

CITY OF EDMONTON – LRT DESIGN GUIDELINES

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14.0 IMPACT MITIGATION, AESTHETICS, ROW CONTROL

14.1 GENERAL

14.1.1 Scope

This chapter provides the design guidelines for the following:

- Measures that can be implemented to mitigate the impacts that LRT can have on adjacent communities.
- Aesthetic treatment including landscaping along the LRT ROW and around stations.
- The control and protection of the LRT ROW.

14.1.2 Bylaws, Standards, Practices, Guidelines, References

City of Edmonton Design and Construction Standards (*City Design Standards*)
City of Edmonton Noise Bylaw 7255
City of Edmonton Transportation Planning Branch, Landscaping Guidelines for Road Right-of-Way – Revised March 1993
City of Edmonton Zoning Bylaw 12800
Landscape Guidelines for the South Light Rail Transit (LRT) Extension – UMA 2001
Noise Position Paper – Stantec Consulting Ltd., March 2001
Residential Vibration Monitoring and Assessment – ACI Acoustical Consultants Inc., May 2003

14.2 LRT IMPACTS AND ABATEMENT MEASURES

14.2.1 LRT Impacts

In addition to affecting traffic and pedestrian patterns, the introduction of LRT into a community may be visually obtrusive, and may be perceived as increasing noise and vibration levels.

The development of transportation options during the planning phase is intended to present solutions related to mitigate the disruption of vehicular traffic and pedestrian patterns.

14.2.1.1 Visual Intrusion

The installation of the LRT infrastructure which includes the trackway, overhead catenary wires and support masts, signal support poles, grade crossing control measures, fencing, stations, and other ancillary structures, including the LRT train moving through the community, may be considered by some community residents as being visually displeasing.

14.2.1.2 Noise

The majority of the noise created by the passage of the LRT train is from the rail/wheel interface, track switches and associated equipment, and the LRV motors and cooling fans. Lesser amounts of noise are generated by wind noise and friction between the pantograph and the contact wire. Chapter 2 Vehicles, Section 2.2.1.9 has a table which shows typical noise levels generated from an LRV at various operating speeds.

Other sources of noise are from activities in and adjacent to stations, safety devices for vehicular and pedestrian traffic, maintenance activities along the ROW, and activities associated with the construction of the LRT.

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The Consultant should refer to the Stantec *Noise Position Paper* for additional data derived from an environmental noise model study that was carried out for the South LRT Extension.

14.2.1.3 Vibration

Vibration can be caused by the movement of LRT trains along the tracks and LRT construction activities. Chapter 2, Section 2.2.1.10 has a brief discussion on the degree of vibration generated by LRV's. The Consultant should also refer to the *ACI Residential Vibration Monitoring and Assessment Study* for the results of vibration monitoring and the prediction of vibration levels in the McKernan and Belgravia communities.

14.2.2 Noise Bylaw

The City of Edmonton has enacted Bylaw 7255, A Bylaw to Prohibit, Eliminate or Abate Noise Within the City of Edmonton. The Bylaw defines noise level descriptors, specifies acceptable noise levels that can be generated by vehicles and what is acceptable for several classes of land use. It also specifies the penalty to be imposed when the noise levels are exceeded.

Noise from LRT operations is covered in the criterion for vehicular noise and should not exceed a 24 hour *Leq of 60 dBA.

***Equivalent Continuous Sound Level (Leq)** is defined as a calculated sound level over the measured time period that has the same acoustical energy as the actual fluctuating sound levels that occurred during the same period. It is a single number descriptor commonly used for environmental noise measurements.

14.2.3 Abatement Techniques

14.2.3.1 Visual Abatement

Screen fencing, berming, depressed LRT alignment, landscaping, or combinations thereof, are all acceptable visual screening methods subject to ROW availability, and cost-benefit analysis. Screen fencing can be of wood, metal or concrete construction.

14.2.3.2 Vibration Abatement

Vibration as a result of LRT operations is not anticipated to be problematic as per the findings of the *ACI Residential Vibration Monitoring and Assessment Study*. Notwithstanding, Chapter 5 Trackwork, Section 5.2.5, describes trackwork design measures that can be employed to further reduce LRV vibration levels.

14.2.3.3 Noise Abatement

There are a number of techniques available to reduce or absorb the noise generated from a passing LRT train.

These techniques are:

- Trackwork design measures as described in Chapter 5 Trackwork, Section 5.2.5.
- Lubrication of rails on curves to reduce wheel squeal.
- Construction of depressed track sections or earth berming.
- Noise Walls or Barriers.

To be effective, the medium selected for a noise wall preferably should have sound absorption characteristics, and must be placed in the line of sight between the noise source and the point of observation.

The placement of trees and shrubs alone is not an acceptable medium for reducing noise.

The location, size and spatial requirements of the installation will be determined during preliminary engineering phase of the design activities.

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Structural design considerations for noise walls are outlined in Chapter 9 Structures, Section 9.6.

14.3 AESTHETIC CONSIDERATIONS

14.3.1 General

Chapter 1 General, Section 1.2.2.2 enunciates seven broad principles to be applied to LRT development in Edmonton. Section 1.2.3 Land Use, lists a number of related items that Consultants must examine through the planning and design process. Section 1.2.4 Aesthetics/Arts Program, provides details of City Policy C458 related to the provision of Artwork in City facilities.

The Consultant must become familiar with this material at the outset of design.

14.3.2 Landscape Design Principles

From the broad principles, seven major design principles were formulated for landscape development in the LRT corridor. They are:

- Safety and security
- Maintenance
- Neighbourhood integration and mitigation
- Buffering
- Aesthetics
- Fiscal responsibility
- Stakeholder involvement

Section 2.0 of the UMA *Landscape Guidelines for the South Light Rail Transit (LRT) Extension* provides the detailed considerations for each of these principles. In addition, this document provides additional design criteria for “soft” and “hard” landscape features.

The principles apply to the LRT ROW, stations, Park and Ride, and Kiss and Ride facilities, traction power substations, structures, and roadway and pedestrian access elements.

14.3.3 Landscape Design Reference Documents

A number of other documents have been prepared by the City that provide the Consultant with the guidelines and standards to be used in the development of design landscape plans and specifications. The intent is not to restate the content here, but just list the documents for the Consultant’s reference. They are:

City Design Standards - Volume 5 Landscaping
City of Edmonton Transportation Planning Branch, Landscaping Guidelines for Road Right-of-Way – Revised March 1993.

14.3.4 Architectural Requirements

The Consultant will prepare designs for LRT stations and Ancillary facilities, grade separation structures, noise, and screen and barrier walls, in accordance with the design principles stated in Chapter 10 Stations and Ancillary Facilities, Section 10.2.6.

14.4 ROW ACCESS CONTROL AND PROTECTION

For safety and security reasons, access onto the LRT ROW by the public (in vehicles, on bicycles, or on foot) must be controlled through the provision of fencing, barriers, and signage.

Where different types of fencing/barriers connect together, the design must accommodate a seamless transition in order to maintain the continuity of the fence/barrier.

14.4.1 Fencing

14.4.1.1 Exclusive, Semi-Exclusive Use ROW

All ROW in this operating category must be fenced to provide protection for the public. Normal fencing requirements will be heavy-duty chain link barrier fencing. The absolute minimum fence height is 1.2 m with a height of 1.8 m being typical. Fencing will generally be parallel to the track and located within the defined ROW. The Consultant should refer to the figures in Chapter 3, Clearances and Right-of-Way for further details.

Where aesthetics and community standards demand, other types of protection such as wooden, steel or concrete barriers, pipe rail or hedgerows may be considered. The location and type of barrier fence will be determined on a case-by-case basis.

Where necessary, gates that can be locked must be installed to provide access to the ROW by maintenance or emergency personnel and equipment. The locations should include direct access to all surface trackway turnouts. This requirement is also applicable to Section 14.4.1.2.

14.4.1.2 Shared Use ROW

Where the LRT alignment is located in a shared use ROW, the installation of fencing or barriers may be somewhat limited due to the roadway and pedestrian movements, and related crossing requirements. Each section of the LRT alignment must be analyzed carefully to determine feasible fencing or barrier locations.

14.4.1.3 Type II and III Stations

If practicable, fencing/barriers should be installed adjacent to surface LRT stations to prevent pedestrians from accessing the tracks except at controlled crossing areas.

The following factors should be considered when developing the fence/barrier location plan:

- Pedestrian safety
- Station platform access
- Grade crossing configuration and related control measures (refer to Chapter 18 Street Design, Section 18.5, Grade Crossing Safety)

14.4.1.4 Drop-Off and Parking Areas

Fencing or barriers should be considered for locations where there is the potential vehicular/pedestrian conflict, or security may become an issue (refer to Chapter 18 Street Design, Section 18.7).

14.4.1.5 Tunnel Portals/Overpass Structures

Fencing should be considered for areas around tunnel portals and on bridges for use by pedestrians crossing over the LRT trackway. The objective is to discourage persons from dropping or throwing objects onto the LRT ROW.

In areas where pedestrians come into close proximity to the overhead catenary system, a protective shroud must be installed over the contact wires. The mesh in the shroud should be closely spaced to prevent any contact with the energized conductors (refer to Chapter 6 Traction Power, Figure 6.5).

14.4.1.6 Related Fencing Requirements

Vehicle service, maintenance and storage areas must be secured by a perimeter fence.

All fencing with a metal component to be located in areas where pedestrian movements occur must be grounded.

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14.4.1.7 Standards Reference Documents

Standards for Screen, Uniform and Solid fences are provided in Volume 5 Section 10 Landscaping, of the *City Design Standards*.

The specification for steel chain link fencing is given in Volume 5, Section 02821. For chain link fence details, refer to Drawings 9450, 9452, and 9454.

14.4.2 Signage

Signage indicating that trespassing is prohibited on the LRT ROW should be erected at all locations where the public can gain access. Typical locations include road and pedestrian grade crossings and at stations. Other specific signage may be required at designated locations.