

FACILITIES BUILDING ENVELOPE STANDARD - WATERPROOFING

MX-FAE-STD-C009

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Facilities Building Envelope Standard - Waterproofing

MX-FAE-STD-C009

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Preface

This is the first edition of the Facilities Building Envelope Standard–Waterproofing (MX-FAE-STD-C009). 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 Building Envelope Standard–Waterproofing (MX-FAE-STD-C009) 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.

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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 design requirements for new waterproofing systems for stations and facility structures.

1.2 Scope

- 1.2.1 Waterproofing systems typically include multiple key components such as waterproofing membranes, protection boards, drainage boards, reinforcement layers, sealants, expansion joints, and protective coatings. These systems are installed on one (1) surface of a structural element to create an impervious barrier against water and moisture penetration. This includes surfaces located above grade, on grade or below grade, which may be horizontal or vertical.
- 1.2.2 The design of waterproofing systems applies to a range of structures, including but not limited to parking garages, pedestrian tunnels, pedestrian bridges, suspended slabs, slabs-on-grade, foundation walls, elevator pits, and other facility elements. This standard excludes facility roofing systems.
- 1.2.3 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
Blindside Waterproofing	A waterproofing system that is installed before the structural element, such as a foundation wall, is constructed, typically against a soil-retaining system.
Cold Joint	An unintentional joint where new concrete is poured against hardened concrete, requiring watertight treatment.
Construction Joint	An intentional joint created at the interface between concrete placements, requiring a watertight treatment.
Crack-Bridging	The ability of a waterproofing membrane to stretch across cracks and accommodate movement without failure.
Drainage Board	A board used in combination with a waterproofing membrane to channel water away from structures.
Elastomeric	A material property indicating flexibility.
Elevator Pit	A below-grade compartment designed to house the lowest portion of an elevator system.
Expansion Joint	A joint that allows for expansion and contraction of the structure caused by temperature changes or structural loads without distress.
Flashings	Protective components (membrane or metal) used to prevent water penetration at joints or transitions.
Hydrostatic Conditions	Conditions where water pressure is exerted against below-grade structural elements.

Term	Definition
Leakage Criteria	Defined limits for allowable water penetration in a waterproofed structure.
Penetrations	Openings or holes through a waterproofing system, such as for pipes or conduits.
Reglet	A thin strip or saw cut at terminations.
Service Life	The expected duration a waterproofing system remains effective under normal conditions.
Substrate	The surface onto which the waterproofing membrane is applied.
Surface Preparation	The process of conditioning a substrate to ensure proper adhesion with the waterproofing membrane.
Terminations	Endpoints or edges of a waterproofing membrane where it must be properly sealed.
Traffic Coating	A protective coating applied to surfaces to resist wear and provide skid resistance.
Transitions	Areas where different materials or surfaces meet within the waterproofing system.
Waterproofing System	A multi-component system applied to structures to prevent water, moisture, and chemical ingress.
Waterstop	A material embedded in joints to prevent water ingress.
Weeping Tile	A perforated pipe at the perimeter of foundations to collect and redirect groundwater away from structures.

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
OBC	Ontario Building Code
QA/QC	Quality Assurance and Quality Control
PVC	Polyvinyl Chloride

3. Waterproofing

3.1 Design Requirements

3.1.1 General Requirements

- 3.1.1.1 Design and incorporate a continuous exterior waterproofing system for all stations and facilities, ensuring coverage of all below-grade areas, including below the slab, to protect the structure and prevent water, moisture, and chemical ingress to the building interior.
- 3.1.1.2 The waterproofing design shall be comprised of specifications and design drawings that include project-specific details. Details shall include, but not be limited to, each typical and atypical condition, comprising substrate types, corner and edge conditions, flashings, penetrations, transitions, and terminations.
- 3.1.1.3 All components of the waterproofing system shall be sourced from a single manufacturer whenever feasible. When tying into an existing system where different waterproofing materials may be present, ensure full compatibility between the systems. Provide detailed interface drawings that clearly indicate tie-in points and overlap dimensions to facilitate proper integration and performance.

3.1.2 Performance Requirements

- 3.1.2.1 The waterproofing system of structures shall have a predicted service life of twenty (20) years, except for thin traffic coating systems, which shall have a predicted service life of fifteen (15) years.
- 3.1.2.2 The waterproofing system shall have crack-bridging properties and be fully bonded to the substrate under applicable service conditions, including cold weather conditions where applicable.
- 3.1.2.3 Thin traffic coating systems shall resist traffic wear, skidding, and damage under its intended use in all expected environmental conditions (e.g., wet, dry, snow, chemical, UV). Additional coat(s) shall be designed for driving aisles, ramps, and turn areas.
- 3.1.2.4 Expansion joint systems shall be pre-formed/pre-compressed or self-expanding and be capable of accommodating multi-directional movement, including horizontal shear movement. The joint system shall be sized by the manufacturer and/or consultant to accommodate the total range of movement at each joint location. Expansion joint systems within or below an occupied space shall comply with the minimum fire rating as required in the Ontario Building Code (OBC). For horizontal surfaces experiencing vehicular or pedestrian traffic, design a system with an elastomeric hinged cover system or an approved equivalent.
- 3.1.2.5 Membrane reinforcement shall be incorporated into liquid-applied waterproofing systems.

- 3.1.2.6 When detailing, ensure a minimum upturn and downturn of 150 mm onto horizontal and vertical surfaces and a minimum overlap of 300 mm when tying into existing systems or as required by the manufacturer, whichever is greater.
- 3.1.2.7 All horizontal concrete structures (e.g., slab-on-grade, staircases, and landings, etc.) where water vapour may pass through or become trapped below the slab shall be coated with a breathable penetrating sealer, such as a 100% silane-based sealer or siloxane sealer. Impermeable coatings may be designed for on-grade structures with vapour barriers and insulation layers below the concrete structure.

3.2 Asset Specific Requirements

3.2.1 Below Grade Structures

- 3.2.1.1 Design a waterproofing system that is adhered to the positive (exterior) side of the structure with at least one (1) impermeable non-expansive layer. Below-grade waterproofing systems can either be pre-applied (blindsided) before the foundation walls are constructed or post-applied after the foundation walls are in place.
- 3.2.1.2 Where below-grade concrete structures (e.g., foundation walls, caisson walls, knee walls, and others) extrude above grade, the waterproofing system shall also be carried above grade. The termination point of the system shall be properly designed to:
 - a) Protect the waterproofing upturn from environmental exposure;
 - b) Prevent water intrusion between the waterproofing system and structure; and
 - c) Conceal the waterproofing membrane from view, where exposed conditions would otherwise result in an unfinished appearance.
- 3.2.1.3 Acceptable methods of terminating the waterproofing upturn include overlapping with the exterior cladding system waterproofing, terminating into a concrete reglet, or sealing with a metal termination bar. Where the waterproofing membrane remains visible above grade, prefabricated metal flashings shall be installed to protect the membrane and conceal it from view.
- 3.2.1.4 Drainage board and weeping tile systems shall be designed in combination with the waterproofing system and site-specific requirements. Drainage boards shall be provided, at minimum, from grade level down to 1 m below the design groundwater table.
- 3.2.1.5 At blindsided applications, all tie-holes and tie-back connections shall be fully sealed as per the manufacturer's recommendations. Ensure the waterproofing system design fully seals all exposed fasteners used to secure the membrane, thereby maintaining membrane continuity and integrity.

- 3.2.1.6 All construction and cold joints in below-grade cast-in-place concrete structures shall be watertight, with at least three (3) layers of internal leak protection, consisting of one (1) layer of PVC waterstop and two (2) additional layers of hydrophilic waterstop. Where wall thickness prevents proper spacing for three (3) layers, two (2) layers may be used with sufficient separation per manufacturer requirements, subject to technical justification and approval by the Owner of this Standard.
- 3.2.1.7 Provide tie-in between above-grade and below-grade waterproofing systems.
- 3.2.1.8 Elevator pit shells (horizontal slab and vertical walls) shall be waterproofed with a positive side waterproofing system. In scenarios where the pit does not have an independent foundation (e.g., the design incorporates grade beams, depression into a mat foundation, pile foundations, etc.), submit alternative positive side designs to the Owner of this Standard for review.

3.3 Quality Assurance and Quality Control (QA/QC)

- 3.3.1 The following QA/QC activities shall be included in the project agreement to ensure proper documentation and certification by the Professional Engineer responsible for the design throughout construction. At project completion, all QA/QC documentation shall be submitted to the Owner of this Standard for review and approval.
 - a) Surface Preparation: Documentation confirming that surface preparation followed manufacturer guidelines, explicitly prohibiting chemical solvents and torch drying of the substrate;
 - b) Quality Control and Assurance Protocols: Certification from the manufacturer confirming their representation during surface preparation and system application, compatibility and compliance certifications from the manufacturer, and reports from independent third-party testing and verification of the installation process;
 - c) Experience and Qualification of Applicators: Documentation demonstrating that only qualified applicators with a minimum of five (5) years' experience and manufacturer approval executed the installation, including details of training and certification requirements fulfilled by the applicators;
 - d) Inspection and Testing: Reports of independent site inspections and in-situ material testing, including membrane thickness, adhesion tests, and localized water leakage tests as recommended by the manufacturer and consultant. Documentation of inspections and testing carried out prior to backfill for below-grade structures, along with a schedule detailing the frequency of these tests and the criteria for acceptable results; and
 - e) Allowable Water Leakage Rates: Project documents shall incorporate definitions of clear and measurable water leakage criteria appropriate to the structure's intended use and moisture exposure. The criteria shall include specific limits and detail how leakage rates are to be assessed (e.g., visual inspection, touch, equipment-based measurements, or other appropriate methods).