FACILITIES CIVIL ENGINEERING STANDARD – SITE ELEMENTS

MX-FAE-STD-C006

Facilities Architecture & Engineering
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METROLINX

Facilities Civil Engineering Standard – Site Elements

MX-FAE-STD-C006

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Preface

This is the first edition of the Facilities Civil Engineering Standard– Site Elements (MX-FAE-STD-C006). The purpose of this standard is to provide minimum civil engineering requirements and design guidance to designers for Metrolinx-owned assets.

This standard is to be followed by Engineering and Design Consultants working on Metrolinx projects and internal Metrolinx staff.

The technical content within the Facilities Civil Engineering Standard– Site Elements (MX-FAE-STD-C006) was developed by the Metrolinx Facilities, Architecture, and Engineering's Civil Engineering Team within the Asset Management and Maintenance Division, which includes specialized subject matter experts.

This Standard is available for external users to download via the Metrolinx public download site at https://www.metrolinx.com/en/metrolinx-technical-standards

Suggestions for revision or improvements can be sent to Metrolinx Facilities, Architecture, and Engineering (FAE) Civil Engineering Team, Attention: Senior Manager, FAE Civil Engineering, who will introduce the proposed changes to Metrolinx FAE Civil Engineering. The Senior Manager, FAE Civil Engineering, ultimately authorizes the changes. A description of the proposed change shall be included along with information on the background of the application and any other useful rationale or justification. Proposals for revisions or improvements shall include your name, company affiliation (if applicable), email address, and phone number.

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1. General

1.1 Purpose

1.1.1 This standard outlines the requirements for site elements at Metrolinx stations and facilities. These elements, located outside of buildings, are permanent structural and protective components designed to enhance site functionality, security, and user safety.

1.2 Scope

1.2.1 The following site elements are covered under this standard:

a) Gates;

b) Bollards;

c) Impact-resistant planter boxes;

d) Guards and railings; and

e) Tactile walking surface indicators.

1.2.2 The design and arrangement of site elements, including both their functionality and aesthetic considerations, shall comply with relevant Metrolinx Design Standards, including but not limited to:

a) GO Station Architecture Design Standard (DS-04);

b) Subway Station Architecture Design Standard (DS-09);

c) LRT Architecture Design Standard (DS-13);

d) Architectural Material and Finishes Design Standard (DS-24);

e) Bus Rapid Transit (BRT) Architecture Design Standard (DS-27); and

f) GO Design Requirements Manual (DRM).

1.2.3 This standard does not apply to site furnishings intended for user comfort or convenience, such as garbage receptacles, benches, or similar amenities.

1.2.4 This standard excludes site layout, planning, and design, which are addressed in Metrolinx Design Standards and the GO Design Requirements Manual (DRM). The following areas are also excluded:

a) Rail corridors, except for rail platforms;

b) Bus Rapid Transit (BRT) or Light Rail Transit (LRT) corridors, except for BRT and LRT stations and facilities,

c) BRT and LRT stops; and

d) Rail Maintenance Facilities (RMF) and/or layovers.

1.2.5 This document shall be read in conjunction with the Metrolinx Facilities Civil Engineering and Building Envelope Standard—General (MX-FAE-STD-C001).

2. Definitions & Abbreviations

2.1 Definitions

2.1.1 The capitalized terms used in this standard shall have the meaning prescribed in Table 1.

Table 1: List of Definitions

Term	Definition
Bollard	A short, sturdy post installed to control or direct traffic, protect pedestrians and structures, or prevent vehicle access.
Gate	A movable barrier within a fence system designed to control pedestrian and vehicle access.
Guide Rail	A safety barrier designed to prevent vehicles from leaving a roadway or impacting hazardous areas.
Guard	A protective barrier placed along walkways, platforms, or elevated areas to prevent falls.
Impact-Resistant Planter Box	A reinforced planter box designed to absorb vehicle impact while serving as an aesthetic feature.
Retractable Bollard	A bollard that can be lowered or removed to allow temporary vehicle access.
Tactile Walking Surface Indicator (TWSI)	A textured ground surface that provides guidance and warnings for visually impaired individuals.

2.2 Abbreviations

2.2.1 The abbreviations used in this standard shall have the meaning prescribed in Table 2.

Table 2: List of Abbreviations

Abbreviation	Definition
AODA	Accessibility for Ontarians with Disabilities Act
ASTM	American Society for Testing and Materials
CSA	Canadian Standards Association
DS	Design Standard
MTO	Ministry of Transportation of Ontario
OBC	Ontario Building Code

3. Site Elements

3.1 Design Requirements

3.1.1 Design Responsibility

3.1.1.1 The structural design of site elements shall be undertaken and sealed by a Professional Engineer licensed to practise in the Province of Ontario.

3.1.2 General

3.1.2.1 All elements shall be designed for structural stability, accounting for the following key factors:

a) Environmental considerations such as freeze-thaw cycles; and

b) Applicable loads such as impact loads, horizontal loads, and vertical loads.

3.1.2.2 The material selection process shall prioritize corrosion resistance while minimizing maintenance requirements. The design shall integrate measures to prevent galvanic corrosion, such as using compatible materials or separating and insulating dissimilar materials.

3.1.2.3 Comply with Ontario Provincial Standard Specifications and Drawings where applicable.

3.2 Asset Specific Design Requirements

3.2.1 Gates

3.2.1.1 A gate is a movable barrier integrated into a fencing system that provides controlled access points for maintenance activities or emergency egress. The location and frequency of gates are dictated by the DRM, Metrolinx Design Standards, or as required by the Metrolinx Operations Team.

3.2.1.2 Gate design shall incorporate the following features:

a) Single, double or sliding styles, depending on available site spacing and operational needs. The selection process shall involve Metrolinx Operation and Maintenance team;

b) Signage shall be provided to educate the public of potential risks and deter unauthorized pedestrian access. Refer to Metrolinx Wayfinding Design Standard (DS-03) for stencil and signage specifications;

c) Single or double locks as required by the Railway, Hydro, or other users; and

d) Heavy-duty hinges.

3.2.1.3 Gates shall incorporate the following optional features where required, based on site conditions:

a) Gate stoppers, where there is the potential for gates and/or gate components to swing into the train's dynamic envelope, a sidewalk, or a travelled portion of a roadway. Gate anchoring shall be designed to minimize the need for gate stoppers where feasible;

b) Self-closing mechanisms, where there is a risk of injury to workers or the public;

c) One-way mechanisms, where site conditions require access through the gate to be restricted to only one direction;

d) Security features, such as fob systems, two-way communication systems and remote opening and closing mechanisms and control systems; and

e) AODA compatibility for all gates where pedestrian access is needed by members of the public.

3.2.1.4 Gate dimensions shall be based on the type of access needed at the specific location:

a) A maintenance access gate shall be included where access to a station property is to be restricted to maintenance vehicles, equipment, and personnel. The maintenance access gate shall be a minimum of 2700 mm in width and 1800 mm in height, where feasible. Where the maintenance access widths and/or heights are constrained, planning associated with facilitation of access for vehicles, equipment and personnel to all areas requiring maintenance is required and shall be approved by the Owner of this Standard in consultation with Station Operations;

b) A pedestrian access gate shall be installed where access is to be restricted to pedestrians only. The minimum width of the pedestrian access gate shall be 1500 mm, and the height shall be set by the height of the fencing adjacent to the gate;

c) A roadway entrance gate is required across roadways where bus and/or vehicular access is required into restricted areas. The width of the bus entrance gate shall be offset a minimum of 300 mm from the edge of the pavement. The gate height shall be the same as adjacent fencing, and set by a risk analysis; and

d) A rail entrance gate is required where there is a continuous fence around a facility, with rail connections present for the purposes of rail traffic entering/exiting. These gates are required to ensure a continuous line of fencing is present. The gate shall be large enough to facilitate entrance/exit of rail traffic, as is required for the specific corridor.

3.2.1.5 For gates at GO railway corridors, refer to Metrolinx Fencing and Anti-Trespassing Requirements (RC-0401-06) document.

3.2.2 Exterior Bollards

3.2.2.1 Permanent bollards shall comply with the requirements in Metrolinx Design Standards.

3.2.2.2 Exterior bollards at customer-facing facilities, such as a station, shall be:

a) 20MPa concrete-filled 6 mm thick Type 316 stainless steel pipe with a satin finish; or

b) 20MPa concrete-filled 6 mm galvanized steel pipe, protected with a 3 mm thick Type 316 stainless steel cover, satin finish in areas with higher safety requirements and only at non-customer-facing locations.

3.2.2.3 Exterior bollards at non-customer-facing facilities, such as maintenance facilities, shall be:

a) 20MPa concrete-filled 6 mm thick galvanized steel pipe, protected with a 3 mm thick polyethylene “safety yellow” coloured cover; or

b) 20MPa concrete-filled 6 mm galvanized steel pipe, protected with a 3 mm thick Type 316 stainless steel cover, satin finish.

3.2.2.4 Minimum diameter of the bollards shall be 200 mm;

3.2.2.5 The steel pipe shall conform to CSA G420.20, Class H and CSA G40.21 Grade 350W.

3.2.2.6 Exterior bollards shall have a separate footing with a minimum depth of 1200 mm to prevent frost heaving.

3.2.2.7 Bollards shall project between 1,000 mm to 1,200 mm above grade.

3.2.2.8 Bollards shall have two 50 mm contrasting reflective bands around the circumference of the bollard at a designated recessed space:

a) The top band shall be located 80 mm below the top surface; and

b) The lower band shall be located 150 mm below the top band.

3.2.2.9 Bollards shall be finished with a crown top to prevent standing water from collecting on flat surfaces.

3.2.2.10 Retractable and removable bollards shall follow the requirements of fixed bollards with the following additions:

a) Bollard design shall meet minimum M30 and P1 criteria as per ASTM F2656;

b) Receiver below grade shall be permanently installed with a top that is flush with the pavement and a cap to prevent dirt accumulation while the post is removed; and

c) Removable posts shall be provided that can be manually lifted out of the receiver to provide access.

d) An exposed locking mechanism shall be provided with a padlock keyed to the line master. Access shall be vandal-resistant and shall not be easily tampered with.

3.2.3 Impact-Resistant Planter Box

3.2.3.1 Impact-resistant planter boxes may be required on station properties as a decorative alternative to bollards. The requirements for this asset are as follows:

a) Planter boxes shall be designed to resist the impact of a vehicle travelling at a minimum speed of 50 km/h, preventing penetration or toppling upon impact;

b) Planter boxes shall be designed with reinforced concrete, in accordance with CSA 23.1, with a minimum compressive strength of 30MPa at 28 days and an exposure class of C-1;

c) Planter box height shall range from 600 mm to 900 mm to effectively block vehicles while maintaining aesthetic appeal;

d) The base shall have a minimum width of 600 mm to prevent tipping or displacement;

e) Planter boxes shall include a drainage system to prevent excess water accumulation, which could compromise structural integrity or create slip hazards to adjacent walkways; and

f) A waterproof liner or approved alternative shall be included on the interior side of the planter box.

3.2.4 Guide Rails, Guards and Railings

3.2.4.1 The location, dimension, and style of all guide rails, guards and railings shall conform to the Ontario Building Code, Metrolinx Design Standards, and the DRM.

3.2.4.2 Materials used shall be corrosion-resistant, such as stainless steel or galvanized steel.

3.2.4.3 Guide rail design shall comply with the MTO Roadside Design Manual. At a minimum, guide rails shall use a semi-rigid system. Where sufficient working width is not available, or where excessive deformation upon impact could damage adjacent features (e.g., light posts, utilities, or structures), a rigid system shall be used to limit deflection.

3.2.4.4 The base of guards and railings shall be fastened to the ground using base plates and compatible anchor bolts to prevent galvanic reactions.

3.2.5 Exterior Tactile Walking Surface Indicators (TWSI)

3.2.5.1 Exterior Tactile Walking Surface Indicators (TWSI) may be required on station properties to alert people with low or no vision of potential hazards. The requirements for this asset are as follows:

a) Placement of TWSI shall comply with the Metrolinx Universal Design Standard (DS-02); and

b) TWSI at locations other than platform edges shall be cast iron and conform to requirements of CSA B651 and Ontario Regulation 191/11. Performance criteria shall meet or exceed the values specified in Table 3.

Table 3: Minimum Requirements for Tactile Walking Surface Indicators (TWSI)

Standard	Property	Minimum Result
ASTM A 48	tensile strength	class 30 B
ASTM C 1028	slip resistance	dry 0.8 min, wet 0.65 min
ASTM C 501-84	wear resistance	wear index: > 15

3.2.5.2 TWSI plates shall be positioned to avoid interference with utility maintenance hole covers and hand wells; and

3.2.5.3 TWSI at the edge of rail platforms shall comply with PC-001 New Tactile Tile Installation on New Rail Platform Curb and PC-002 New Tactile Tile Installation on Existing Rail Platform Curb.