FACILITIES CIVIL ENGINEERING STANDARD – WATER SUPPLY SYSTEMS

MX-FAE-STD-C003

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METROLINX

Facilities Civil Engineering Standard – Water Supply Systems

MX-FAE-STD-C003

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Preface

This is the first edition of the Facilities Civil Engineering Standard—Water Supply Systems (MX-FAE-STD-C003). 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—Water Supply Systems (MX-FAE-STD-C003) 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.

October 2025

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1. General

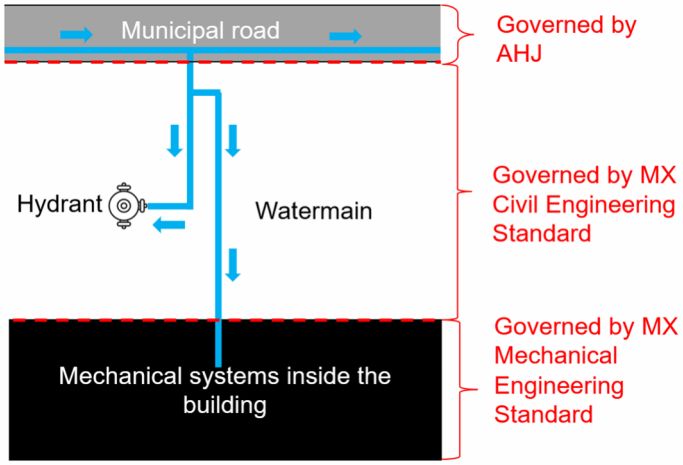
1.1 Purpose

1.1.1 This standard outlines the design requirements for potable and fire protection water supply systems at Metrolinx stations and facilities.

1.2 Scope

1.2.1 This standard applies to the water system and associated appurtenances that typically extend from the municipal right of way or municipal water system and connect to the exterior of the buildings on Metrolinx sites, as per Figure 1.

Figure 1: Schematic Diagram showing Scope Delineation



1.2.2 The following items are excluded from this standard:

a) Systems that are installed within a rail corridor, outside the stations and/or facility footprint;

b) Systems that cross the rail corridor at a station and/or facility (the portion of the system that is installed underneath the rail corridor);

c) Systems within a Bus Rapid Transit (BRT) or Light Rail Transit (LRT) corridors, outside of BRT and LRT stations;

d) Rail maintenance and storage facilities; and

e) Mechanical systems located within buildings, tunnels, and/or other structures at Metrolinx stations and facilities.

1.2.3 The requirements in this standard are specific to Metrolinx assets and are intended to supplement the requirements that are dictated by the Authority Having

Jurisdiction (AHJ), which is typically the municipality where the site is located, responsible for water supply and fire protection.

1.2.4 The requirements for water systems are based on the principles, methods and practices stipulated in the following documents:

a) The Ontario Building Code (OBC);

b) National Fire Protection Association (NFPA) 24;

c) MECP Design Guidelines for Drinking Water Systems (DGDWS); and

d) Fire Underwriters Survey (FUS).

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
Backflow Prevention Device	A mechanical device that prevents contaminated water from the building from flowing back into the clean water supply.
Corrosion Protection	Methods used to prevent watermain and valve corrosion, including coatings, cathodic protection, and non-corrosive alloys.
Distribution System	The network of pipes, valves, and meters that transport potable water from the municipal system to Metrolinx facilities.
Fire Flow	The amount of water available for firefighting, calculated based on demand and system capacity.
Hydrant	A water supply outlet used by fire services, which shall meet clearance and protection requirements.
Isolation Valve	A valve that allows sections of the water supply system to be shut off for maintenance without disrupting the entire network.
Metering	The measurement of water consumption using water meters to track flow rates and pressure.
Potable Water	Water that meets health and safety standards for drinking and consumption.
Standalone System	A self-contained water system for facilities not connected to municipal water services.
Thrust Block	A reinforced concrete support that prevents movement of pipes due to internal water pressure.
Tracer Wire	A conductive wire placed alongside non-metallic pipes to aid in locating underground infrastructure.

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
AHJ	Authority Having Jurisdiction
AWWA	American Water Works Association
CSA	Canadian Standards Association
DS	Design Standard (Metrolinx)
FUS	Fire Underwriters Survey
MECP	Ministry of the Environment, Conservation and Parks
NFPA	National Fire Protection Association
OBC	Ontario Building Code
OPSS	Ontario Provincial Standard Specification
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance / Quality Control
MECP	Ministry of Environment, Conservation & Parks

3. Water Supply Systems

3.1 Design Requirements

3.1.1 Design Responsibility

3.1.1.1 The design of water supply systems shall be undertaken and sealed by a Professional Engineer licensed to practise in the Province of Ontario.

3.1.2 Water Demand

3.1.2.1 Potable water demand at Metrolinx stations shall be calculated as per local AHJ requirements.

3.1.2.2 Actual water usage at Metrolinx sites may vary significantly from the design flow rates prescribed by the AHJ, which often assume lower demand than what may occur in practice. During the design of potable water supply systems, account for factors such as stagnation resulting from actual site-specific usage patterns and implement appropriate mitigation measures as required.

3.1.2.3 The fire demand calculations shall account for the main station as well as all auxiliary structures on site.

3.1.3 Distribution System Capacity

3.1.3.1 Consultation with the AHJ regarding distribution system capacity is required. A hydraulic assessment shall be performed, if required by the AHJ. Flow and pressure testing of municipal hydrants are required in support of fire service design.

3.1.4 Standalone Systems

3.1.4.1 All sites shall connect to a municipal water supply, unless it can be demonstrated that a local water supply connection is not available or inadequate, with agreement from both Metrolinx and the AHJ.

3.1.4.2 All standalone systems shall meet the requirements of NFPA 1142 or the AHJ's requirements, whichever is more stringent.

3.1.4.3 Where retrofits to a standalone site civil water system are proposed at a station or facility, a review of changes to the municipal supply surrounding the station shall be conducted. A connection to the municipal water supply and associated abandonment of the standalone system is required, should it be available at the time of system retrofit.

3.2 Computational Requirements

3.2.1 The calculation of required sizes of mains, valves, meters, and other relevant components shall be carried out in accordance with the design requirements of AHJ.

3.2.2 System pressures shall be verified to ensure compliance with the acceptable range specified by the AHJ.

3.3 General Design Requirements

3.3.1 All municipal service connections shall be designed in accordance with the requirements of AHJ and shall be subject to their approval.

3.3.2 A geotechnical report shall be prepared to support the design of the watermains, which shall include the following minimum design elements:

a) Bedding requirements;

b) Trench backfill requirements;

c) Dewatering requirements;

d) Soil disposal requirements;

e) Construction methodologies; and

f) Thrust block design.

3.3.3 The distribution system shall be designed to avoid dead-end sections or long hydrant leads that may lead to stagnation. If not deemed possible, the Professional Engineer responsible for the design shall review the need for ongoing system flushing. If it is determined that regular flushing of the system is required, auto-flushing stations shall be installed to facilitate maintenance and operations.

3.3.4 Clearances between all watermains and sewers shall follow requirements by Ontario Procedure F-6-1, as amended.

3.3.5 Tracer wire is required on all PVC components of the system such that watermains and hydrant laterals can be traced without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.

3.3.6 Existing water systems that will be abandoned or are already abandoned shall be removed where encountered during station retrofit projects to avoid constraints on future projects. Exceptions may be made if technical justifications demonstrate long-term cost benefits for abandoning the system in place, subject to approval by the Owner of this Standard.

3.4 Asset Specific Design Requirements

3.4.1 Watermains (Potable and Fire Supply)

3.4.1.1 Corrosion protection shall be achieved either directly through non-corrosive alloys or protective coatings in accordance with manufacturer's recommendations or indirectly through cathodic protection in accordance with OPSS.MUNI 442.

3.4.1.2 Corrosion protection is required where new metallic components are used. If a station retrofit involving watermain works is undertaken, any existing metallic components within the construction zone are to be corrosion-protected.

3.4.1.3 Thrust blocks shall be used where joint restraints are required.

3.4.1.4 Pipe sizes smaller than those required by the AHJ for their infrastructure may be used if they meet the requirements of the OBC. For ease of maintenance, pipes shall be sloped at a minimum of 0.25% to allow for gravity drainage.

3.4.1.5 All watermains and appurtenances shall have a minimum ground cover of 1.75 m. At watercourses, creeks, culverts, and ditches, a minimum of 1.2 m ground cover from the obvert to the finish grade is permitted when adequate frost protection is provided. The maximum ground cover shall not exceed 2.25 m, except in areas of conflict with other utilities.

3.4.2 Hydrant Requirements

3.4.2.1 Hydrant specifications shall meet the requirements of the AHJ.

3.4.2.2 Hydrants shall be located, where possible, in low-traffic areas that offer clear, unobstructed visibility from the site's designated fire route, including during all seasons and lighting conditions. The siting of hydrants shall be planned to minimize impacts on the customer experience during maintenance and inspection activities.

3.4.2.3 Where visibility may be problematic, hydrants are to be raised or flagged.

3.4.2.4 A minimum clearance of at least 1 m shall be maintained from all above-ground obstructions.

3.4.2.5 Hydrant access shall remain fully unobstructed during and after snow removal operations. The need for manual snow clearing around hydrants shall be minimized through appropriate siting and layout design.

3.4.2.6 Impact protection is required within 2 m of vehicle traffic areas. Protection measures shall not block the hydrant nozzle cap.

3.4.2.7 An isolation valve and box shall be installed at all hydrants and be located no more than 1 m away from the hydrant.

3.4.3 Valves

3.4.3.1 Valves shall be located in parking lot drive aisles or landscaped areas within 3 m of parking lot drive aisles. High-vehicular and pedestrian traffic areas, requiring traffic controls for valve operation, shall be avoided wherever possible.

3.4.3.2 Where the water supply system services multiple buildings or facilities on a site, valves shall be installed to allow isolation of the various buildings or facilities in the event of maintenance issues, so that one location can be shut off without impacting other areas requiring water.

3.4.3.3 Where a watermain crosses the railway corridor, valves shall be located within the station footprint on both sides of the corridor to allow for the railway crossing to be turned off.

3.4.3.4 Gate valves shall be used, unless technical justification for the use of other options is provided for review and approval by the Owner of this Standard.

3.4.3.5 Any valves that are to be operated primarily by Metrolinx staff shall be opened counterclockwise. This would exclude valves located at the property line or on hydrant leads where the AHJ is the primary user.

3.4.4 Metering

3.4.4.1 Water meters on Metrolinx sites shall be designed and installed as required by the AHJ.

3.4.4.2 Where options for various meters are available, ensure the meter(s) selected do not impact the water pressure of the servicing system on the site.

3.4.4.3 Meters shall be installed in a location that minimizes impact on the customer experience during inspection and maintenance.

3.4.4.4 Sub-metering of the water system shall be completed as per Metrolinx Sustainable Design Standard (DS-05).

3.4.5 Water Reclamation Systems

3.4.5.1 The design of water reuse systems shall meet the OBC and AHJ requirements, and follow the requirements of the Metrolinx Sustainable Design Standard (DS-05).

3.4.6 Backflow Prevention Devices

3.4.6.1 Where backflow prevention devices are used, the design shall meet requirements from the AHJ.

3.5 Quality Assurance & Quality Control (QA/QC)

3.5.1 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) All watermains shall be cleaned and disinfected. Procedures for cleaning and disinfection shall be as per the governing AHJ;

b) All water systems shall be pressure tested;

c) Tracer wire continuity testing shall be completed;

d) All hydrants and valves are to be exercised to ensure that they are both accessible and operational; and

e) Successful completion of all QA/QC measures shall be certified by the Professional Engineer responsible for the design, in a memo documenting all work completed.