
Code of engineering practice for works on, near, or adjacent the Luas light rail system



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1. INTRODUCTION

1.1 Purpose of the code of engineering practice

The purpose of this code is to provide guidance for any relevant party (as defined below) proposing to undertake works on, near or adjacent the light railway. It sets out information on precautions to be taken in accordance with current legislation and Luas operating procedures. It also sets out the procedures to be followed in applying for, carrying out, and completing the works on, near or adjacent to the light railway. In the unlikely event that there is any difference between a requirement of the bylaws and any provision of this code, the former shall take precedence.

It should be noted that any reference contained in this code, whether a reference to any enactment or otherwise, should be construed as a reference to such provision as amended, adopted or extended from time to time.

1.2 Preamble

On the light railway there are dangers to life and limb that are significantly different from those met elsewhere. Light rail vehicles (LRVs) can travel at speeds up to 70kph, are quiet in operation, and cannot steer to avoid obstructions. Exposed overhead lines carry electricity at a potentially dangerous voltage. This code of engineering practice provides information on the precautions to be taken to ensure the safety of all persons in the vicinity of the light railway and to avoid danger from moving LRVs, and the electric traction system.

It may become necessary to review and refine the provisions of this code from time to time.

2. DEFINITIONS AND ABBREVIATIONS

For the purposes of this code the following words and expressions have the following meanings:

Authorised person has the same meaning as the Authorised Person in the bylaws: any officer, employee or agent of an operator acting in the execution of his or her duty upon or in connection with a light railway or any member of the Garda Síochána whose attendance is requested on a light railway by an authorised person;

Central control room (CCR) means the Luas central control room, which is located at the Luas Depot, Red Cow, Clondalkin, Dublin 22. All operational and maintenance activities are controlled from the CCR;

Dead means at or about zero voltage and disconnected from the system but not isolated or earthed;

Electric traction system (ETS) means any part of the light railway electric traction installation, in the street, on private property, or carried on a LRV standing on rails, that can be made live by operating a control device, including the overhead conductor system (OCS), all earth

collecting mats and stray current collecting mats and associated traction return system. **The OCS shall be considered live at all times.**

ETS danger zone means the area within 2.75 metres of any part of the OCS (appendix 1);

Emergency works mean works that become necessary as a result of a serious unexpected and/or dangerous situation that must be started without delay to safeguard life, plant and/or property;

Isolated means disconnected and separated from all sources of electrical supply in such a way that this disconnection and separation is secure;

Isolated and earthed means (in the traction supply systems' context) the complete process of rendering identified equipment or plant isolated and earthed so that it may be released for works under a works access permit;

Isolation means where equipment or plant of the light railway is isolated in order that works permitted under a works access permit may proceed;

Light rail operator (Operator) has the same meaning as the Operator in the bylaws: Transport Infrastructure Ireland (TII) or such other person with whom TII has made arrangements under section 43(5) of the Transport (Railway Infrastructure) Act 2001 to operate a light railway.

Light railway means the entire light rail network of the 'light railway' as defined in the Transport (Railway Infrastructure) Act, 2001 for the time being, including without limitation all trackwork, lines, platforms, substations, control centres, buildings, structures, and the entire OCS including all live conductors and associated supports;

Live means at a voltage by virtue of being connected to a source of electricity;

Light rail vehicle (LRV) has the meaning set out in the Transport (Railway Infrastructure) Act, 2001; a vehicle with flanged wheels designed to run on a light railway.

Occupation means a defined part of the light railway made available to a PICLW for works authorised under a works access permit where LRVs may continue to operate albeit with restrictions as may be required as a condition of the occupation being approved;

Overhead conductor system (OCS) means an arrangement of wires, suspended over and adjacent to the light railway tracks, for supplying electricity to LRVs; together with the associated fittings, insulators and other attachments by means of which the wires are suspended or registered in position, plus the feeders, switches, jumpers, etc between the outer insulators of the support wires. **The OCS shall be considered live at all times;**

Person in charge of Luas worksite (PICLW) means a person over eighteen years of age with the appropriate safety awareness training, sufficient technical knowledge or experience to avoid danger in the works he is required to undertake or a person having the written approval of the Operator to works within the swept path, to arrange protection and supervise properly constituted working parties, and to accept safety documents required by the nature of their duties;

Possession means a defined part of the light railway made available for works where the movement of LRVs on that part of the light railway is discontinued for the duration of the works and, where applicable, the OCS has been isolated and earthed;

Public road has the meaning set out in the Roads Acts, 1993-2015: a road over which a public right of way exists and the responsibility for the maintenance of which lies on a road authority;

Relevant party means any utility or other party (including businesses situated along the light railway) and their respective contractors, (other than TII and the Operator) needing to perform works on, near or adjacent to the light railway;

Transport Infrastructure Ireland (TII) means the government agency with the statutory rights and obligations conferred on it by the Transport (Railway Infrastructure) Act, 2001 and the Roads Acts, 1993-2015, and ensuing subordinate legislation;

Swept path means the area reserved for a moving LRV, which includes an allowance for pedestrian or road vehicle safety. The boundaries of the swept path are the closest distance that is safe to approach a moving LRV. Providing this defined area is kept clear there can be no direct collision with an LRV. The swept path is visibly marked with road markings and/or kerb lines in on-street sections and is indicated on TII asbuilt drawings.

For off-street sections, the line of the swept path can generally be measured as a 950mm offset from the nearest running rail; although for areas where the track alignment involves curvature, this offset will increase and should be confirmed by TII.

Traffic supervisor means a member of the Operator's staff on duty in the CCR at any time who has responsibility for the daily running of the light railway including its power supply;

Underground parallel feeder cables means those cables, part of the electric traction system, that are the electric traction distribution cables that run underground in buried ducts. They are distributed up to the OCS at approximately 300 metre intervals via trackside cabinets;

Urgent works means works that are necessary to restore supplies of water, gas, electricity, telecommunications or any other form of public service being provided at the time in question or in certain circumstances, to enable the relevant parties to comply with their regulatory standards and/or obligations;

Utility means a person, body or business, including a local authority who has a statutory obligation to provide a service to the public or who has a statutory right to work on or in a public road. Utilities means a collection of more than one utility;

Weekly engineering meeting means the weekly meeting convened by the Operator for the purpose of discussing the items listed in section 5.5.5, and attended by any other persons required to discuss such items;

Weekly engineering notice (WEN) means a weekly notice that is circulated as appropriate containing relevant details of all approved works for the following week's activities that require possessions, occupations and isolations;

Works access permit means a written declaration (in the form provided by the Operator) signed and issued by the Operator to the PICLW detailing the conditions under which works can be carried out;

Works request means a formal request (via the works request form provided by the Operator) by a relevant party to undertake works as described in section 4.1.

3. SCOPE

- 3.1 This code of engineering practice is intended to provide the necessary information on the procedures that need to be followed in order to obtain clearance to undertake works, as well as the precautions to be taken when working on, near or adjacent to the light railway.
- 3.2 Working on, near or adjacent to the light railway exposes persons to hazards over and above those normally encountered, such as:
- (a) the presence of moving LRVs, which do not have the facility to steer around the works being undertaken; and
 - (b) the presence of a high voltage OCS and underground parallel feeder cables.

THE OCS SHALL BE CONSIDERED LIVE AT ALL TIMES
UNLESS EXPRESSLY CERTIFIED OTHERWISE BY THE OPERATOR

- 3.3 To ensure that any works as described in section 4.1 are undertaken safely, it is necessary to obtain the sanction of the Operator for the works being undertaken and, as necessary, to have special working arrangements possibly including isolation and earthing of the OCS.
- 3.4 Compliance with this code will apply to works carried out on behalf of the Operator and/or by relevant parties on, near or adjacent to light railway infrastructure controlled by the Operator.
- 3.5 Contractors appointed to work for the Operator or contractors who require access onto the light railway will be required to comply with the Operator safety and coordination procedures and any special Operator requirements for any works as described in section 4.

- 3.6** The construction and maintenance methodology for any works carried out outside the swept path and the ETS danger zone (see appendix 1) shall be notified to the Operator in advance, along with the need for any protective measures for the light railway.
- 3.7** Under its terms of engagement, the Operator is required to ensure that any works carried out on, near or adjacent to the light railway comply with various statutes and/or regulations relating the safety of operation of passenger services. As set out further at section 5.2 below, the relevant parties are also required to comply with all relevant legislation relating to health and safety and operation of passenger services.

4. WHEN PERMISSION IS REQUIRED FOR PLANNED WORKS

4.1 Planned works for which a works request is required

All relevant parties must obtain a works access permit (in the form provided by the Operator), from the Operator prior to commencing works of the type described in paragraphs (a) to (f) below, which, for the avoidance of doubt, is an illustrative list of works in respect of which a works access permit will be required, and is not intended to be exhaustive.

- (a) Any works within the ETS danger zone (see appendix 1);
- (b) Any works within the swept path;
- (c) Any works that could fall onto overhead line cables;
- (d) Any works causing vibration that may affect the tramway such as demolition or foundation construction works. Any such activities that are outside the swept path must also follow the directions of the relevant local authority;
- (e) Any trenchless methods of tunnelling beneath the trackslab; or
- (f) The movement of any high loads under the OCS.

4.2 Obtaining authority for planned works

- 4.2.1** The form of works request and works access permit may be requested by contacting the Operator at the address below. Authority to undertake planned works is obtained by submitting a completed works request form to:

Luas Works Permits Coordinator
Luas Depot
Red Cow
Dublin D22 C5P3

Email: maintenance@luas.ie
Tel: 01 4614910
Fax: 01 4673046

The works request form should be submitted by the relevant party to the Operator not later than 12.00 midday on the Monday falling at least two weeks prior to the planned works. If the Operator reasonably believes that the applicant has allowed an insufficient period of time before the planned works are due to commence it will be entitled to refuse its permission.

4.2.2 The works request form will be used to determine:

- (a) whether the planned works can be safely undertaken with LRVs still running;
- (b) if a local restriction on LRV running is required;
- (c) if the safety of either the light railway or the relevant party's staff or contractor(s) may be at risk;
- (d) whether a possession is required; and
- (e) whether the OCS requires to be isolated and earthed.

4.2.3 If the planned works are sufficiently close to the light railway such that safety of either the light railway or any person would be prejudiced, the Operator will require the relevant party to work in either:

- (a) a possession, during which no LRVs will be running and, if necessary, the OCS will be isolated and earthed. Permission for a possession will normally only be granted during the period between the close of passenger service of the light railway and the start of the following day's service, typically 2.00am to 4.00am, although longer periods may be granted if the need is unavoidable; or
- (b) an occupation, during which LRVs will continue to run past the relevant party's worksite and **THE OCS WILL REMAIN LIVE**. Depending upon the circumstances, the relevant party or its contractors will either be able to continue working whilst LRVs run past at reduced speed, provided that the appropriate safety measures have been taken, and section 5.2 is being complied with, or it will be allowed to work between LRVs, with LRVs being stopped momentarily as needed to allow it to clear the tracks (see appendix 1 for diagram describing an occupation).

4.2.4 Works will not be authorised to commence until all necessary documentation has been submitted and permission has been granted in accordance with this code of engineering practice.

4.2.5 Where the planned works may involve the excavation of a public road or part of a public road, the relevant parties shall obtain the prior written consent of the relevant road authority in accordance with section 63 of the Transport (Railway Infrastructure) Act, 2001. The road authority may impose conditions on any consent issued for the purposes of planned works, and the relevant parties shall comply with any such conditions in carrying out the planned works.

- 4.2.6 For the purposes of section 64 of the Transport (Railway Infrastructure) Act, 2001, any relevant party on the light railway on foot of a works access permit granted in accordance with this code of engineering practice shall not be considered a trespasser.

4.3 Urgent works or emergency works

- 4.3.1 The procedure to be followed in an emergency situation is set out in section 6.5 below. To the extent that emergency works are necessary, the procedure set out in section 4.2 does not require to be followed by a relevant party in carrying out such works.
- 4.3.2 Where urgent works become necessary within the period of notice set out in section 4.2 for works as defined in section 4.1, the Operator must be contacted by the most expeditious route available, and the relevant party must follow the works request procedure insofar as is practicable in the circumstances. Agreement must be reached and confirmed either in writing or verbally by the authorised person as to the extent and nature of the urgent works and the precautions which the Operator will require to be implemented for the safety of the light railway and any person, including those carrying out the urgent works. Additionally, method statements shall be provided by the relevant party for approval by the Operator.
- 4.3.3 Where necessary, consultation between the Operator's staff and the relevant party may take place on site in order to determine the most satisfactory method for proceeding with the urgent works or emergency works.

5. ACCESS TO THE LIGHT RAILWAY

5.1 Overview

The Operator has a procedure in place to allow for daily engineering and maintenance works on the light railway. This allows for works during engineering hours as defined below. The standard day can be described as follows, although the times are given for guidance only:

- 5.1.1 Normal running hours (these are typical times and should be confirmed with the Operator)

When the LRVs are in passenger service:

- (a) 5.30am – 0.30am Monday to Friday;
- (b) 6.30am – 0.30am Saturday;
- (c) 7.00am – 11:30pm Sunday and public holidays.

During these periods, the scope for other trackside activities - such as maintenance - is limited.

5.1.2 Engineering hours

Nominally 2.00am to 4.00am every day, during which time is set aside for maintenance and engineering activities (in line with procedures described in this code). A coordination system is in place so these limited periods can be utilised efficiently.

Note: test or training LRVs may run during this period and it should not be assumed that all LRV running has ceased.

Procedures are in place to allow for extended possessions for major engineering works, but these will only be put in place in exceptional circumstances, as alternative transport services need to be provided.

The procedures set out in the following sections 5.2 to 5.5 will apply for all works on the light railway.

5.2 Statutory obligations

In carrying out any site works inside or outside the swept path, the relevant party shall ensure that it complies with all relevant legislation. The relevant party and their respective contractors shall be held solely responsible for both the issue of notices in accordance with all relevant legislation and compliance with these statutory obligations.

5.3 Training and protective equipment

5.3.1 Safety awareness course

The Operator will provide a specific safety course for relevant parties intending to carry out planned works as defined in section 4.1; this course will take approximately three hours. The relevant party may provide this training, with the prior agreement and approval of the Operator, to their own staff, via their own personnel, who will have attended the Operator's training and a recognised 'Train the Trainer' course.

5.3.2 Protection of personnel working on or about the light railway

The relevant party must appoint a competent PICLW to take charge of any group which is working on the light railway.

5.3.3 Personal protective equipment (PPE)

All personnel working on, near or adjacent to the light railway must wear PPE as agreed by the Operator, as appropriate to the nature of the planned works and as identified by a documented risk assessment undertaken by the relevant party as part of the works request. As a minimum, all personnel must wear high visibility clothing, safety helmets and safety footwear.

5.4 Working arrangements

5.4.1 Occupations, possessions and possessions with isolation and earthing

Any planned works as described in section 4.1 must be carried out under the protection of an occupation, a possession or a possession with isolation and earthing. These are normally arranged for during engineering hours when LRV services have ceased and protection measures have been instituted to prevent LRVs moving into the worksite.

The detailed arrangements for an occupation, possession, or a possession with isolation and earthing, are available from the Operator. In addition the training referred to in section 5.3 provided by the Operator for each PICLW will include full details of the procedure and documentation to be followed by the PICLW before, during, and upon completion of any works as described in section 4.1. However, a traffic supervisor in the CCR must always be contacted to confirm the times of any occupation or possession, as on occasion it may be necessary to alter times, sometimes at short notice (see appendix 1 for diagrams).

5.5 Procedure for works request forms: submission, authorisation

To enable planned works as described in section 4.1, the following documentation and procedures shall be in place:

5.5.1 Works request forms

Any relevant party intending to carry out planned works as described in section 4.1, is required to comply with section 4.2.

5.5.2 Short notice works request applications

Works requests may be submitted at short notice (less than the periods detailed in section 4.2), where the works to be undertaken are required to maintain safe operation of the LRVs on the light railway and/or maintain safe operation of the light railway or to resolve an operational restriction. The authorised person will review each short notice works request.

5.5.3 Works request form content

Works request forms shall typically contain the information listed below. The Operator may ask for more detailed information depending on the nature and duration of the works.

- (a) Location at which it is required to work;
- (b) Description of the works to be undertaken;
- (c) Names and details of competence of the PICLWs;
- (d) A method statement and risk assessment for the works; and

- (e) Commencement date and time of works, and proposed duration of works.

5.5.4 Receipt and review of works request forms

All works request forms upon receipt by the Operator will:

- (a) Be allocated a reference number;
- (b) Contain the date reviewed by the Operator;
- (c) Contain the results of the preliminary review and the status of the application (ie if it has been accepted (including any conditions attaching to such acceptance), rescheduled at the weekly engineering meeting or rejected (including the reasons for such rejection)).

5.5.5 Weekly engineering meetings

Weekly engineering meetings will be held to review all current works request forms received pursuant to sections 4.2 and 4.3.2 and recorded on the Operator's system to ensure there are no conflicts between different works or with LRV operations.

The weekly engineering meeting shall be held to discuss and resolve:

- (a) current works request forms; and
- (b) the following week's engineering programme

Once a works request has been accepted, the Operator may request the presence of the relevant party at the weekly engineering meeting in order to reschedule the works to a date and time different to that specified on the works access permit. Rescheduling may be required where separate works are conflicting and cannot proceed at the same time.

5.5.6 Preparation of the weekly engineering notice (WEN)

A WEN shall be prepared by the Operator after the weekly engineering meeting. The notice will be distributed to all persons, contractors and organisations (in so far as their activities are affected).

5.5.7 Possession coming into force during an occupation

If a possession comes into force during an occupation all works activities shall be stopped and persons withdrawn to a safe position until a worksite is set up within the possession in accordance with the Operator's procedures for the setting up of a worksite within a possession.

5.5.8 Replacement of PICLW

If a PICLW needs to be relieved/replaced, the outgoing PICLW must:

- (a) advise the incoming PICLW of the full details of the arrangements associated with the worksite;
- (b) hand over the relevant documentation to the incoming PICLW; and
- (c) advise the name of the incoming PICLW to the authorised person who will keep a record of all such details.

The incoming PICLW must sign the appropriate documentation at the time the outgoing PICLW is relieved.

5.5.9 Suspension of works at a worksite

When works are suspended at a worksite, the PICLW will advise the authorised person if works are to be resumed at a later time. If works are to be resumed, the PICLW will ensure that:

- (a) signage is left in position; and
- (b) the appropriate documentation is retained by the PICLW, or, if the PICLW is to be relieved, the appropriate documentation is handed to the authorised person who will then reissue them to the incoming PICLW.

In the case of a possession the authorised person must not permit any movements through a worksite where works have been suspended.

5.5.10 Finishing works

5.5.10.1 After completion of the works at the end of each day or works session, any protective measures not required to remain in place shall be removed. A traffic supervisor shall be advised and record all such details.

5.5.10.2 When works are completed at a worksite, the PICLW will:

- (a) inform the authorised person that works have been completed and that all persons have been withdrawn from the worksite to a safe distance;
- (b) ensure that all secured points are released; and
- (c) request permission from the Authorised Person to remove the worksite signage.

5.5.10.3 The PICLW will then remove the signage and advise the authorised person that portion of the line is clear and it is safe for LRVs to pass.

5.5.10.4 The PICLW will then sign the appropriate documentation and hand them to the authorised person to confirm that the works have been completed and that all persons, materials, plant etc are clear of the line.

5.5.11 Unfinished works

If, upon receipt of the appropriate documentation referred to in section 5.5.10.4, the authorised person is satisfied that works can continue safely as an occupation without the protection of a possession, the PICLW must then carry out the arrangements for setting up an occupation as set out by the Operator in its operational engineering procedures. These procedures are available from the Operator upon request.

5.5.11.1 If it is not practical to hand over the appropriate documentation referred to in section 5.5.10.4, the PICLW will:

- (a) verbally advise the authorised person that the above actions have been carried out;
- (b) sign the appropriate documentation; and
- (c) send the documents to the authorised person in accordance with the instructions of the authorised person.

The authorised person must record details of the time and completion of each worksite on the appropriate documents.

5.5.12 Return of documentation

All documentation shall be returned to the Operator for retention. All documents will be subject to internal check procedures and safety audit.

6. SAFETY

6.1 General safety

The LRVs are driven under line of sight rules, ie at a speed at which they can be stopped within the distance that the driver can see. They are, except for their inability to steer around obstacles, no different in this respect to normal road vehicles. LRVs can travel at speeds of up to 70kph; however it should be noted that their braking distances are generally two to three times greater than those of other road vehicles.

The signals on the light railway are those provided at road junctions in addition to the normal traffic light signals where the tracks pass through a public road junction.

Compliance with this code of engineering practice does not relieve any party of any of its duties of care to the public and/or its personnel/contractors or any of its responsibilities under statute.

6.2 The electric traction system - danger and precautions

The OCS comprises contact wires suspended over the track, from which electric current is collected by the LRV via pantograph. The contact wires may be supported by means of poles, masts, or building fixings. The methods of support vary with the application, but include cross span wires or ropes, bracket arms, and cantilevers. For on-street sections the minimum height of the contact wire above the rail will be between 5.5 metres and 6 metres, unless appropriate signs indicate that the wire is lower than this (for example, under low bridges). For segregated off-street sections, the minimum height of the contact wire will be 5.2 metres, unless appropriate signs indicate that the wire height is lower.

The OCS is charged with electricity at up to 925 volts direct current. The OCS, attachments, and some supporting wires have no protective covering, so are potentially dangerous to approach.

The OCS must be considered to be live at all times. The only time that this will not be the case is if the authorised person has given specific written confirmation that an isolation has been carried out, ie the OCS between nominated limits has been isolated from all live conductors, proven dead, earthed, and declared safe through the issue of the appropriate documentation.

6.3 Certification

Where a possession is accompanied by an isolation of the electric traction system for works by a relevant party, the appropriate documentation issued by the Operator will indicate the limits of the OCS isolation.

6.4 Electrical safety guidance within the electric traction system (ETS) danger zone

No works shall be allowed to take place anywhere within the ETS danger zone unless a works access permit and the appropriate documentation indicating limits of isolation, is obtained from the Operator.

Plant may be driven across the light railway at public road crossings or at other locations with the prior agreement of the Operator providing that all telescopic arms, booms, buckets, platforms and jibs on the plant are in position for normal public road driving, and all tipping and demountable cab mechanisms are in their lowest positions. At locations remote from normal public road crossings where it is agreed that plant is to cross under the OCS, precautions as laid down by the Health and Safety Authority (HSA) must be taken, in consultation with the Operator. These must fully comply with HSA recommendations concerning barriers and goalposts, which must be constructed to the dimensions specified by the Operator at the time

of the consultation. The Operator may vary these dimensions from one crossing location to another, depending on its operational needs.

When in operation, no mechanical excavator, lifting, or platform plant, or water jet shall be allowed to approach the ETS danger zone unless the plant is being driven in accordance with the above access guidelines (see appendix 1 for diagram of said danger zone).

Ladders for use within the ETS danger zone must be of all-timber construction, or of an approved insulating alternative, in which metal reinforcing is not permitted. If ladders of metal or mixed construction are to be used outside the ETS danger zone, consideration will be given to ensure that their use minimises risk. It is not permitted to direct water towards any part of the OCS.

Any scaffolding erected close to the OCS shall be earthed, or otherwise electrically protected, after consultation with the Operator. Where fixed scaffolding installations exist incorporating ladders or other means of access, measures must be taken to prevent unauthorised access whilst the site is unmanned.

Any personnel working near the OCS, whether within or outside the ETS danger zone, must take special care when carrying out the following type of works:

- (a) oiling, washing, painting, repairing or carrying out works on any type of lighting standards, signals, buildings and other structures;
- (b) carrying or using paint, water or other liquids in positions where they are likely to be thrown, to fall or to be projected onto the OCS;
- (c) carrying or using materials such as rope, wire, metal or conductive measuring tapes, pipes, rods, poles, ladders or brooms, mops or similar articles; or
- (d) tree felling.

Where these items are of such length that if not carried horizontally there would be a possibility of them coming into contact with or close to the OCS, they must be carried horizontally, not raised above shoulder height, and by two or more persons if necessary.

If any problems in complying with these guideline procedures arise, the relevant party must consult the Operator, so that suitable mutually agreed arrangements can be made to take all reasonable precautions to avoid danger.

6.5 Emergencies

Whilst working on the light railway under a works access permit emergencies can arise. It may be that the contractor of a relevant party is the first person to become aware of the emergency, and it is important that the right action is taken. The following procedures apply:

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- 6.5.1 Keep all persons as far from the danger as possible. Contact the Operator as a matter of priority, but do not leave the site unattended; if necessary send another person to make the emergency call.
- 6.5.2 If necessary, dial 999 or 112 and ask for the appropriate emergency services.
- 6.5.3 It may be necessary to stop LRVs, or make dead the OCS, or both. This can be done by directly contacting the CCR (see below). The traffic supervisor or authorised person can make dead the electrical supply to any section of OCS by means of the supervisory control system. This process is termed an emergency disconnection. Note however, that this may not happen immediately, as other safety aspects have to be considered (for example, the risk of stranding an LRV in the incident area).
- 6.5.4 If it is immediately necessary to stop approaching LRVs, do so by facing the approaching LRV and raising both hands above the head or by waving a red light at night or in poor visibility. This is recognised as an emergency stop signal by the LRV driver. Take care to ensure that you can be seen clearly by the LRV driver, whilst at the same time not putting yourself in a position of danger.
- 6.5.5 Any public telephone can be used to contact the CCR. The number of the direct line which can be used for this purpose (and this telephone number is to be used **only** for emergencies) is +353 (0)1 4673040.
- 6.5.6 Contact with the CCR can also be achieved in other ways, and the options are listed below:
- (a) LRVs are equipped with radio, which the driver can use to contact the CCR;
 - (b) there are emergency help points on all Luas stops and they can be used by anyone to contact the CCR directly;
 - (c) most Operator staff carry a radio, and it can be used to contact the CCR directly;
 - (d) a message can be passed through the Gardaí, or member of the emergency services who can use their respective control room to contact the CCR directly.
- 6.5.7 In any emergency message to the CCR, the person making the call is to:
- (a) state that it is an **emergency** call;
 - (b) state as accurately as possible the location of the emergency (eg by quoting the number of the nearest OCS mast / pole, or other easily-identifiable structure), naming a tram stop or specific location on the line and stating the direction of travel applicable.
 - (c) state as fully as possible what the emergency is, and whether it is considered necessary to have an emergency disconnection of the OCS;

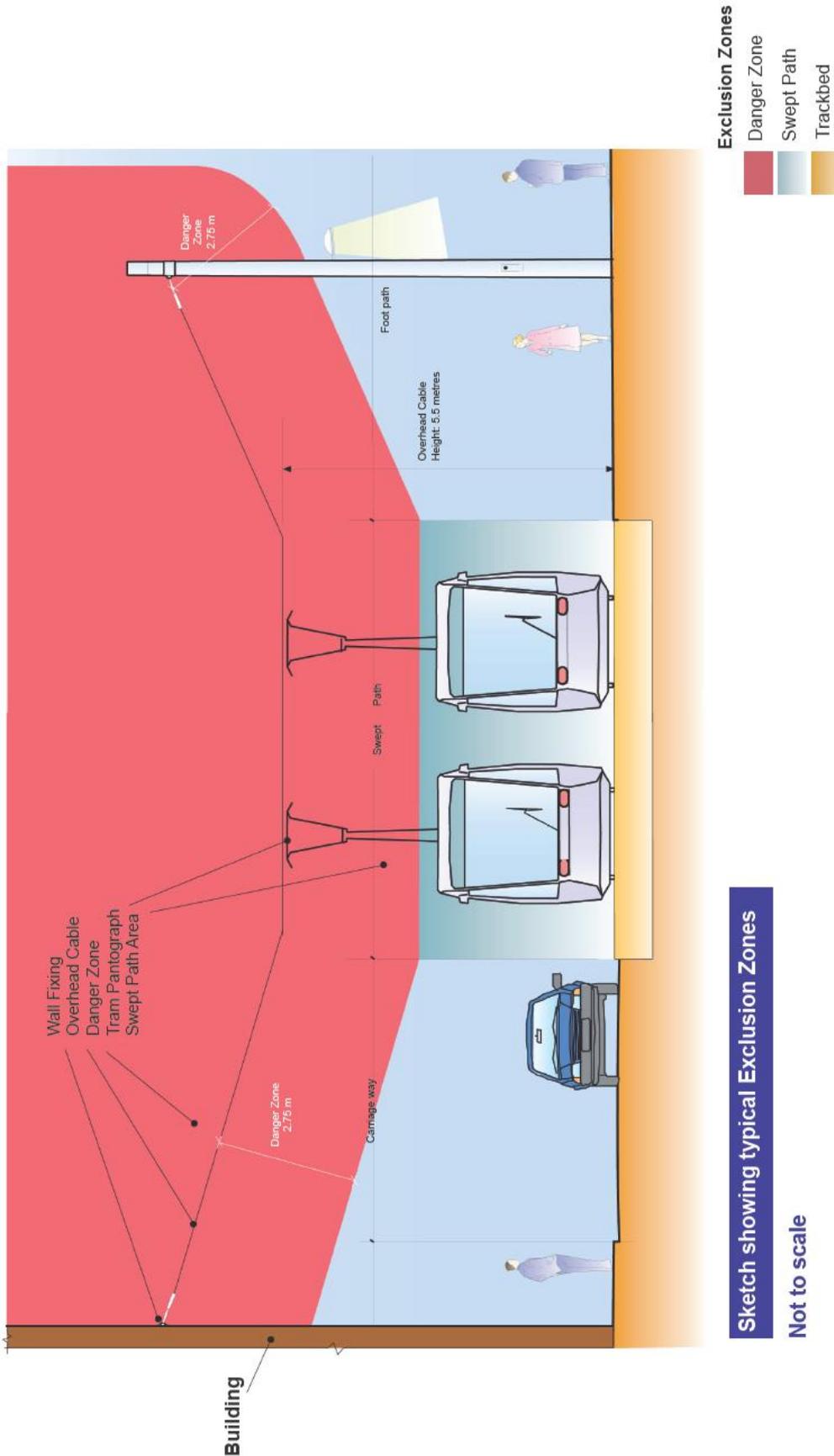
- (d) make sure the message is fully understood;
- (e) state name, company and where you are speaking from;
- (f) if at a telephone, ensure that the number is known to the traffic supervisor and remain there until told what to do, or assured that no further information is required, and, if applicable, until assured by the traffic supervisor that the electricity supply has been disconnected.

6.5.8 Never attempt to recover equipment or to rescue people from contact with the OCS. Contact the CCR for advice immediately. If a casualty is touching the OCS, do not touch the person until the correct procedure has been followed, and it is safe to attend to the person.

6.5.9 Make yourself familiar with the procedure for dealing with cases of electric shock.

6.5.10 **Remember that an emergency disconnection only switches off the electricity supply; the OCS can be considered safe to touch ONLY after the full isolation and works access permit procedure has been carried out.**

Appendix 1 – Diagram



Sketch showing typical Exclusion Zones

Not to scale

Appendix 2 – Enacted bylaws

Refer to SI No 101/2004 - Light Railway (Regulation of Works) By-Laws 2004

www.irishstatutebook.ie/eli/2004/si/101/made/en/

Appendix 3 – Vibration and Settlement

VIBRATION

Without diminishing the relevant party's responsibility to prevent any damage arising from works, the maximum allowable vibration levels as measured by peak particle velocity (PPV) at any point on the light railway shall be as follows:

	LEVEL 1	LEVEL 2	LEVEL 3
PPV above 50Hz	10 mms ⁻¹	12 mms ⁻¹	15 mms ⁻¹
PPV 50 Hz and below	10 mms ⁻¹	10 mms ⁻¹	10 mms ⁻¹

For all works the following procedure shall apply (all references to vibration readings or results shall be deemed to mean vibration measurements obtained from the monitoring instrumentation):

- (i) **Vibration readings below trigger level 1**
As long as measured vibrations are below level 1, works can continue as applied
- (ii) **Vibration readings between trigger levels 1 and 2**
In the case when measured vibration results exceed level 1, the relevant party shall initiate a review of his techniques and propose alterations to his methods including measures for reduction of vibration. These measures shall consider the works techniques, the geological conditions and other relevant factors. Any such measures shall be tested, applied and carefully monitored by the relevant party.
- (iii) **Vibration readings between trigger levels 2 and 3**
In the event of vibration readings exceeding trigger level 2 or when damage to the light railway has been suspected, the associated works shall cease and the relevant party shall initiate a review of his techniques. The relevant party shall submit details of his proposed modifications to the works to ensure that vibrations do not exceed trigger level 1. The modifications shall be identified in a document submitted to TII. Works shall not recommence without the consent of TII.
- (iv) **Vibration readings above trigger level 3**
In the event of vibration readings exceeding level 3 in a discrete event, the procedure as described in (iii) shall apply.

In addition, the general application of works procedures and assessment methods shall be in accordance with BS 7385 (1993): *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground-borne vibration*.

SETTLEMENT

During works such as demolition, excavation, piling, deep construction, at, near or adjacent the light railway, a full settlement monitoring regime is required to ensure the track rail alignment remains within tolerance.

This regime, its operation and submittal of monitoring results to TII, shall be provided by the relevant party at their expense and issued to TII for approval.

A set of trigger values will be formally notified to the relevant party, as well as the full technical aspects of the monitoring regime, as a constraint to ensure the safety of the light railway is not compromised by settlement or twist of the track.

TII require a formal agreement to implement the monitoring regime on the following basis, as a minimum:

The relevant party shall agree to ensure that they consult with TII and obtain TII approval in regard to the necessary monitoring and mitigation measures to be taken at all locations where the light railway is within the zone of influence of the proposed works. The extent of the zone of influence for the works shall be agreed with TII.

The relevant party shall provide adequate notice to TII of the works before they start and in particular give at least eight weeks' notice prior to the placing of track monitoring equipment or any structural condition monitoring equipment on the light railway.

Take baseline readings for a period of at least two weeks prior to works likely to have an impact on the light railway (eg piling or adjacent excavation). During the two week period monitoring readings must be taken on a daily basis.

When the works are taking place in the zone of influence, take the monitoring readings on a continuous basis.

When the works have passed beyond the zone of influence, take the monitoring readings on a daily basis for a further two week period or until ground settlements cease, whichever is the latter.

Ensure that all monitoring readings taken are received by TII no later than 9.00am the day following that which they were taken, or sooner if requested.

TII in turn, shall agree not to withhold or delay unreasonably any approval sought.

Trigger values for settlement (subject to change prior to formal issue by TII):

AMBER	4mm per 20m	maintain Luas operations with reduced speed
RED	6mm per 20m	halt operations until corrective measures in place



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