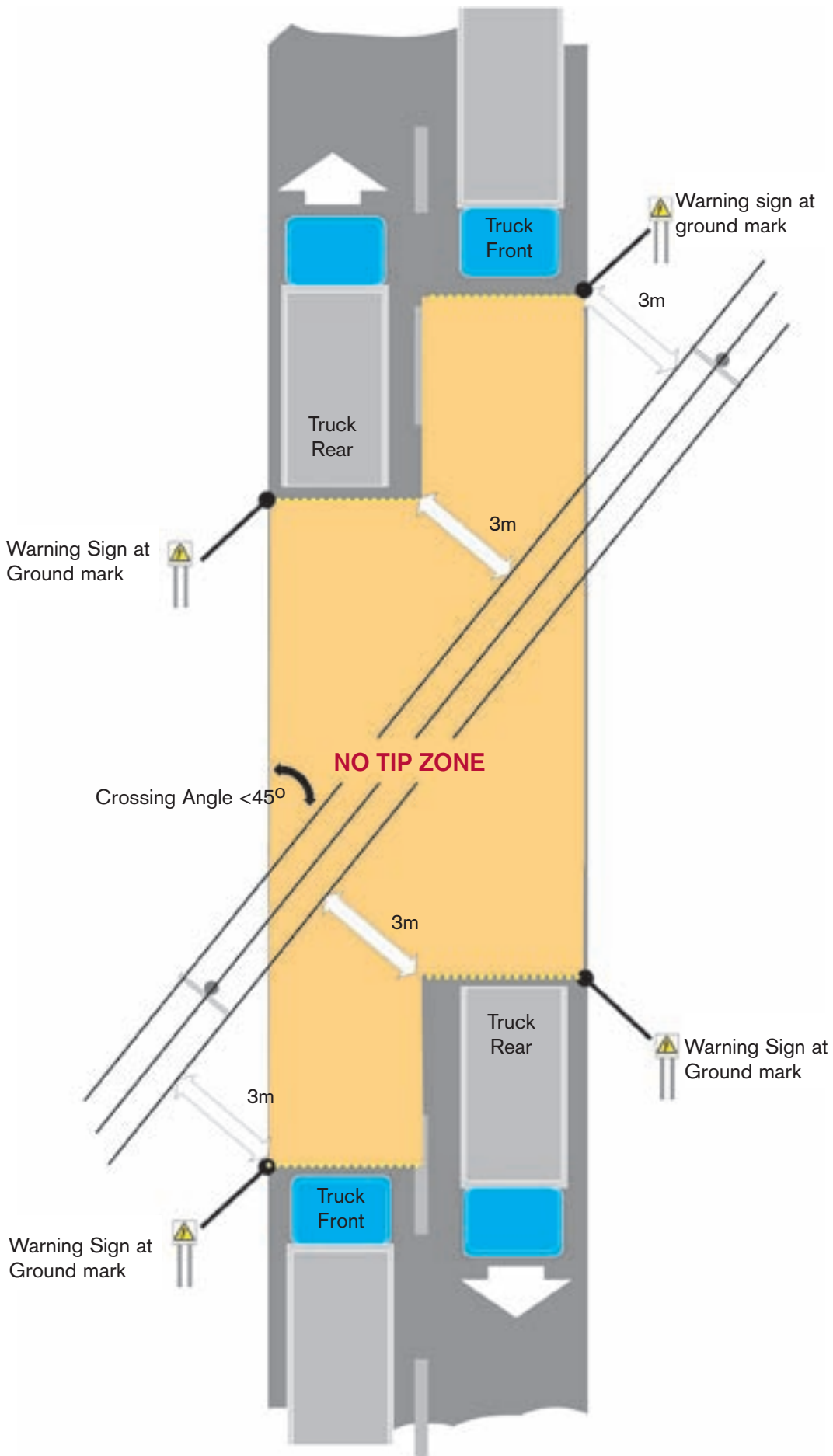


Fig 7b. Safe System of Work for road resurfacing only where crossing angle is less than 45 degrees with road

9.3 Procedure for Road Strengthening and Resurfacing where Overhead Electricity Lines Approach Close to and/or Run Parallel to the Roadway.

Some overhead electricity lines may not cross roadways but may approach close to or run parallel to the roadway for a section of the road. The preliminary site survey must identify locations where overhead electricity lines could present a hazard to tipping trucks, taking into account the route of the resurfacing works, the camber of the road, the presence or use of lay-bys, material storage dumps and any other relevant factors. If the Risk Assessment identifies the possibility of inadvertent contact or near contact then **appropriate additional controls over and above those listed in Section 9.2 must be applied.**

In these situations the operating voltages of the overhead electricity lines must be determined in advance, as the particular voltage of each line will determine the minimum clearance that must be maintained at all times. Line voltages can be determined from the electricity map records or by consulting ESB Networks (See Appendix 6 for contact details for obtaining maps and for consulting with ESB Networks). For this type of work the minimum clearance for the relevant voltage as specified below refers to the **minimum horizontal clearance as measured on plan view between the skip of the tipper truck and the nearest overhead line conductor.**

9.3.1 Minimum Clearances for different overhead line voltages

For road strengthening/resurfacing works where overhead electricity lines approach close to and/or run parallel to the roadway, the minimum lateral clearance from the nearest point of the skip of the truck as measured horizontally on plan view must not be less than :

- 1.0 metre for Low Voltage lines (both insulated and bare conductors) – **See Fig 8**
- 3.0 metres for 10kV, 20kV and 38kV lines
- 4.5 metres for 110kV lines
- 6.0 metres for 220kV lines
- 8.0 metres for 400kV lines

If the Risk Assessment identifies that the relevant minimum clearances as specified above cannot be achieved at all times between the overhead electricity line and the nearest point of contact with the Skip of the Tipper Truck, then an alternative safe method must be adopted. Examples could include the use of a low level front tipping dumper to transport the road materials to the paver or spreader, the use of combination spreader units, the use of height limiting control measures in conjunction with a competent dedicated observer etc.

In certain limited situations it may be necessary to have an electricity line “switched out and earthed” before proceeding with the work.

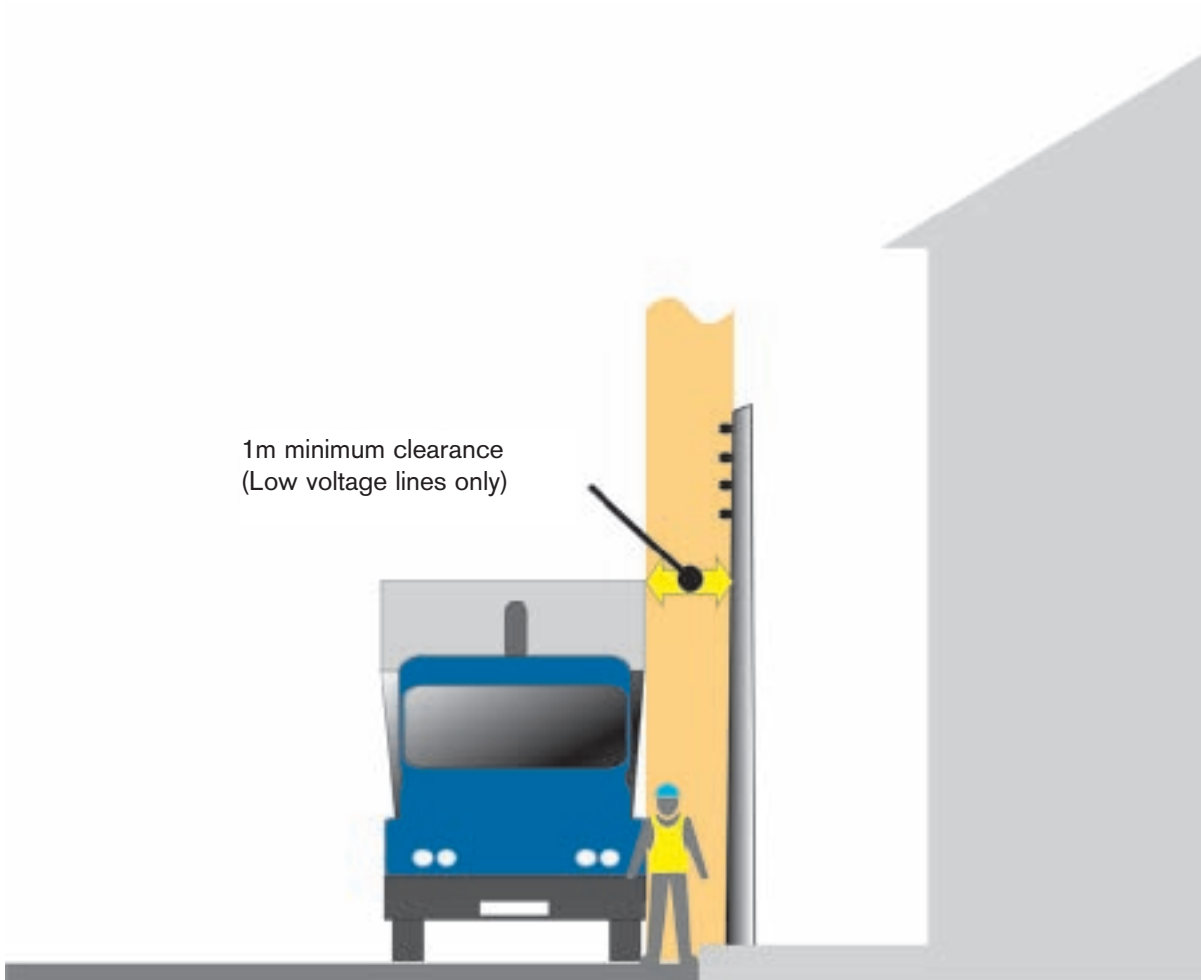


Fig 8. Road resurfacing parallel or at close approach to a low voltage line

10.0 Work on eircom Telecommunications Overhead Services

All eircom telecommunications overhead services should be designed and constructed in accordance with the standards specified in the joint eircom and ESB Networks 'Protection from Power Circuits Manual'.

In all circumstances, the design should ensure that every effort is made to locate the services such that any work on the construction or subsequent maintenance of those services can be undertaken in accordance with the general provisions of this Code of Practice.

Where it is necessary to operate plant near a live overhead electricity line for the construction or maintenance of eircom overhead telecommunications services, this work should only proceed on the basis that a written risk assessment and work method statement is prepared and that appropriate controls are put in place to prevent contact or near contact with any live overhead electricity line. These controls should include the following:

- The operatives must have completed specific training on the hazards of working near live overhead electricity lines
- A site-specific written risk assessment must be completed and appropriate controls identified before any work commences
- A method statement must be prepared
- There must be a minimum of two operatives on site. One of the operatives must act as a dedicated observer with a duty to communicate guidance from a safe position so as to ensure that no part of any operating plant or person or any object held by any person comes into contact or near contact with live overhead electricity lines

11.0 Transporting of High Loads by Road

11.1 Introduction

Overhead electricity lines crossing public roads can present both an electrical and physical hazard in transporting “High Loads” if appropriate control measures are not implemented.

The electrical hazard arises from the risk of either contacting or coming close enough to cause electricity to flashover from live electricity lines as the load is transported under such lines.

Apart from the hazards from overhead electricity lines there may be other obstacles or hazards associated with transporting high loads such as telecommunication lines, trees, bridges etc.

11.2 Definition of a High Load

In the context of this section a “High Load” is defined as any load that is greater than 4.65 metres high at its highest point - measured vertically from a flat horizontal surface on which the loaded transporting vehicle is parked.

ESB Networks standard clearances for electricity lines crossing public roads are designed to cater for the safe passage of loads up to 4.65 metres high. No special measures are required for loads up to this height limit and it should not be necessary to consult with ESB Networks in these cases. For loads greater than 4.65 metres high, ESB Networks must be consulted well in advance of the proposed transportation date.

11.3 Planning for the Transport of High Loads

When it is intended to transport “High Loads” along a route that crosses under any overhead electricity lines, it is essential that ESB Networks are consulted at the planning stage so that a full assessment of the implications and the control measures that may be required can be carried out and advised.

Overhead lines of all voltages from 230 volts to 400,000 volts cross over public roads.

The minimum safe clearance required between the nearest point of any load and a live electricity line is determined by the voltage of the electricity line. This minimum safe clearance can vary very substantially across the possible range of voltages.

In order to determine the control measures required for any particular “High Load”, ESB Networks will have to individually assess each overhead line crossing on the proposed route for the load. In some cases, no specific control measures beyond this assessment may be required but in general control measures may vary from having to arrange for the supervision by ESB Networks staff of the safe passage of the load to the switching out of lines or in more extreme cases, making arrangements for raising the height of the lines in advance.

11.4 Information Required by ESB Networks

In order to assess the control measures required for transporting any “High Load” the following information must be submitted to ESB Networks at the planning stage:

- A clearly marked road map showing the planned route for the load including any local deviation from main roads that may occur to avoid other restrictions such as bridges. Such maps should indicate starting and finishing locations.
- Accurate detailed dimensions of the load including maximum height and width.
- Road Transport Operators name and contact details.
- Planned schedule for transporting the load including dates, times and whether more than one load is involved, and stopover arrangements if any.

11.5 Responsibilities of the Road Transport Operator

The Road Transport Operators responsibilities shall include the following:

- The notification of ESB Networks of its intention to move a “High Load” under or close to ESB Networks overhead electricity lines or equipment.
- The provision of accurate information on the “High Load” to ESB Networks.
- Comply with all precautions and control measures advised by ESB Networks.
- Comply with all directions given by any ESB Networks staff that are escorting the “High Load”.

11.6 Additional Requirements

Permits or approvals from other statutory or public bodies may also be required in advance of transporting high loads. The definition of “High Loads” in the context of required permits or approvals from such other bodies may differ from the definition at Section 11.2 which specifically relates to safe passage under ESB Networks overhead electricity lines.

Appendices

- Appendix 1** Principles of Prevention
- Appendix 2** Checklist for Barriers, Goalposts, Warning Signs, Bunting etc - Form OHL1 - Example
- Appendix 3** Electrical Hazard Risk Assessment Form – EHRA Template
- Appendix 4** Road Resurfacing Safety Audit Form - Template
- Appendix 5** Emergency Procedures
- Appendix 6** Contacting ESB Networks

Principles of Prevention

The general Principles of Prevention contained in Schedule 1 to the Safety, Health and Welfare at Work Act 2005 set out a hierarchy with regard to the prevention of accidents and ill-health, and apply to the duties of Project Supervisor Design Process, Designers and Project Supervisor Construction Stage.

1. The avoidance of risks.
2. The evaluation of unavoidable risks.
3. The combating of risks at source.
4. The adaptation of work to the individual.
5. The adaptation of the place of work to technical progress.
6. The replacement of dangerous articles, substances, or systems of work by non-dangerous or less dangerous articles.
7. The giving of priority to collective protective measures over individual protective measures.
8. The development of an adequate prevention policy in relation to safety, health and welfare at work.
9. The giving of appropriate training and instruction to employees.

Form OHL1

Checklist for Barriers, Goalposts, Warning Signs, Bunting etc. (Example)

| Recommended Weekly Check Sheet For Overhead Line Protection. | | | | Site: ABCD at Newtown Road P.S.C.S: Joe Bloggs | |
|---|---------------------------|--------------------------|--------------------|--|---|
| Date/Time | Inspected by | Location/ Crossing ID | Protection Type | Comment | Action |
| 01-May-08 11.00 am | J Smith Safety Officer | Grid 3-5, A-B | Bunting | Bunting damaged at north side of ESB line | Reported to J Murphy, site engineer at 13.00, 1 May 2008. |
| | " | | Goalposts | In order | Reported to J Murphy, site engineer at 13.00, 1 May 2008. |
| | " | | Traffic Barriers | In order | No action |
| | " | | Signage | In order | No action |
| | " | Grid 6-12, A-B | Bunting | In order | No action |
| | " | | Goalposts | Not Applicable | Not Applicable |
| | " | | Traffic Barriers | 4 Traffic Barriers Removed at south side of line | Reported to J Murphy, site engineer at 13.00, 1 May 2008. |
| | " | | Signage | In order | No Action |

Electrical Hazard Risk Assessment Form – ERHA (TEMPLATE)

ON-SITE ELECTRICAL HAZARD RISK ASSESSMENT FORM – EHRA

This form should be used, whenever road strengthening or re-surfacing works are to be undertaken in the vicinity of Live Overhead Electricity Lines or Equipment.

This form should be completed for each overhead line conflict situation on a daily basis

Name of Contract: _____

Road No./Section No. : _____

| Conflict Identification No. | | | | | |
|--|--------|--------|--------|--------|--------|
| Specify the Voltage of electricity lines that run parallel to or closely approach a road (LV; 10/20/38kV; 110kV; 220kV; 400kV) | | | | | |
| Are the crew familiar with the appropriate section of the Code of Practice for Avoiding Danger from Overhead Electricity Lines (Section 9)? - please circle as confirmation | Y / N* | Y / N* | Y / N* | Y / N* | Y / N* |
| Are the extremities of the “No-Tip Zone” established and marked out on site? | Y / N* | Y / N* | Y / N* | Y / N* | Y / N* |
| Are Warning Signs erected at both entry and exit of “No-Tip Zone”? | Y / N* | Y / N* | Y / N* | Y / N* | Y / N* |
| Has a person being appointed to control work at the overhead line crossing/conflict location? | Y / N* | Y / N* | Y / N* | Y / N* | Y / N* |
| Has a procedure for safe working at the overhead line crossing/conflict location been decided by the Person In Charge (PIC) | Y / N* | Y / N* | Y / N* | Y / N* | Y / N* |
| Do <u>All</u> staff understand the proposed Safe Work Method and agree that work can proceed safely with the networks LIVE? | Y / N* | Y / N* | Y / N* | Y / N* | Y / N* |

SIGNED: _____ (Person In Charge) **DATE:** ____/____/____

AGREED BY CREW : (Circle) Yes / No*

ESB Emergency Phone No. 1850 372 999

* If the answer to any of the above questions is “No” then appropriate action must be taken for the relevant conflict to address the issue involved before proceeding with the work at that location.

ROAD RE-SURFACING SAFETY AUDIT FORM (TEMPLATE)

| CONTRACTOR: | | AUDIT DATE: |
|---|---------------|-------------------------------|
| WORK LOCATION: | | AUDITOR(S): |
| DESCRIPTION OF WORK: | | NAMES OF CREW MEMBERS: |
| ISSUE | STATUS | COMMENTS |
| Has the crew a copy of the Preliminary Survey/Pre-Work Planning Assessment? | Y / N | |
| Has an Electrical Hazard Risk Assessment (EHRA) being completed for all relevant crossings/conflicts? | Y / N | |
| Is the crew familiar with EHRA requirements? | Y / N | |
| Are "No-Tip Zones" established, marked on site and being complied with? | Y / N | |
| Are Warning Signs erected at crossing/conflict locations? | Y / N | |
| Is there an appointed person controlling work at crossing/conflict locations? | Y / N | |
| Are crew members trained for the tasks they are completing? | Y / N | |
| Is crew working as per appropriate Contractors Method Statement? | Y / N | |
| Has the crew got ESB Networks Emergency Contact Number (1850 372 999) | Y / N | |
| Commendable Safe Actions: | | |
| Deviations Observed: | | |
| Suggestions Taken and Items for Follow Up: | | |

SIGNED: _____ (Person In Charge) **DATE:** ____/____/____

Auditor Signature: _____ **DATE:** ____/____/____

Emergency Procedures

These guidelines are designed to reduce the risk of injuries and fatalities in the event of accidental contact with electricity networks. The guidelines outline the steps that should be followed for the different scenarios described below.

In the context of this appendix an "Emergency" would include the following:

- Fallen/low conductors
- Conductor in contact with a vehicle or machine
- Casualty on site
- Others - road accident, fire, medical emergency, damage to overhead line/underground cable or other electrical plant.

Notes:

LV means Low Voltage defined as less than or equal to 1000 volts (1.0kV)

HV means High Voltage defined as greater than 1000 volts (1.0kV)

If you are unsure of the Network voltage you should always treat it as if it is HV.

ESB Networks Emergency Contact Tel no. is 1850 ESB 999 (i.e. 1850 372 999)

Scenario 1: LV Line on ground / Low or fallen conductor

- STOP WORK, remain calm and stay clear
- Keep everyone clear of the live LV conductor(s)
- Do not allow yourself or others to come into contact with a person who is in contact with live LV conductor(s)
- If supply cannot be isolated and provided it is safe, pull victim clear by pulling clothing (provided it is not wet), or using timber or other non-conductive medium
- Do not use conductive material e.g. metal, aluminium etc. to pull victim clear
- Contact ESB Emergency Service at 1850 372 999 to request disconnection of the network
- Do not leave the site unattended – remain on site until ESB staff arrive.
- Do not approach LV conductors until ESB confirm it is safe to do so

The above also applies to any accidental contact with live LV e.g. domestic/industrial etc.

Scenario 2: HV Line on ground / Low or fallen conductor

- STOP WORK, Remain calm and stay clear
- Keep others clear
- Do not approach the live conductors or persons in contact or near contact with live conductors
- Do not make any attempt to pull victims clear
- Do not leave the site unattended – remain on site until ESB staff arrive.
- Contact ESB Emergency Service at 1850 372 999 to request disconnection of the network
- Do not approach until ESB confirm it is safe to do so

Scenario 3 Machine/Truck/Crane in contact with LV or HV Overhead line

Three different scenarios can exist:

a) Machine is operable

- STOP WORK, remain calm and keep others well clear
- Instruct everyone outside the vehicle not to approach or make contact with it
- Disengage from line by lowering plant and slowly drive the machine well clear of the line provided this does not risk breaking the conductor or dragging it to the ground
- Do not leave the site unattended – remain on site until ESB staff arrive
- Contact ESB Emergency Service at 1850 372 999 to request disconnection of the network
- Do not approach until ESB confirm it is safe to do so
- After emergency is cleared, check vehicles for damage before normal use continues

b) Machine is not operable and there is no immediate risk from fire or other hazard

- STOP WORK, remain calm and stay in the cab
- Instruct everyone outside the vehicle not to approach or make contact with it
- Do not exit the cab until ESB confirm that it is safe to do so
- Contact ESB Emergency Service as soon as possible at 1850 372 999
- Do not leave the site unattended – remain on site until ESB staff arrive
- Do not approach until ESB confirm it is safe to do so
- After emergency is cleared, check vehicles for damage before normal use continues

c) If the machine is not operable and there is an immediate risk from fire or other hazard

- STOP WORK, remain calm
- Instruct everyone outside the vehicle not to approach or make contact with it
- The operator should jump clear of the machine and avoid making contact with any part of the vehicle when on the ground
- Land with the feet kept as close together as possible and avoid placing hands on the ground
- Shuffle away from the vehicle – by taking half steps only or hop with both feet together
- Avoid taking full steps or spreading the feet in any direction
- When well clear of the vehicle, continue to treat the conductors as live
- Contact ESB Emergency Service as soon as possible at 1850 372 999
- Keep yourself and others clear of the vehicle
- Do not leave the site unattended – remain on site until ESB staff arrive
- Do not approach the machine until ESB confirm it is safe to do so
- After emergency is cleared, check vehicles for damage before normal use continues

In all emergencies

- Contact relevant emergency service
- Conduct a Hazard & Risk Assessment of this emergency situation and make the situation safe – do not endanger yourself or others
- Deal with the emergency situation calmly ensuring own safety and the safety of your colleagues and the public are not compromised by the actions taken.

Pictorial Summary of Emergency Procedure

IF YOU CONTACT AN OVERHEAD WIRE



Stay calm, disengage gently, back away if possible, call emergency number, STAY IN THE CAB

If risk increases jump clear and keep others away DO NOT STEP DOWN

EXTREME DANGER! NEVER MAKE CONTACT between truck and ground

Keep all people well clear of possibly electrified plant and damaged cable.

Call ESB emergency @ 1850-ESB-999
(easier to remember than 1850-372-999)

Contacting ESB Networks

For all Emergencies including contact with Overhead Electricity Lines call

1850 372 999

For other ESB Networks queries including general queries in relation to overhead lines call **1850 372 757** or email: esbnetworks@esb.ie or see ESB Networks Area Office addresses on web site (www.esb.ie/esbnetworks).

For all ESB Networks Map Records (overhead lines, underground cables and other plant):

- (a) Write to Central Site, ESB Networks, Osprey House, Lr. Grand Canal Street, Dublin 2
- (b) Send a fax to 01 6388169. (Include map of area and contact address and phone no.)
- (c) Email: centralsiterequests@esb.ie
- (d) Register for access to electronic map records – make arrangements via (a) or (c) above

Map records that have been requested as set out above will be delivered by post. Allow up to 10 days for delivery. In emergency cases maps can be collected by special arrangement at the address at (a) above by calling 01 7026558 or 01 7026185.

Map requests should include the following information:

- (i) A site map/area map with geographic reference,
- (ii) A return postal address and
- (iii) A telephone contact number.

ESB Networks provide a range of safety material, such as booklets, posters, cab stickers and DVD's addressing the issue of electrical safety. This material is free and may be obtained by calling **1850 372 757** or by email request to: esbnetworks@esb.ie. Some of this material is also available for free download from ESB Networks web site at www.esb.ie/esbnetworks.

ESB Networks code 9803203-1

