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Transport Infrastructure Ireland

TII Publications



Light Rail Environment - Technical Guidelines for Development

PE-PDV-00001
December 2020

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TII Publication Title	<i>Light Rail Environment - Technical Guidelines for Development</i>
TII Publication Number	<i>PE-PDV-00001</i>

Activity	<i>Planning & Evaluation (PE)</i>		Document Set	<i>Technical</i>
Stream	<i>Planning and Development (PDV)</i>		Publication Date	<i>December 2020</i>
Document Number	<i>00001</i>		Historical Reference	<i>N/A</i>

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TII Publications



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1. Context

1.1 Introduction

TII safeguards the strategic function of Luas and National Roads to promote the safe and efficient operation of both the national roads and light rail networks. This function includes protecting Luas infrastructure from adverse impacts of development for the benefit of people working for, using and living and working near light rail.

It is required to obtain a permit from the Luas operator in accordance with the Light Railway (Regulation of Works) Bye-laws 2004 (S.I. number 101 of 2004) for works at any Luas infrastructure interface, including hoarding and scaffolding.

Any works adjacent or interfacing with Luas infrastructure must be carried out in accordance with TII's '*Code of engineering practice for works on, near, or adjacent the Luas light rail system*' available at <https://www.luas.ie/work-safety-permits.html>.

1.1.1 Purpose of these Guidelines

These guidelines (the Guide) provide important information for the design and execution of developments and related works in the vicinity of light rail. The purpose of the Guide is to ensure that the operational safety and efficiency of the light rail are maintained while improvements in accessibility, permeability and interfaces with the public realm where possible are facilitated.

The Guide is intended to assist:

- the planning authority in the assessment of planning applications; and,
- potential developers in the design and execution of development in the light rail environment.

1.1.2 Scope of these Guidelines

The Guide has been prepared having regard to TII experience, similar material produced in Queensland (Australia) and feedback from the Transportation Planning Division of Dublin City Council. Specific guidance is provided for information required to be submitted with planning applications for developments in proximity to light rail to demonstrate compliance with TII's '*Code of engineering practice for works on, near, or adjacent the Luas light rail system*'.

This Guide will be reviewed and updated when necessary. In due course this Guide will be superseded by the publication of a full suite of technical guidelines for the design of light rail systems and then replaced with a wider-ranging document covering salient aspects in more detail.

1.1.3 Structure and Use of the Guide

This Guide is structured in three parts:

1. Context:

This part provides the context for development in the light rail environment.

2. Development Proposals adjacent to a Light Rail Corridor:

This part provides guidance on information required:

- a) when preparing a planning application for development in the vicinity of light rail

- b) to be consistent with TII's 'Code of engineering practice for works on, near, or adjacent the Luas light rail system'

3. Advice for Permit Works and Activities in the Light Rail Environment:

This part provides general advice on requirements in order to comply with the legislation governing activities and works in a light rail environment where the appropriate planning consents have been obtained.

1.2 Development Management

1.2.1 Development Management Process

TII is not a planning authority. TII's role in the development management process is as a statutory consultee for planning applications under Article 28 of the Planning and Development Regulations 2001, as amended. For the light rail, planning authorities must notify TII on a range of planning applications, which include:

- where the development might have an impact on the light rail;
- where the development might
 - a) give rise to a significant increase in the volume or type of traffic, including construction traffic, passing under a height-restricted railway bridge, or using a railway level crossing, or a bridge over a railway;
 - b) because of its proximity to a railway, impact on the structural integrity of railway infrastructure during construction of the development; or
 - c) endanger or interfere with the safe operation of a railway, during and / or after construction.

For Luas TII has a code of engineering practice which seeks to protect the light rail and associated infrastructure in terms of:

- the safety of people using and working for and / or living and working near the light rail;
- the operation of the light rail for the city region; and
- addressing potential impacts of development.

In considering each planning application referred by the planning authorities, TII has regard to a variety of issues as they relate to light rail. These include the location and nature of the proposed development, potential safety issues arising, the volume and nature of traffic to be generated by the development and potential impacts on the operation of the light rail system.

TII's Landuse Planning section coordinates and manages responses to planning applications referred by planning authorities, submissions and appeals to An Bord Pleanála, attendance at oral hearings and liaison with planning authorities to resolve light rail and national roads issues.

In accordance with policy and protocol, any and all liaison with TII regarding prospective development and planning applications will only be facilitated through the relevant planning authority.

Typical steps in the development management process

Step	Actor	Actions
Pre-planning:	Planning Authority Applicant / Developer TII	Pre-planning meeting(s) between the applicant / developer and the planning authority with TII in attendance where applicable.
Preparing Planning Application	Applicant / Developer	Applicant/developer prepares planning application having regard to TII's ' <i>Code of engineering practice for works on, near, or adjacent the Luas light rail system</i> ' and guidelines.
Planning Application Processing	Applicant / Developer Planning Authority TII	Applicant/developer submits application to planning authority who then refer it to TII. TII assess the development application and recommend appropriate conditions or requirements for further information by way of response to the planning authority.
Decision	Planning Authority	The planning authority issues the development decision with conditions / reasons as applicable.
Compliance	Applicant / Developer Planning Authority TII	Where required, the applicant / developer submits material demonstrating compliance with the conditions to the planning authority for approval. TII reviews the information relevant to conditions related to light rail, and issues a response regarding compliance to the planning authority.
Permit Application	Applicant / Developer Luas Operator TII	Where required the applicant / developer submits a request for infrastructure works approval to the Luas Operator in accordance with the requirements outlined in Part 3 of this guide and those in TII's ' <i>Code of engineering practice for works on, near, or adjacent the Luas light rail system</i> '.
Permit Decision	Luas Operator TII	TII assess the works requirements and provide a decision to the applicant and Luas Operator on relevant permit applications. Any such approval provided by TII may be subject to requirements including the provisions for a formal legal agreement providing inter-alia insurances and indemnities related to the proposed works.
Works	Applicant/Developer Luas Operator	The applicant / developer, other authorised entity or the Luas Operator undertake the works. Certification of works undertaken by designated personnel and / or relevant authority.

1.2.2 Roles and Responsibilities

Transport Infrastructure Ireland (TII)

TII is a statutory non-commercial body with statutory rights and obligations conferred on it by the *Transport (Railway Infrastructure) Act, 2001 and the Roads Acts, 1993-2015*, and ensuing subordinate legislation. TII safeguards the strategic function of Luas and National Roads to promote the safe and efficient operation of both the national roads and light rail networks.

National Transport Authority (NTA)

The NTA is a statutory non-commercial body charged with devising and implementing strategies and projects to enhance sustainable travel choices thus increasing use of public transport. It has responsibility for capital investment in the Greater Dublin Area and for projects promoting sustainable transport nationwide. The NTA is responsible for planning and provision of future Luas and Metro lines. It is also involved in the supply of public transport services in Ireland, as the contractor / funder for public service obligation contracts or via subcontracting arrangements such as that for Luas, which is contracted to TII.

Local (Planning) Authority

Under the Planning and Development Acts, local authorities are planning authorities responsible for land use planning and the built environment with development management and forward planning functions. Planning authorities assess planning applications and, where applicable, seek technical advice from state agencies such as TII for development applications that are of relevance. They also prepare development and local area plans that may be relevant to the operation of the light railway. The local authorities are also roads authorities responsible for roads upon which the light railway may operate, as well as certain public utilities in its vicinity.

An Bord Pleanála

An Bord Pleanála was established under the Local Government (Planning and Development) Act, 1976 and is responsible for the determination of planning appeals and certain other applications under the Planning and Development statutes. An Bord Pleanála is the consenting authority for certain other road and railway schemes that may include compulsory purchase orders.

Light Rail (Luas) Operator

The Luas Operator represents 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 rail system. The Luas Operator is responsible for managing works and activities on and near the light rail system.

Applicant / Developer and other relevant private parties

For the purpose of this Guide, any person, organisation, utility provider or other party - including businesses situated along the light rail system - and their respective contractors, (other than TII and the Luas Operator) needing to perform works on, near, or adjacent the light railway.

1.2.3 Light Rail Environment

For the purposes of this Guide, the light rail environment can be described as a combination of the following:

- **Light Rail Corridor**

The entire physical network of light rail as defined in the *Transport (Railway Infrastructure) Act, 2001* including and without limitation the exclusion zone, the zone of influence (see Figure 1), all trackwork, lines, platforms, substations, control centres, buildings, structures and the entire overhead conductor system (OCS) including all live conductors and associated supports, the land below the infrastructure or works and the airspace above.

- **Adjacent Area**

Area adjacent which to any light rail infrastructure, in which development can affect light rail infrastructure itself and related infrastructure works. The area adjacent to the light rail should be determined with reference to the boundaries which have been submitted to the relevant planning authorities by TII.

For the majority of developments, this area extends up to 200 metres from the light rail corridor to include for traffic impacts but it may also include relevant development contribution areas which can be extensive.

The indicative extent of the light rail environment including technical referral zones is illustrated below.

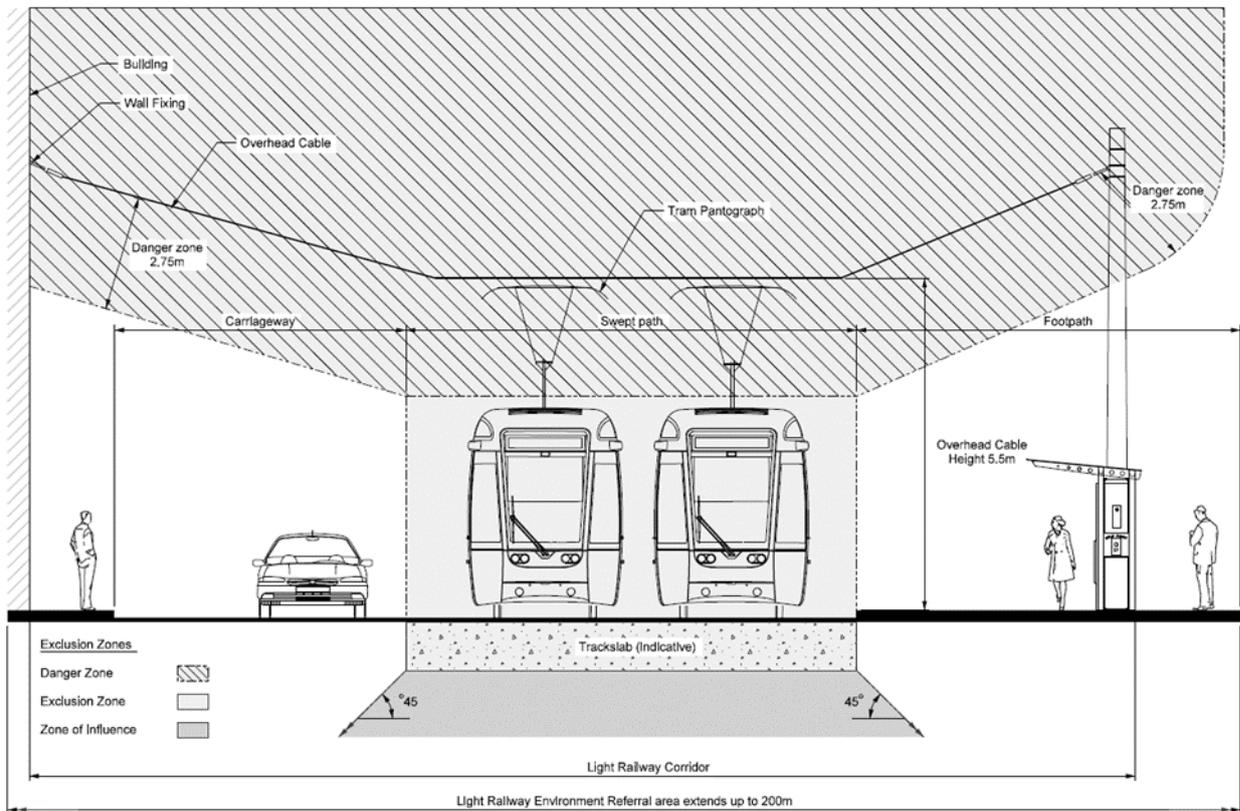


Figure 1 Light Railway Environment (not to scale) - a larger scale version is included in Appendix A.

1.2.4 The Light Rail Exclusion Zone

The exclusion zone is a specific area within the light rail environment comprising three elements:

- Electric traction system (ETS) danger zone
- Swept path
- Trackbed / trackslab

Any works and activities in or adjacent the exclusion zone, especially excavation and construction activities need to be closely managed in order to ensure the structural integrity and safety of light rail corridors and light rail infrastructure.

Electric Traction System (ETS) Danger Zone

ETS represents any part of the light rail electric traction installation, in the street, on private property, or carried on a Light Rail Vehicle (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 systems.

The OCS comprises contact wires suspended over the track, from which electric current is collected by the LRV via pantographs. 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. The ETS danger zone generally means the area within 2.75 metres of any part of the OCS.

For on-street sections, the minimum height of the contact wire above the rail is between 5.5 metres and 6 metres, unless 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 signs indicate that the wire height is lower. The OCS is charged with electricity at up to 925 volts direct current.

The OCS, its attachments, and some of the supporting wires have no protective covering and are potentially dangerous to approach. **The OCS shall be considered live at all times.**

Swept path

The swept path comprises the area reserved for a moving LRV and 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. The extent of the swept path is available on TII as-built drawings.

For off-street sections, the line of the swept path on straight track 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.

Trackbed / Trackslab

The Luas light rail trackbed / trackslab comprises track infrastructure including rails, fastenings, sleepers, other means of fixation of the rails and all the track support layers. Depending on track types these are either ballast, sub-ballast or capping for the ballasted track type, or reinforced concrete slab and foundation layers for slab track and embedded track.

The Luas trackslab is generally 6.6m wide for a double width embedded track (on-street type). For ballast tracks double track width shall account for all ancillary services such as cable ducts and drains, resulting in a total width in the order of 10m.

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. The extent of the zone of influence for the trackslab is demonstrated in Figure 1.

Works and activities within the exclusion zone shall be designed, planned and executed in such a manner as to minimise risks to the serviceability, durability and structural integrity of the light rail infrastructure.

2. Development Proposals and the Light Rail Environment

2.1 Technical Considerations for Development Proposals

Trams require fixed tracks, overhead lines, building fixings and associated infrastructure to operate. These are technically complex and costly to alter. In addition, changes to this infrastructure would lead to disruptions to the Luas light rail passenger service which should be avoided.

TII has identified the following interfaces which need to be addressed in planning applications in the Light Rail Environment:

- buildings, structures and landscaping
- construction management
- access – provision of vehicular and pedestrian accesses
- access – public Transport Infrastructure
- stormwater and drainage
- future light rail developments and upgrades

2.2 Buildings and Structures

2.2.1 Context

The siting of buildings, structures (including advertising), infrastructure, utilities, and landscaping can compromise the safety and structural integrity of existing light rail corridors, and light rail transport infrastructure. Development proposals must not compromise the safety and structural integrity of light rail infrastructure or light rail transport services. There is a requirement to ensure that development does not compromise and/or significantly increase cost of light rail maintenance and operation as well as the State's ability to deliver future upgrades to light rail infrastructure.

Buildings, structures, infrastructure, services and utilities in the light rail environment can create safety hazards for passengers and employees of the light rail or damage light rail transport infrastructure by:

- the addition or removal of vertical surcharge or lateral loading on the light rail corridor;
- distracting drivers of light rail vehicles; and / or
- providing opportunities for projectiles to be thrown onto the light rail corridor.
- Interrupting line of sight for safe operation of the light rail vehicles.

Development proposals need to ensure that buildings, structures, infrastructure and utilities are located and designed to ensure the safety of:

- people,
- property,
- light rail corridors, and
- light rail transport infrastructure.

2.2.2 Supporting Information

It is recommended that all planning applications for development that may impact the light rail corridor provide the following supporting information:

<p>LRT 1 – Light Rail Context Site Plan</p>
<p>A site plan of the existing and proposed development (including foundations, infrastructure, utilities and hard or soft landscaping) showing the location of any existing and / or proposed:</p> <ul style="list-style-type: none"> • Light rail corridors and light rail transport infrastructure (including OCS) located on, or in proximity of the subject site; and • Light rail exclusion zone.
<p>LRT 2 – Minimum clearance distance demonstration</p>
<ul style="list-style-type: none"> • Demonstration that the development, including the outermost projection of all development (including buildings, structures, and landscaping), meets and maintains at all times the minimum clearances from the light rail exclusion zone, specified in TII's '<i>Code of engineering practice for works on, near, or adjacent the Luas light rail system</i>'. • Minimum clearances from the light rail exclusion zone should be demonstrated for development construction and maintenance activities, including the use of equipment such as cranes, cherry pickers, scaffolding and temporary fences.
<p>LRT 3 – Information demonstrating protection of light rail corridor</p>
<p>Provision of supporting technical information demonstrating that the siting of buildings and structures in the Light Rail Corridor will not compromise the safety and structural integrity of the light rail.</p> <p>This should include:</p> <ul style="list-style-type: none"> • Protection of sight lines, intervisibility, accessibility, permeability and safety along the full extent of the track alignment; • Elevational design to ensure no risk of intrusion of people into the ETS danger zone (2.75m offset in all directions from the nearest item of OCS infrastructure) via opening windows, maintenance, cleaning, balconies or terraces; • Implementation of public realm elements directly involving light rail infrastructure. • This will include: <ol style="list-style-type: none"> i. Details of materials, finishes, surfacing and landscaping (hard and soft) where development interfaces and impacts light rail infrastructure including any proposed upgrade to the track materials and finishes; and ii. Provision of minimum clear widths for footpaths beside track (e.g. no intrusion from outdoor seating or furniture).
<p>LRT 4 – Protection of tram drivers sightlines</p>
<p>Tram drivers have to “pick” signals from long distances. It is difficult to do this if the tram driver’s view is cluttered with structures and lights especially flashing lights alongside the tramline. In areas parallel to the tram line light emitting or reflecting structures should not be erected which interfere with the views of the tram driver in the interests of tram and public safety.</p> <p>Where a building or structure emits or reflects point light sources towards oncoming light rail vehicles, supporting information should provide detail on how potential impacts will be mitigated. Possible mitigation options include, but are not limited to:</p> <p>omission of flashing lights,</p>

landscaped buffers between the light sources and the light rail corridor,
shields on light sources to prevent direct light being emitted into a light rail corridor,
automated dimming in accordance with ambient light conditions / levels, and
glint and glare studies for extensive glazing and / or solar panels.

LRT 5 - Provision of tree planning and soft landscaping

- All development proposals should include details of the sitting and the design of the tree line, individual trees or planting that demonstrates the maintenance of the visibility of approaching trams.
- Tree planting must account for adjacent services and infrastructure which includes light rail tracks and all OCS installations and thus should use root barriers and root directors as per BS 8545 and current best practice for landscaping.
- A maintenance protocol must be proposed that will be established by the maintainer of the trees and planting and agreed with TII and the light rail operator before any tree / plants are planted adjacent to a light rail line or stop.

NOTE: The light rail operator may remove any tree perceived as a liability to or interfering with the safe operation of the light rail system. This includes heavy falling of sap or leaves on the tracks, fouling of OCS or its fixings and constraining visibility. In this regard attention is drawn to the Transport (Railway Infrastructure) Act, 2001 (section 49) which states that ‘...a railway undertaking may lop, remove or cut any tree, shrub or hedge which obstructs or interferes with—’.

LRT 6 – Public Realm Treatment

Public realm elements proposed, including materials and landscaping, should be compatible with, and complimentary to the existing light rail hard and soft landscaping treatments.

LRT 7 – Construction & Maintenance Proposals

Provision of supporting technical information demonstrating that any construction and maintenance activities will not interfere with light rail corridors or light rail infrastructure. See Section 2.3 of the Guide.

NOTE: It is strongly recommended that applicant / developer consults the light rail operator when seeking to undertake construction and maintenance activities in proximity to the light rail danger zone when a decision has been made on the planning application.

2.3 Construction Management

2.3.1 Context

The characteristics of the physical site, construction techniques, management and materials used can impact light rail.

Demolition, filling, excavation and the use of retaining structures in a light rail environment can impact on the structural integrity of light rail transport infrastructure. Demolition, filling, excavation and retaining structures can also undermine or cause subsidence of land within the light rail corridor.

Filling and excavation associated with creating a level building pad, excavation for basement car parking, the installation or insertion of temporary and permanent retention systems, constructing footings for fences and building foundation structures, can result in ground disturbance.

Specifically, works involving ground disturbance can de-stabilise or undermine light rail transport infrastructure and the land supporting this infrastructure.

This may be through vibration impacts, ground movement, subsidence, changes to loading such as lateral and vertical loading and groundwater impacts. Settlement or movement of light rail tracks or other infrastructure during construction of a development in a light rail environment represents a significant risk to light rail users, operators and the general public.

The above potential impacts require that effective mitigation measures are identified at the earliest stages of the design of development through the preparation of a construction management plan (CMP). The CMP should demonstrate that the development will not interfere with light rail infrastructure and operations or any light rail infrastructure works and that the risks associated with construction works are being carefully managed and mitigated as required. For the avoidance of doubt; construction works include demolition works, either in their own right or as a precursor to replacement development.

The purpose of a construction management plan, for the purpose of this Guide, is to outline the approach to be taken for managing construction works in a manner that protects the light rail corridor. The CMP ensures that possible impacts that may arise from the construction works have been appropriately identified, managed and minimised.

The construction management plan should be included and submitted as part of a planning application.

TII advises that to ensure to health and safety issues are addressed, a Construction Method Statement should also be prepared.

2.3.2 Technical Requirements

It is recommended that planning applications consider the need to provide the following information:

<p>LRT 8 - Construction Management Plan (CMP)</p> <p>In general, the CMP should include the following:</p> <ul style="list-style-type: none">• Construction traffic, light rail and pedestrian management plan;• Identification of all Luas corridor interfaces• A risk assessment for works associated with the interfaces• Proposed mitigation measures for unacceptably high risks, that may include;<ul style="list-style-type: none">i. Vibration and settlement monitoring plan;ii. Surveying and geotechnical investigations; andiii. Groundwater monitoring and management plan. <p>The CMP shall accord with the method statement approach in TII's "<i>Code of engineering practice for works on, near, or adjacent the Luas light rail system.</i>"</p> <p>Due to potentially adverse impacts on light rail, the requirement for such plans and actions should be highlighted as part of the pre-planning discussions between the developer or their agents, the planning authority and TII. It is also strongly recommended that the developer engages with the light rail operator when developing and implementing monitoring regimes post planning decision.</p>
<p>LRT 9 – Demolition</p> <p>Where development is for demolition, or demolition is part of a proposed development the CMP shall include evidence of the consideration of the following outline issues:</p>

- Measures to be taken to avoid collapse over the alignment as well as deposition of rubble and spoil onto the alignment;
- Staging and operation of mechanical plant and equipment particularly in the area of the Overhead Conductor System (OCS);
- Take down sequence;
- Erection of hoarding and scaffolding, particularly in footpath areas adjoining the light rail alignment and in proximity to OCS building fixings, OCS poles and associated infrastructure;
- Removal of rubble and spoil away from the alignment via dedicated haul routes;
- Removal of potential hazardous or otherwise harmful waste and airborne pollutants; and
- A settlement and vibration monitoring programme during the demolition works in accordance with TII's 'Code of engineering practice for works on, near, or adjacent the Luas light rail system'.

LRT 10 - Construction Traffic, Light Rail and Pedestrian Management Plan

A construction traffic and pedestrian management plan should identify mitigation measures to protect operational light rail infrastructure. The following outline issues should be addressed:

- Nature, volume and proposed management of construction traffic associated with the proposal
- Servicing access arrangements during construction works; and
- Proposed scaffolding and hoarding lines with pedestrian and traffic management proposals.

NOTE: Any construction and maintenance activities will not divert vehicle, pedestrian or cycle traffic into the light rail exclusion zone.

LRT 11 - Management of Overhead Conductor System

Where OCS fixings / poles are required to be removed / replaced due to demolition or construction works plans and details depicting OCS fixing / pole protection / replacement and safety distances shall be submitted. Plans and details shall take account of, and demonstrate the following:

- All works associated with replacing local OCS building fixings with permanent building fixings including, if relevant; temporary OCS poles and / or fixings and any temporary and / or permanent modification of the local OCS equipment and configuration.
- The need for the procurement of an OCS Design & Build package by the Developer for its Contractor's undertaking to TII's approval. The OCS designer and installer must demonstrate experience of successful work on similar systems.

NOTE: Subject to a grant of planning permission, any proposal for which OCS fixings are required to be installed / removed / replaced due to demolition or construction works will require a formal legal agreement with TII prior to the commencement of development.

LRT 12 - Vibration and Settlement Monitoring

Where excavation, boring, piling, blasting or fill compacting during construction results in vibration impacts which may cause damage to light rail infrastructure, impact on the safety of the light rail operation or light rail infrastructure works, the applicant / developer will be required to provide a supporting vibration and settlement monitoring plan with the planning application documentation.

A Vibration and Settlement monitoring plan must be prepared in accordance with the standards indicated in Appendix 3 of TII's 'Code of engineering practice for works on, near, or adjacent the Luas light rail system'.

For specific locations on the network, the following may also be required:

LRT 13-Surveying and Geotechnical Assessment

Where development proposals include filling, excavation, building foundations, retaining structures or other works involving ground disturbance that may interface with light rail related retaining structures, it is recommended that the applicant / developer provides a supporting geotechnical assessment. The geotechnical assessment must be certified by a Registered Professional Engineer and prepared in accordance with 'Eurocodes'. It must include cross sections, elevations, and any required supporting technical details including:

- the location and extent of any proposed excavation and filling (earthworks), including likely volumes of cut and fill adjacent to the light rail corridor;
- the location and extent of any proposed excavation and filling to occur within the zone of influence;
- the type, spacing, location and depth of building foundation structures (including proposed structures such as footing, bored piles and associated columns);
- the maximum depth of any excavation, maximum height of any proposed filling and the gradient and height of any proposed batters adjacent to the light rail corridor;
- the maximum height and intended form / design of any proposed retaining walls or structures adjacent to the light rail corridor;
- where proposed excavation, filling / backfilling or retaining walls will be greater than 1 meter in depth or height abutting the light rail corridor, Geotechnical Engineer certified drawings must be provided demonstrating that the works will not de-stabilise any light rail infrastructure or the land supporting this infrastructure;
- demonstration that the basement retention system is impermeable and has sufficient seepage cut-off, if groundwater seepage is an issue;
- demonstration that the basement retention system is robust and sufficient to prevent any movements of the light rail infrastructure. This may require finite element and seepage modelling to demonstrate that any retaining structures, excavation, and filling / backfilling will be located outside the light rail corridor;
- provision of design assumptions and calculations;
- scaled cross sections and elevations clearly indicating interfaces with the light rail corridor including any light rail infrastructure and the difference between existing site levels and finished / design levels as a result of the proposed earthworks; and
- demonstration that retaining structures do not adversely impact on the light rail corridor through loading impacts such as the addition or removal of lateral loads or additional vertical surcharge loads which requires demonstration (using finite element modelling) that the basement retention system is impermeable, has sufficient seepage cut-off (if groundwater seepage is an issue) and is of robust design sufficient to prevent any movements of light rail infrastructure.
- Assurance of slope stability requirements of light rail corridor land is consistent with the requirements stipulated in EN 1997 Geotechnical Design.

LRT 14 Groundwater Monitoring and Management Plan

Where excavation and filling impact on the ground water in the light rail environment, the applicant / developer will be required to provide a certified groundwater monitoring and management plan which investigates excavation and construction work impacts on the light rail corridor and any light rail infrastructure. The groundwater monitoring plan should establish a management and monitoring program which ensures that the integrity of the light rail infrastructure and its safe and efficient operation are not adversely affected by the development.

A groundwater monitoring and management plan must include the following:

- groundwater monitoring (including but not limited to groundwater seepage, fluctuations, ground water levels adjacent to light rail infrastructure and field tests to confirm the water tightness of the retaining system) to be undertaken during construction, including identifying any changes that would adversely affect the integrity of the light rail infrastructure;
- confirmation that groundwater monitoring will be undertaken and certified;
- mitigation measures to be employed during works to manage the identified risks on the light rail and details of the mitigation measures; and
- an alert and response plan which provides alarm and reporting procedures, required actions, responsibilities and stop-work requirements in the event of groundwater issues during excavation and construction works.

2.4 Provision of Vehicular and Pedestrian Access

2.4.1 Context

The integrity and safety of the light rail operation must be protected by ensuring that risks associated with vehicular, cyclist and pedestrian access are minimised by carefully managing access to the light rail corridors.

Vehicular, cyclist and pedestrian access to properties bordering light rail corridors can lead to adverse impacts on safety, efficiency and service reliability of the light rail. Increased vehicle access across light rail corridors may also negatively impact on light rail operating times and service level performance targets and increase risk to public safety. The safety of pedestrians, cyclists, road users and light rail transport infrastructure can be safeguarded by appropriately managing access to the light rail corridor.

2.4.2 Technical Requirements

It is recommended that planning applications that propose access adjacent to or crossing the light rail corridor consider the need to provide the following information.

LRT 15 - Access to Light Rail Corridors

- Properties with existing safe access will generally be facilitated access to the light rail corridor for the purposes of managing existing vehicular, cyclist and pedestrian access.
- Any new vehicular, cyclist or pedestrian access arrangement will not be facilitated, apart from where exceptional circumstances exist and agreement with TII has occurred during the application pre-planning stage or during the preparation of city, county or local area development plans.

LRT 16 - Design of On-Site Vehicle Movements

On-site circulation should be designed to allow vehicles to enter and exit the property in a forward direction so as to avoid service vehicles, buses and other vehicles reversing onto the light rail corridor and potentially into the path of a light rail vehicle (LRV) or light rail infrastructure. On-site vehicular maneuvering should also be designed to prevent queuing of vehicles seeking to enter properties from roads where general traffic is sharing road space with the light rail.

2.5 Access to Public Transport Infrastructure

2.5.1 Context

Development can impede, delay and obstruct pedestrians' ability to access public transport infrastructure at light rail stops. It is critical that applicants / developers and planning authorities ensure safe, efficient and legible access arrangements for pedestrians to light rail stops and other public transport infrastructure with supporting public realm design and supporting facilities such as seating and bicycle stands as well as surveillance. Developments must maintain pedestrian and cycle access pathways or consider appropriate alternative access pathways to light rail stops where impacted by a proposed development.

2.5.2 Technical Requirements

It is recommended that planning applications that include / propose access to the light rail corridor consider the need to provide the following information.

<p>LRT 17 - Existing Pedestrian and Cycle Access to Light Rail Stops</p> <p>Existing pedestrian and cycle access to light rail stops should be maintained and enhanced as part of the development where possible. Any disruption to pedestrian access to light rail stops must be mitigated appropriately during and after construction phases.</p>
<p>LRT 18 – Increasing access to / from light rail stops</p> <p>Developments in the vicinity of light rail stops should consider the possibility of enhancing pedestrian and cyclist access to and from light rail stops and provision for modal interchange.</p> <p>Cycle and pedestrian access including pedestrian desire lines should be considered with reference to:</p> <ul style="list-style-type: none"> • Design requirements in <i>Design Manual for Urban Roads and Streets</i> (Department of Transport, Tourism & Sport and Department of Environment, Community & Local Government, 2013) provides guidance for the design of urban roads and streets. This should inform the development of the road hierarchy and road design at the local level. • Permeability Best Practice Guide (NTA, 2013) • The <i>National Cycle Manual</i> (NTA, 2011) which was produced to advice on best practice in design for cycling facilities.
<p>LRT 19 – Public Realm treatment for new accesses</p> <p>Public realm elements proposed, including materials and landscaping, should be compatible with, and complimentary to the existing light rail environment.</p>

2.6 Future Light Rail Developments and Upgrades

2.6.1 Context

Development can affect the State's ability to deliver upgrades to existing light rail infrastructure. In particular buildings, structures and operational works can impact on the form, cost and delivery of light rail infrastructure. There is a requirement to ensure that development does not compromise and/or significantly increase cost of light rail maintenance and operation as well as the State's ability to deliver future upgrades to light rail infrastructure.

2.6.2 Technical Requirements

It is recommended that planning applications that propose development that crosses / intersects with a future light rail corridor provide the following information.

LRT 20 - Future Light Rail Developments and Upgrades

Where a proposed development will occur on, or adjacent to a light rail upgrade / new corridor, it is recommended that applicants / developers provide:

- A site plan of the subject site detailing lands intended for planned upgrades to light rail corridors or infrastructure as identified in relevant publications (e.g. by NTA or TII)
- Supporting information demonstrating how the proposed light rail infrastructure is considered in the site layout of the development.

2.7 Stormwater and Drainage

2.7.1 Context

Stormwater, flooding and drainage impacts associated with development, including during construction and on-going operation of new developments, have the potential to adversely impact the safety and operational integrity of existing or future light rail corridors or light rail infrastructure. This includes:

- causing a worsening or actionable impact on existing or future light rail corridors or infrastructure such as the discharge of stormwater from a subject site causing flooding in the light rail corridor;
- interfering with and / or causing damage to existing or future light rail corridors or infrastructure such as run off from a subject site causing siltation of stormwater and drainage infrastructure; and
- causing erosion resulting in the de-stabilisation of existing or future light rail corridors or infrastructure.

Adverse impacts can be caused by altering peak discharges, flood levels, the frequency / duration of flooding, flow velocities, water quality, and sedimentation and scour effects.

It is necessary for the applicant / developer to carefully manage any impacts resulting from stormwater, flooding and drainage of the development to ensure no worsening or actionable impact to existing or future light rail corridors or infrastructure.

This can be achieved by ensuring the development does not:

- create any new discharge points for stormwater runoff onto an existing or future light rail corridors;
- interfere with or cause damage to existing stormwater drainage on existing or future light rail corridors or infrastructure;
- cause or result in settlement of light rail infrastructure;
- increase stormwater surcharge to any existing culvert or drain on existing or future light rail corridors,
- reduce the quality of the stormwater discharge onto an existing or future light rail corridors; and
- result in a reduction in light rail asset life or increase light rail maintenance costs.

2.7.2 Technical Requirements

It is recommended that planning applications that propose development with surface water drainage requirements in the light rail environment provide the following information.

LRT 21 – Protection of Light Rail Stormwater & Drainage Arrangements

Sufficient proposal information to enable development assessment officers to establish whether the proposed development will result in stormwater and drainage impacts on existing or future light rail corridors or infrastructure.

Basic stormwater information (including an appropriately scaled drawing) shall include:

- existing site topography / levels (contour information can be sourced from the relevant local authority or prepared by a registered surveyor);
- proposed finished levels of the proposed development;
- information verifying whether the subject site is flood prone (flood searches and mapping are often obtainable from the relevant local authority);
- existing drainage infrastructure on the subject site and in the immediate surrounding area such as culverts or 'kerb and channel' in roads including the location of all natural and constructed drainage features such as pits, culverts, open channels, drains, detention or retention basins as well as gullies, wetlands, waterways and similar features (information is best provided in the form of a site detail and contour survey prepared by a registered surveyor);
- proposed drainage infrastructure to be provided by the development including any devices such as pipes, downpipes, pits, detention basins, tanks and drains that are proposed to be used to manage stormwater and connect it to the proposed point of discharge with the location of the proposed stormwater discharge clearly identified, preferably via a certified drawing showing the proposed stormwater drainage design for the development with associated hydraulic calculations; and
- proposed increase in impervious area of the subject site as a result of the development including the location and extent of any proposed hardstand or sealed surfaces which should be clearly illustrated on the architectural drawings of the proposed development.

3. Advice for Permit Works and Activities in the Light Rail Environment

3.1 Permit Works and Activities Interfering with Light Rail Infrastructure.

The safety of light rail operations and workplace health and safety are paramount. TII and the light rail operator have safety policies which extend to all works undertaken in and adjacent to the light rail corridor.

Working on, near or adjacent to the light railway exposes persons to hazards over and above those normally encountered, such as:

- the presence of moving light rail vehicles, which do not have the facility to steer around the works being undertaken; and
- the presence of the high voltage Overhead Conductor System and underground parallel feeder cables.

The purpose of Part 3 of this guide is to provide information only in relation to when a permit permission is required to undertake works in the light rail environment after the necessary planning consents have been received.

The requirements in Part 2 of the Guide may also have relevance for works or activities within the light rail environment which will, or have the potential to, impact on the safety of people, property and light rail infrastructure. When planning permission is granted, it is recommended that applicants liaise with the light rail operator to ascertain construction safety and access requirements well in advance of any works commencing.

TII's '*Code of engineering practice for works on, near, or adjacent the Luas light rail system*' provides 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 light rail.

3.2 When a Light Rail Work Safety Permit is Required for Works in the Light Rail Environment

3.2.1 Works for which a Light Rail Work Safety Permit is Required

Prior to commencement of development and if relevant planning consents have been received, it will be necessary for any applicant, developer or contractor to apply for a works permit from the light rail operator by virtue of the Light Railway (Regulation of Works) Bye-laws 2004 (S.I. number 101 of 2004) which regulates works occurring close to the light rail infrastructure.

A works access permit, from the Luas Operator must be obtained prior to commencing works of the type described 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.

- Any works within the **Electric Traction System** (ETS) danger zone (see Appendix A);
- Any works within the swept path;
- Any works that could fall onto overhead line cables;

- 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;
- Any trenchless methods of tunnelling beneath the track slab; or
- The movement of any high loads under the Overhead Conductor System.

For the purpose of the TII Code of Practice, the term "works" includes all forms of work, including the movement of persons, equipment, materials and vehicles, any preparatory, demolition, construction or maintenance work and any painting or washing of premises.

TII will not be liable for any costs associated with the removal and reinstatement of Luas related fixings / hardware / landscaping etc. as a result of the proposed works which shall be borne by the applicant, developer or contractor.

All works associated with removal, temporary and final instatement of Luas infrastructure are to be performed out of Luas operational hours, under system shutdown and Overhead Conductor System isolation.

3.2.2 Obtaining Light Rail Work Safety Permit Authority for Undertaking Works

The forms for Light Rail Work Safety Permit consent including the 'works request' and 'works access permit' may be requested by contacting the light rail operator at the address below. The authority to undertake 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 no later than 12.00 midday on the Monday falling at least two weeks prior to the planned works. The Operator may refuse permission when the applicant has allowed an insufficient period of time before the scheduled commencement of works.

Works will not be authorised to commence until all necessary documentation has been submitted and permit consent has been granted in accordance with TII's '*Code of engineering practice for works on, near, or adjacent the Luas light rail system*'.

Where the proposed works involve the excavation of a public road or part of a public road, the developer / contractor 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 proposed works, and the relevant parties shall comply with any such conditions in carrying out the proposed works.

3.2.3 Indemnity

TII will require an agreement to ensure that a specific indemnity is procured and maintained in favour of TII for public liability insurance for the development irrespective of which entity maintains the insurance.

The applicant / developer shall be responsible for, and shall release and indemnify TII, its employees, agents and contractors from and against all liability for:

- death or personal injury;

- loss of or damage to property or assets (including property and other assets belonging to TII or for which it is responsible);
- a breach of statutory duty; and
- losses, actions, claims, demands by third parties against TII, and any costs, charges and expenses (including legal expenses on an indemnity basis) suffered or incurred by TII in respect of the same which may arise out of, or in consequence of, the design or construction of the development or the presence on the site and any construction access areas and / or the Luas light rail system of any of the applicant's / developer's contractors, sub-contractors, their employees or agents or any other related party.

The developer shall be responsible for any loss of Luas revenue or any other costs associated with a suspension of passenger services which may arise out of, or in consequence of, the design or construction of the development or the presence on the site and any construction access areas and / or the Luas System of any of the applicant's / developer's contractors, sub-contractors, their employees or agents or any other related party.

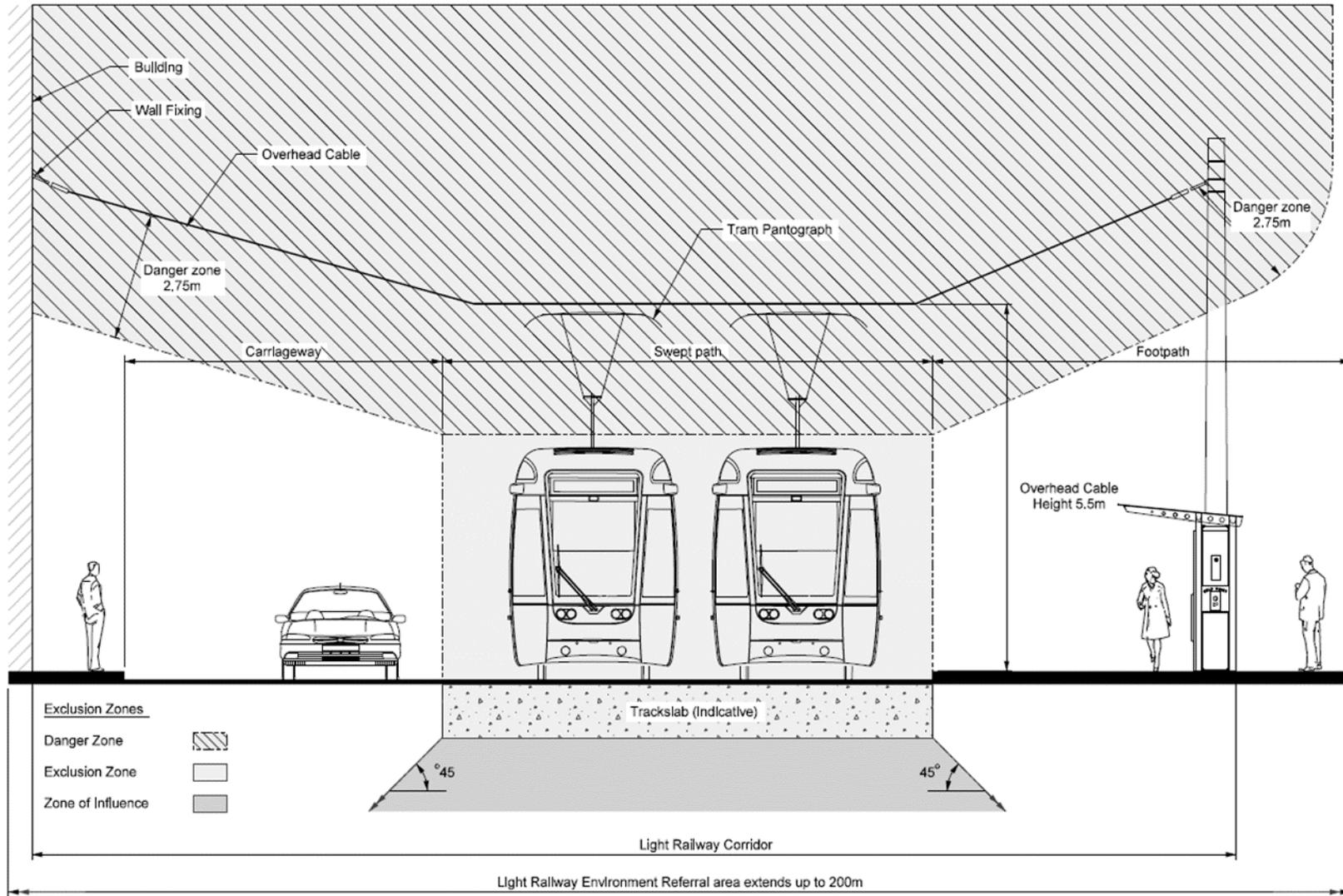
The applicant / developer shall not be obliged to indemnify TII for any injury, loss, damage, cost and expense caused by the negligence or wilful misconduct of TII, their employees or agents.

3.2.4 Statutory Obligations

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

Appendix A:

Figure Light Rail Environment (Not to Scale)



Appendix B: Definitions and Abbreviations

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.
Luas	Irish Light Rail System
Luas/light rail transport Infrastructure	This includes both the fixed line and the Overhead Conductor System (OCS) and all facilitating, ancillary infrastructure.
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.
Planning applications	All applications for permission / consent for development under the Planning & Development Act 2000, as amended
Relevant party	In the context of Light Rail Work Safety Permits (Section 3 of this Guide) 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.
Swept path	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 as built 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.
Trackbed / trackslab	Track infrastructure including rails, fastenings, sleepers, other means of fixation of the rails and all the track support layers.

These, depending on track types, are either ballast, sub ballast or capping for the ballasted track type, or reinforced concrete slab and foundation layers for slab track and embedded track.

The Luas trackbed is generally 6.6m wide for a double width embedded track (on-street type). For ballast tracks, double track width shall account for all ancillary services such as cable ducts and drains, resulting in a total width in the order of 10m.

GUIDELINES ACRONYMS

LRV	Light Rail Vehicle
OCS	Overhead Conductor System
ETS	Electric traction system.



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