



REGIONAL MUNICIPALITY
OF **WOOD BUFFALO**



2025

DESIGN SERVICING STANDARDS AND DEVELOPMENT PROCEDURES

Disclaimer

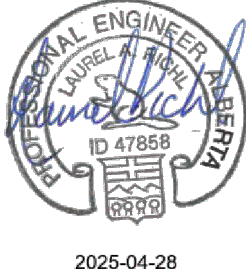
This document was developed for establishing standards and guidelines for the Regional Municipality of Wood Buffalo's expectations in the design and construction of Public Infrastructure. Care has been taken to confirm the accuracy of the information contained herein. The views expressed herein do not necessarily represent those of any individual or contributor. Public Infrastructure design continually evolves, and practices change and improve over time, so it is necessary to regularly consult relevant technical standards, codes, and other publications rather than relying on this publication exclusively.

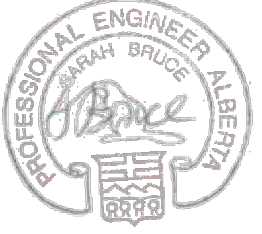
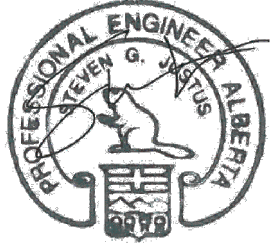
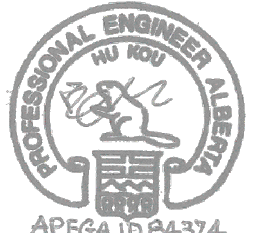
The Regional Municipality of Wood Buffalo and the authors of this document, Associated Engineering Alberta Ltd., want to convey that this document does not constitute a project-specific design. As such, no part of this guideline alleviates the responsibility of the professionals retained to design and construct specific projects from taking full responsibility for and Authenticating their designs, as required, in accordance with the requirements of Alberta Association of Landscape Architects, Association of Professional Engineers and Geoscientists of Alberta, Alberta Association of Architects, the *National Building Code of Canada - Alberta Edition*, and any other statutory requirements.

Standard Details, figures, and specifications are provided to convey the Regional Municipality of Wood Buffalo's typical requirements. Representations may not be to scale, may be substantially schematic in nature, and/or may require further elaboration and development. As such, those articles that are not suitable for integration into a specific design without review and modification and are only intended for use by a competent designer exercising professional judgement. The designer shall modify and supplement as necessary to provide a complete, properly functioning design that conforms, in all respects, to the Regional Municipality of Wood Buffalo's functional requirements. When integrated into a particular design, it is the designer's responsibility to ensure all components and specifications are suitable and safe for the use and location intended, and to ensure all applicable codes, legislative requirements, and the requirements of the authority(ies) having jurisdiction are adhered to. In addition, any accessibility, operational, and maintenance requirements must be met.

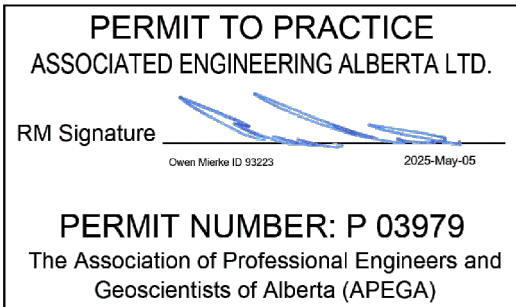
Deviations from the represented nominal design parameters, questions of intent or accuracy, or any other apparent conflicts, shall be reconciled with an appropriate Regional Municipality of Wood Buffalo representative. Finally, when employing any aspect of this document, the ultimately responsible professional designer shall remove any Authentication of the original author(s), note any provenance as appropriate, and apply their own Authentication, as required.

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Note: All revisions shall be accompanied by a letter Authenticated by the Professional(s) of Record. Append letters in pages following Revision History table as required.

1 INTRODUCTION TO STANDARDS

1.1 Foreword

This document is applicable to both capital works projects completed by the Municipality and development projects completed by Developers. This document is intended to provide information and define minimum acceptable standards to interested parties requiring knowledge of the principles governing the development of land and installation of Public Infrastructure within the Municipality.

It is the responsibility of the Municipality, Developers, Consulting Engineers, and Contractors to apply sound engineering principles and industry best practices to provide an end product that is practical, economical, efficient, safe, and sustainable to operate and maintain by the Municipality. Any Deviation from these standards requires a written request to the Municipality for approval prior to implementation.

This document is available on the Municipality's website and will be reviewed and updated as necessary to remain current with the Municipal Development Plan, related Strategic Plans, and industry best practices, and to remain in compliance with regulatory requirements. Revised documents will be uploaded to the Municipality's website. Users of this document are required to refer to the Municipality's website periodically to ensure they have the latest edition.

These standards have been prepared based on municipal and provincial regulations and standards as well as industry best practices. If any standards set forth in this document contradict other applicable industry standards, the more stringent standards shall apply. Where these standards refer to bylaws, policies, acts, guidelines, regulations, or standards, this shall mean the most recent edition or amendments of the referenced document.

1.2 Scope

These standards and procedures apply to the preparation and submission of Development Briefs, Engineering Design Briefs, Area Structure Plans, Outline Plans, Preliminary and Detailed Engineering Drawings, and the construction of the following Public Infrastructure in both rural and urban communities within the Municipality:

- **Roadways**, sidewalks, curbs and gutters, and alleys.
- **Sanitary sewer** and **storm drainage** collection systems and related appurtenances, lot servicing and grading, and stormwater management facilities.
- **Water distribution** systems for potable water and fire protection and lot servicing.
- **Shallow Utilities** (i.e., gas, power, telephone, fibre, and cable).
- **Mechanical Plants** including reservoirs, pumphouses, and lift stations.
- **Landscaping** including hard and soft elements and walkway systems.

These standards apply to the design and construction of new infrastructure and the rehabilitation of existing infrastructure. Modifications to these standards may be required in older neighbourhoods (e.g., due to right-of-way restrictions) which the Municipality acknowledges and typically does not consider a Deviation to these standards.

1.3 Definitions

In this document, the following words shall have the meaning hereinafter assigned to them. Words with definitions provided are capitalized throughout this document.

Term	Definition
Alberta Environment	The provincial ministry responsible for environmental policy and sustainable resource development. Known as the Ministry of Environment and Protected Areas, or EPA (2023). This general term is intended to encompass any future changes in department naming.
Alberta Transportation	The provincial ministry responsible for providing a safe and efficient transportation system. Known as the Ministry of Transportation and Economic Corridors, or TRAN (2023). This general term is intended to encompass any future changes in department naming.
Appropriate (Landscape) Maintenance	Maintenance suitable to the time of year, soil conditions, weather conditions, and condition of plant material, to ensure plant material can sustain healthy growth.
Area Structure Plan (ASP)	Provides the framework for developing and servicing new areas of the Municipality. Must include the proposed sequence of development for the area, land uses and population density(ies), general location of major transportation routes and Public Infrastructure, and any matters considered necessary by Council. Active ASPs are on the Municipality's website.
Authenticated	A professional work product that has been signed and sealed by a Professional Engineer (registered in the Province of Alberta and in good standing with APEGA) and which has the consultant's Permit to Practice stamp applied and signed. An Authenticated professional work product indicates that an APEGA licensed professional has overseen the work and is assuming technical responsibility for the professional work product.
BearSmart	A public awareness program which aims to reduce conflict between bears and people. BearSmart's goals are to provide people with information to make safe decisions when in bear territory, to help bear populations survive, and to reduce property damage caused by bears.
Best Management Practices (BMPs)	Methods designed to minimize the risk of releasing pollutants to receiving waters and streams. BMPs operate by trapping stormwater runoff and detaining it until pollutants (e.g., sediment, phosphorous, and other harmful contaminants) can settle out or be filtered through the underlying soils.
Biophysical Assessment	An assessment of the biological and physical elements of an ecosystem, including geology, topography, hydrology, and soils.
Caliper	Diameter measurement of the stem or trunk of nursery stock. Location of the measurement depends on the plant type. For fruit trees, understock, and seedling trees/shrubs, measurement shall be taken at points described in ANSI Z60.1. Otherwise, measurement shall be taken 150 mm above the ground level (field grown stock), from the soil line, at or near the top of the Root Flare (container grown stock), or 150 mm above the Root Flare (bare root plants 100 mm to 114 mm). If the measurement at 150 mm is 114 mm or more, the Caliper shall be measured at 300 mm above the ground level, soil line, or Root Flare, as appropriate.
Canopy	A layer or multiple layers of branches and foliage at the top or crown of a tree.

Term	Definition
Clear Zone	The roadside area immediately adjacent to the outer travelled lane, clear of hazards, which may be used safely by errant vehicles.
Collected Plants	Plants dug from native stands, wood lots, orchards, or neglected nurseries and which have not received Appropriate Maintenance as advocated by the CNLA.
Construction Completion Certificate (CCC)	A certificate prepared by the Owner's Consultant and issued by the Municipality confirming that the work is complete and operational, that all deficiencies have been resolved to the satisfaction of the Municipality, and that the Warranty Period for the work can commence.
Consulting Engineer	The Professional Engineer, in good standing with APEGA, responsible for the design drawings and specifications of Public Infrastructure, supervision of the work, certification that the materials and installation are in accordance with these standards, recording and reporting of as-constructed information, and performing those duties with the standard of care prescribed by APEGA.
Contractor	Any qualified person, persons, or corporation which shall undertake the installation of Public Infrastructure and services on behalf of either the Developer or the Municipality.
Diameter-Breast-Height (DBH)	The diameter of the tree's main stem or trunk as measured at breast height (1.2 m) above ground level. Used for tree valuations and/or assessments.
Developable Area - Gross	Gross Developable Area refers to the total land area of a development application, including developed and undeveloped land, less Environmental Reserve.
Developable Area - Net	Net Developable Area refers to the total land area of a development that can be populated or occupied. Net Developable Area excludes roadways, stormwater management facilities, parks, school space, and Environmental Reserve.
Developer	A person, persons, or corporation which has applied to subdivide and/or develop or to service an existing parcel of land, whether as the owner or an agent for the owner of the land.
Development Agreement	A legal contract for a development setting out the terms and conditions under which development of the land is to take place within the Municipality, including the responsibility to construct public facilities and associated financial obligations.
Development Brief	A document prepared by the Developer or Consulting Engineer providing a planning and development overview of a project.
Deviation	A departure or alternative to these standards. A request for Deviation must be made through a formal (written) request that must be submitted to the Municipality prior to implementation. The request for Deviation must include a recommendation from the Consulting Engineer and must be approved by the Municipality.
Drainage Parkway	A type of ditch which may be used to convey stormwater through or around a development.
Easement	An agreement, usually registered on the certificate of title for the property, that gives the Municipality the right to use a landowner's property in some way (such as to access a utility). Easements can also partially restrict a landowner's use of the affected portions of land.
Engineering Design Brief	A document containing all the technical documentation supporting the project as described in a Development Brief or Outline Plan.

Term	Definition
Environmental Reserve (ER)	Land owned by the Municipality to be preserved in its natural state. Environmental Reserve swamps, gullies, ravines, natural drainage courses, floodplains, and shorelines are defined in section 664 of the <i>Municipal Government Act</i> .
Final Acceptance Certificate (FAC)	A certificate prepared by the Owner's Consultant and issued by the Municipality confirming that the work is complete and acceptable to the Municipality, that all deficiencies and Maintenance work have been resolved to the satisfaction of the Municipality, and that the Warranty Period for the work has expired.
FireSmart / FireSmart Canada	A national program that helps Canadians increase neighbourhood resilience to wildfire and minimize its negative impacts. FireSmart helps protect homes and communities from the threat of wildfire while balancing the benefits of wildfire on the landscape by preparing for the threat of wildfire. It is a shared responsibility of homeowners, the industry, and government.
Franchise(d) Utilities	Utilities that are provided by an independent service provider who pays franchise fees to the Municipality for access to municipal land and the exclusive right to provide distribution through a Franchise Agreement. In the Municipality, this includes gas and electrical power.
Geographic Information System (GIS)	A tool for collecting, managing, analyzing, and presenting geographic data. GIS organizes layers of information into maps and analyzes spatial location. The Municipality uses GIS data to keep a record of their assets.
Intensive Use Area	An area of high use, such as Class 1 trails, trail intersections and entrances/exits, play equipment areas, spray parks, and sports fields.
Issued for Construction (IFC) Documents	The contract drawings and specifications which have been issued by the Consulting Engineer for construction of the work. IFC Documents incorporate any revisions to the IFT Documents which may have been made during the tendering process.
Issued for Tender (IFT) Documents	The contract drawings and specifications which have been approved by the Municipality and issued by the Consulting Engineer for the purpose of competitive bidding by Contractors.
Landscape Consultant	A qualified landscape architect, in good standing with AALA, responsible for the design, layout, and supervision of installation of landscape and related work, recording as-constructed information, certifying the material and installation is in accordance with the standards, and design drawings and specifications, and performing those duties with the standard of care prescribed by AALA.
Landscape Development	All landscaping, outdoor recreation elements, and/or its protection in Public Open Spaces and boulevards as per Section 10 .
Letter of Credit	A letter issued by a bank or financial institution to the Municipality to serve as a guarantee (Security) for the proper performance of a Developer as defined by a Development Agreement.
Maintained Parks	Parks that require regular inspections and on-going maintenance such as grass cutting, irrigation, and trash removal.

Term	Definition
Maintenance	All repairs and/or replacements of any Municipal Improvements which may, at the Municipality's discretion, be necessary during the Warranty Period. The Owner is responsible for all Maintenance during the Warranty Period.
Master Plan	A document that outlines existing and future trends for the Municipality. Examples include utilities (Water, Sanitary, Stormwater) and Transportation Master Plans. These reports describe the status of the existing systems and plan for future expansion areas. Any required upgrades to the existing systems to support future expansion areas are also described.
Major System	Stormwater management facilities and surface flood paths, roadways, and watercourses which convey flows of a 100-year return frequency. The Major System includes culverts crossing roadways.
Minor System	Pipes/open channels which convey flows of a 5-year return frequency without surcharging.
Mulch	A material that is applied to the soil surface to reduce weed growth, retain soil moisture and moderate temperature extremes, prevent damage from lawn maintenance equipment, reduce Soil Erosion or soil splattering onto adjacent surfaces, improve soil quality through its eventual decomposition, and/or improve the aesthetic appearance of the landscape. Mulch can be composed of chipped, ground, or shredded organic material such as bark, wood, or recycled paper. It can also be of unmodified organic material such as seed hulls. Organic fibre blankets or mats can also act as Mulch.
Municipal Development Plan (MDP)	The council-approved planning document that outlines a strategic path to manage regional, rural, and urban growth subject to section 632 of the <i>Municipal Government Act</i> .
Municipal Improvements	A proposed development (such as a new subdivision), off-site upgrades required to support a proposed development, or rehabilitation of existing Public Infrastructure. Municipal Improvements are within public land and are the responsibility of the Owner; examples of Municipal Improvements include deep utilities, Shallow Utilities, roadways, alleys, streetlighting, landscaping, and earthworks.
Municipality	The Regional Municipality of Wood Buffalo. May also be abbreviated RMWB.
Municipal Reserve (MR)	Land owned by the Municipality for the development of parks and school grounds pursuant to sections 666 and 667 of the <i>Municipal Government Act</i> .
Municipal Services	Services provided by the Municipality upon construction completion acceptance; i.e., snow clearing and garbage collection.
Open Space / Public Open Space	Any parcel of land or body of water that is dedicated and reserved for public use, including Municipal and Environmental Reserves.
Outline Plan	A plan providing a more specific planning framework and servicing strategy for an area included in an ASP and conforms to the general principles and concepts established in the ASP. An Outline Plan is an intermediate plan between an ASP and a Tentative Plan of Subdivision.
Owner	The owner of the land; the leaseholder and/or permit holder where work is taking place. In a private development, the Owner is the Developer; in a capital works project, the Owner is the Municipality.

Term	Definition
Owner's Consultant	A Consulting Engineer, Landscape Consultant, or Alberta Land Surveyor hired by the Owner to assist with the design and to oversee construction of the proposed development.
Owner's Representative	A Consulting Engineer, Landscape Consultant, or Alberta Land Surveyor hired by the Owner to act on the Owner's behalf or the Owner when no representative is provided.
Parks, or Parks Branch	The Municipality's Parks Branch.
Partial Construction Completion Certificate	A certificate prepared by the Owner's Consultant and executed by the Municipality confirming that the work associated with a certain portion of the work (e.g., underground Municipal Improvements) is complete and operational, that all deficiencies have been resolved to the satisfaction of the Municipality, and that the Warranty Period for that portion of the work can commence.
Planning and Development Department	The Municipality's Planning and Development Department.
Prime Contractor	A company that, through a written, contractual agreement with the Owner, is responsible for coordination of all activities conducted on a worksite and ensuring OHS Legislation is followed. Without written assignment of Prime Contractor, the person with control over a worksite is deemed the Prime Contractor.
Public Infrastructure	Infrastructure owned and maintained by the Municipality, including utilities (water distribution system, sanitary collection system, and stormwater collection and management system), roadways, and Open Spaces.
Public Utility Lot (PUL)	Land required to be given under Division 8 of the <i>Municipal Government Act</i> for Public Infrastructure (e.g., utilities, walkways, etc.).
Record Drawings	A revised set of Authenticated drawings submitted by the Consulting Engineer to the Municipality upon completion of construction. Record Drawings reflect all changes made to the specifications and drawings during construction and include updated dimensions, lengths, elevations, geometry, etc. of the work.
Recreation Facilities	A building or place used predominantly for recreation, such as: tennis courts, play structures/equipment, sports fields, outdoor ice rinks, spray parks, skate parks, multi-purpose pads, and trails.
Roads, or Roads Branch	The Municipality's Roads Branch.
Roadside Safety	The design of the area between the outer edge of the roadway and the right-of-way limits.
Root Flare	The lower area of a tree where the roots visibly begin to flare out from the base of the trunk.
Seasonal Deficiency	A Municipal Improvement which cannot be completed due to the time of year (e.g., landscaping, concrete, paving, etc.) and which is deferred until the following construction season. Seasonal Deficiencies will not be included in the issuance of a CCC for completed work; Seasonal Deficiencies shall have a separate CCC, Warranty Period, and FAC.
Security	A financial guarantee given by the Developer to the Municipality, via a Letter of Credit (or other form acceptable to the Municipality), to ensure the due and proper performance of its obligations under the Development Agreement.

Term	Definition
Sedimentation	The settling out process of soil particles transported by water. Sedimentation can occur in slower moving, quiescent water bodies or in treatment facilities such as stormwater management facilities. Sediment can also be transported from sites into downstream stormwater infrastructure, potentially reducing the capacity of the stormwater drainage system.
Shallow Utilities	Utilities which can be installed within the frost zone, including Franchise Utilities (gas and power) as well as telecommunications.
Soil Erosion	The removal and loss of soil by the actions of wind, rainfall, or runoff. In construction activities, it is caused by the force of falling and flowing water, resulting in the detachment and transport of soil particles. It is a temporary occurrence that has the potential to carry significant amounts of sediment into storm sewers and watercourses during and immediately after rainstorm events.
Strategic Plan	A Council-approved planning document that sets priorities, directions, and desired outcomes to meet the goals set out in the MDP.
Substantial Performance Certificate (SPC)	A certificate prepared by the Consulting Engineer and executed by the Municipality confirming that the work is substantially complete, noting all deficiencies and Maintenance work that needs to be resolved to the satisfaction of the Municipality, and triggering the release of the major lien fund as defined by the <i>Prompt Payment and Construction Lien Act</i> .
Tangible Capital Assets (TCA)	An economic resource managed by the Municipality; can include roadways, buildings, equipment, land, utilities, stormwater management facilities, etc.
Temporary Protection	Fencing, barricades, signage, and/or other means of protection for a particular area such as newly seeded or sodded areas, partially constructed playgrounds, and existing plant material to be preserved.
Total Performance	Achieved when the work, with the exception of Warranty work, has been fully completed and verified by the Consulting Engineer.
Traffic Calming	The combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour, and improve conditions for non-motorized street users.
Traffic Impact Assessment (TIA)	A report prepared by the Consulting Engineer which investigates the impact a proposed development may have on traffic operations and recommends mitigation measures that may be required due to the proposed development.
Trap Low	A component of an overland drainage system, that may be located on public or privately owned lands, used to control and contain stormwater through the temporary storage of stormwater during or after high intensity rainfall events.
Tree Bed / Tree Well	Excavated area around a tree providing additional topsoil and water retention.
Tree Preservation	The protection of specific trees or an area, group, or woodland from damage or destruction.
Underground Services (UGS), or Underground Services Branch	The Municipality's Underground Services Branch.

Term	Definition
Urban Forest	Trees and associated vegetation located within an urban environment, whether planted or naturally occurring, such as in parks, natural or naturalized areas, the river valley, ravines, roadways, private yards, rooftops, commercial lands, and industrial lands are all part of the Urban Forest.
Urban Forest Management Strategy	A guiding document that outlines the Municipality's approach to plan, care for, and enhance the Urban Forest. Includes discussions on Urban Forestry, including best practices for care and management. Can also provide an understanding of existing resources.
Urban Forestry	The management of naturally occurring and planted trees and associated plants in urban areas.
Warranty Period	A minimum two-year period of time commencing with the execution of a Construction Completion Certificate and ending with the execution of a Final Acceptance Certificate.
Water Network Analysis (WNA)	A report, prepared by the Consulting Engineer, which demonstrates that the proposed water system is capable of meeting these standards based on system pressures, flow velocities, head losses, and flow rates and does not negatively impact adjacent areas or infrastructure.

1.4 Abbreviations and Acronyms

In this document, the following abbreviations and acronyms may be used.

Term	Definition
AALA	Alberta Association of Landscape Architects
AASHTO	American Association of State Highway and Transportation Officials
A-BUS	articulated bus
AC	asbestos cement pipe
ACI	American Concrete Institute
ACP	asphaltic concrete pavement
ADD	average day demand
AEDARSA	Alberta Elevating Devices and Amusement Rides Safety Association
AHU	air handling unit
ANSI	American National Standards Institute
APEC	areas of potential environmental concern
APEGA	Association of Professional Engineers and Geoscientists of Alberta
ARCA	Alberta Roofing Contractors Association
ARP	Area Redevelopment Plan
ARV	air release valve
ASCII	American standard code for information interchange

Term	Definition
ASME	American Society of Mechanical Engineers
ASP	Area Structure Plan
ASTM	American Society for Testing and Materials (now known as ASTM International)
ATD	A-train double (design vehicle)
AWG	American Wire Gauge
AWWA	American Water Works Association
BA	Biophysical Assessment
BC	beginning of curve
BLDG	building
BMP	best management practice
BMS	building management system
BOC	back of curb
BOW	back of walk
BP	Building Permit
BTD	B-train double (design vehicle)
BTUH	British thermal units per hour
C/C	centre to centre
C/W	complete with
CAD	computer aided design
CB	catch basin
CBMH	catch basin manhole
CBR	California bearing ratio
CCC	Construction Completion Certificate
CCIL	Canadian Council of Independent Laboratories
ccts	circuits
CCTV	closed-circuit television
CGSB	Canadian General Standards Board
CI	cast iron pipe
CL	centreline
CNLA	Canadian Nursery Landscape Association
CO	carbon monoxide
COC	contaminants of concern
COMM	community (park) (<i>abbreviated in Table 10-1</i>)

Term	Definition
CONC.	concrete
COR	Certificate of Recognition
CPC	Client Procedures Circular
CPP	concrete pressure pipe
CPTED	crime prevention through environmental design
CRU	commercial retail unit
CSA	Canadian Standards Association
CSM	conceptual site model
CSP	corrugated steel pipe
CTB	colour-dependent plot style table
D/S	downstream
D/W	driveway
DA	Development Agreement
DBH	diameter-breast-height
DCS	distributed control system
DI	ductile iron pipe
DIA.	diameter
DP	Development Permit
EC	end of curve
ECO	Environmental Construction Operations (Plan)
EIA	Environmental Impact Assessment
ELEM	elementary (school site) (<i>abbreviated in Table 10-1</i>)
ELEV.	elevation
EOG	edge of gravel
EOP	edge of pavement
EPA	Ministry of Environment and Protected Areas
EPEA	<i>Environmental Protection and Enhancement Act</i>
ER	Environmental Reserve
ERCB	Energy Resources Conservation Board
ESA	Environmental Site Assessment
ESAL	equivalent single axle load
ESC	erosion and sedimentation control
ETAP	electrical transient analyzer program

Term	Definition
FAC	Final Acceptance Certificate
FB	freeboard
FFE	finished floor elevation
FM	Factory Mutual
FOC	face of curb
FRP	fibre-reinforced polymer
FUS	Fire Underwriters Survey
GBC	granular base course
GHS	Globally Harmonized System for Classification and Labelling of Chemicals (formerly WHMIS)
GIS	geographic information system
GSBC	granular subbase course
H₂S	hydrogen sulfide
HART	Highway Addressable Remote Transducer
HDD	horizontal directional drilling
HDPE	high density polyethylene
HDR	high density residential
HGL	hydraulic grade line
HI	Hydraulics Institute
HMI	human machine interface
HPC	heterotrophic plate count
HRA	<i>Historical Resources Act</i>
HRIA	Historic Resource Impact Assessment
HSU	heavy single-unit truck (design vehicle)
Ht.	typical mature height (<i>abbreviated in approved plant material tables in Section 10</i>)
HVAC	heating, ventilation, and air conditioning
HWL	high water level
HYD	hydrant
I/I	inflow and infiltration
I-BUS	intercity bus
ID	inside diameter
IDF	intensity-duration-frequency
IEEE	Institute of Electrical and Electronics Engineers
IFC	Issued for Construction

Term	Definition
IFT	Issued for Tender
INV.	invert
IP	internet protocol
IPS	iron pipe size
ISA	International Society of Automation
IT	information technology
ITE	Institute of Transportation Engineers
JR	junior high school (site) (<i>abbreviated in Table 10-1</i>)
LDR	low density residential
LED	light-emitting diode (light)
LEL	lower explosive limit
LID	low impact development
LIT	level indicator transmitter
LOC	Letter of Credit
LOS	level of service
LPS	low-pressure sewer system
LSU	light single-unit truck (design vehicle)
LTF	lowest top of footing
LUB	Land Use Bylaw
LVC	length of vertical curve
MAX.	maximum
mbgs	metres below ground surface
MDP	Municipal Development Plan
MDR	medium density residential
MFR	multi-family residential
MGA	<i>Municipal Government Act</i>
MH	manhole
MICI	multi-family, industrial, commercial, and institutional
MIN.	minimum
MOS	maintained Open Space (<i>abbreviated in Table 10-3</i>)
MR	Municipal Reserve
MSU	medium single-unit truck (design vehicle)
MUA	make-up air

Term	Definition
MUT	multi-use trail
MUTCDC	Manual of Uniform Traffic Control Devices for Canada
NAD	North American Datum
NASSCO	National Association of Sewer Service Companies
NAV	National Aviation Society
NBC-AE	National Building Code – Alberta Edition
NBHD	neighbourhood (park) (<i>abbreviated in Table 10-1</i>)
NCHRP	National Cooperative Highway Research Program
NCS	National CAD Standard
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPSH	net positive suction head
NRS	non-rising stem
NSF	National Sanitation Foundation
NTS	not to scale
NWL	normal water level
O&M	operation and maintenance
O/C	on centre
OD	outside diameter
OGS	oil and grit separator
OHS	Occupational Health and Safety
OLA	off-leash area (<i>abbreviated in Table 10-3</i>)
OP	Occupancy Permit
PACP	Pipeline Assessment Certification Program
PDD	peak day demand
PDD+FF	peak day demand plus fire flow
PDF	portable document format
PE	Polyethylene
PF	peaking factor
PHD	peak hour demand
PL	property line
PLC	programmable logic controller
PMPZ	plant material protection zone

Term	Definition
PNEZD	point, northing, easting, elevation, and description
PP	Polypropylene
PRV	pressure reducing valve
PSV	pressure sustaining valve
PUL	Public Utility Lot
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RAP	reclaimed asphalt pavement
RCA	recycled concrete aggregates
RF	rolled face (curb)
RMWB	Regional Municipality of Wood Buffalo
ROW	right-of-way
RRFB	Rectangular Rapid Flashing Beacon
RSI	metric measurement of thermal resistance
RW	resilient wedge
RWSS	the Municipality's <i>Rural Water and Sanitary Servicing Guidelines</i>
S/W	sidewalk
SAN	sanitary (sewer)
SARA	<i>Species at Risk Act</i>
SCADA	supervisory control and data acquisition
SCM	Supply Chain Management
SD	standard detail
SF	straight face (curb)
SFR	single family residential
SI	International System of Units
SIDRA	signalized and unsignalized intersection design and research aid
SMART	Special Mobility Assistance Required Transportation
Sp.	typical mature spread (<i>abbreviated in approved plant material tables in Section 10</i>)
SPC	Substantial Performance Certificate
SPMDD	Standard Proctor Maximum Dry Density
STEP	septic tank effluent pump
STM	storm (sewer)

Term	Definition
SUP	shared use path
SWMF	stormwater management facility
TAC	Transportation Association of Canada
TCA	Tangible Capital Assets
TCP	transmission control protocol
TIA	Traffic Impact Assessment
TLC	Temporary Letter of Certification (issued by the Alberta Construction Safety Association)
TOD	transit oriented design
TRAN	Ministry of Transportation and Economic Corridors
TSS	total suspended solids
TV	television
TYP.	typical
U/S	upstream
UDS	Uniform Drawing System
UGS	Underground Services
UL	Underwriters Laboratories
ULA	Utility Line Assignment (permit)
ULC	Underwriters Laboratories of Canada
UPS	uninterruptible power supply
URD	underground residential distribution
USB	Universal Serial Bus
UTM	Universal Transverse Mercator
VAC	volts alternating current
VDC	volts direct current
VPI	vertical point of intersection
W.R.T.	with respect to
W/	with
WAT	water (main)
WB	wheelbase
WHMIS	Workplace Hazardous Materials Information System (now known as GHS)
WNA	Water Network Analysis

1.5 Municipal Planning Documents

The following documents provide guidance on planning for development and requirements for Public Infrastructure:

- Municipal Development Plan
- Outline Plans
- Strategic Plans
- Land Use Bylaw
- Area Structure Plans
- Area Redevelopment Plan
- Parks Master Plan
- *Transportation Master Plan*
- *Active Transportation Functional Plan*
- *Transit Master Plan*
- *Water Master Plan*
- *Wastewater Master Plan*
- *Stormwater Master Plan*

1.6 Reference Materials

Throughout these standards, reference may be made to other regulatory agencies, standards, and documents. These may include the following. Additional applicable standards and regulations, not noted below, may also be referenced.

- Alberta Environment, *Standards and Guidelines for Municipal Works, Waterworks, Wastewater and Storm Drainage Systems*:
 - *Standards for Municipal Waterworks*
 - *Guidelines for Municipal Waterworks*
 - *Wastewater Systems Standards for Performance and Design*
 - *Wastewater Systems Guidelines for Design, Operating, and Monitoring*
 - *Stormwater Management Guidelines*
- Alberta Environment, *Stormwater Management Guidelines for the Province of Alberta*
- Alberta Safety Codes Council
 - *Alberta Private Sewage Systems - Standard of Practice*
 - *Barrier-Free Design Guide*
- Alberta Occupational Health and Safety (OHS) Legislation
- Government of Alberta
 - *Stepping Back from the Water, a Beneficial Management Practices Guide for New Development Near Water Bodies in Alberta's Settled Region*
 - *Alberta Wetland Mitigation Directive*
 - *Alberta Regulatory Requirements Guide*
 - *Alberta Wetland Policy*
- Transportation Association of Canada (TAC)
 - *Manual of Uniform Traffic Control Devices for Canada (MUTCDC)*
 - *Geometric Design Guide for Canadian Roads*
 - *Turning Vehicle Template*
 - *TAC/Institute of Transportation Engineers (ITE) Canadian Guide to Traffic Calming*

- *Canadian Roundabout Design Guide*
- Alberta Transportation
 - *Highway Geometric Design Guide*
 - *Roadside Design Guide*
 - *Erosion and Sediment Control Manual*
- Institute of Transportation Engineers (ITE), *Transportation Impact Analysis Guidelines for Site Development*
- US Department of Transportation, Federal Highway Administration, *Roundabouts: An Informational Guide*
- RMWB, *Guidelines for the Design and Installation of Traffic Signals*
- RMWB, *Urban Forest Management Strategy*
- RMWB, *Rural Water and Sewer (RWSS) Service Connection Guidelines*
- RMWB ECO Plan Framework
- World Health Organization, *Global Age-Friendly Cities: A Guide*
- City of Edmonton, *Winter City Design Guidelines*
- *FireSmart: Protecting Your Community from Wildfire*
- Alberta BearSmart Program
- National Fire Protection Association
- American Water Works Association (AWWA)
- Canadian Standards Association (CSA)
- *National Building Codes and Standards*

1.7 Freedom of Information and Protection of Privacy Act

The *Freedom of Information and Protection of Privacy Act* gives any person a right to access records in municipal custody or control, subject to limited and specific exceptions. All documents and information, including correspondence, agreements, plans, and specifications that are written, photographed, recorded, or stored in any manner by the Municipality may be subject to the access and privacy provisions of the Act.

Developers and their agents, consultants, and Contractors shall identify all information that they consider confidential, and the basis for confidentiality (including those parts of their submission that relate to trade secrets, commercial, financial, labour relations, scientific, and technical information).

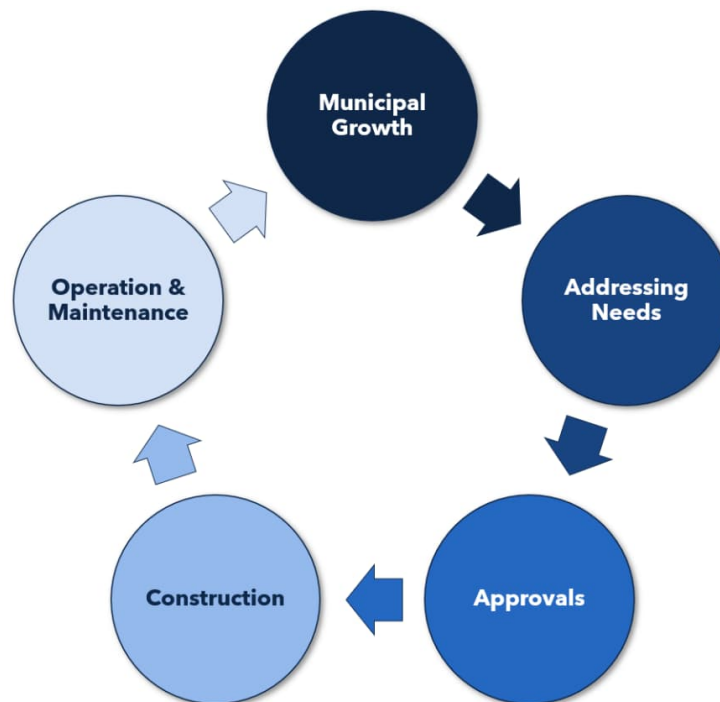
The Municipality will endeavour to use the *Freedom of Information and Protection of Privacy Act* to protect the confidentiality of the information identified by the Developer or their representatives as confidential; however, the Act may apply, and the information may have to be disclosed to members of the public who request access to records in the Municipality's custody and control.

2 PROCEDURES FOR DEVELOPMENT

2.1 General

- .1 This section describes the overall process for managing growth and development within the Regional Municipality of Wood Buffalo and the processes and procedures in place to ensure that Public Infrastructure meets these standards, for the benefit of current and future residents.
- .2 **Figure 2-1** illustrates the overall cycle of development in the Municipality, including components that create growth demands, the parties responsible for addressing growth needs, the approvals process, the construction stages for the installation of Public Infrastructure, and the long-term operation and maintenance by the Municipality.

Figure 2-1 Development Cycle in the Regional Municipality of Wood Buffalo



- .1 **Municipal Growth** - triggered by economic development or changing population needs.
- .2 **Addressing Needs** - changing population needs may be addressed by the community, industry, the Municipality, Developers, or Government.
- .3 **Approvals** - the approvals process for a development project may include an Engineering Design Brief, Area Structure Plan or Area Redevelopment Plan, Outline Plan, Plan of Subdivision, Public Hearing(s), Bylaw amendment(s), and/or a Development Agreement.
- .4 **Construction** - upon completion of construction of Municipal Improvements, a Construction Completion Certificate is issued, signalling the beginning of the Warranty Period, and a Final Acceptance Certificate is issued upon expiration of the Warranty Period.
- .5 **Operation & Maintenance** - the operation and maintenance of Municipal Improvements are taken over by the Municipality upon issuance of the Final Acceptance Certificate.

- .3 In addition to these Design Servicing Standards and Development Procedures, the Municipality has a number of other documents that Developers and/or their agents should be fully aware of in advance of undertaking the design of a specific subdivision or project. Examples include:
 - .1 **Municipal Development Plan (MDP)** - describes general policies and guidelines with respect to land development within the Municipality.
 - .2 **Area Structure Plans (ASPs)** - approved Area Structure Plans are available on the Municipality's website. It is the Developer's responsibility to check with the Municipality to determine if there are any ASPs in effect which may affect his/her proposed development.
 - .3 **Land Use Bylaw (LUB)** - describes permitted and discretionary uses for each land use district and defines numerous design parameters.
 - .4 **Master Plans** - examples include water, wastewater, stormwater, transit, parks, etc.
 - .5 **Other Reports/Studies** - the Municipality may have other reports and/or studies which may impact proposed development (or redevelopment). Examples include Infrastructure Assessments and Capital Plans.
- .4 Communication is key and preliminary meetings with municipal staff to discuss land development proposals and options are encouraged.
- .5 **Note:** Lot grading, deep utilities, roadways, drainage Easements, and landscape improvements within bare land condominiums and mobile home parks are to comply with the requirements of these standards.

2.2 Municipal Responsibility

The Municipality is responsible for providing Municipal Services to all residents and businesses within the Municipality, to the level of service standards prescribed by the applicable federal and provincial legislation and municipal bylaws and Strategic Plans. This responsibility includes the operation and maintenance of Public Infrastructure for the provision of safe and reliable services. These standards and the procedures described herein establish the minimum acceptable standards so that Municipal Services can be efficiently and safely provided for the benefit of the municipal population.

The Municipality's involvement, review, inspection, and approval are therefore required in all aspects of the design and construction of Public Infrastructure and development of land as part of the Municipality's due diligence in ensuring these servicing standards are met.

2.3 Procedures for Development Projects

2.3.1 Key Steps

- .1 The key steps and development procedures from pre-application to final acceptance are outlined on **Figures 2-2** and **2-3**.
- .2 The key steps include the following:
 - .1 Coordination of and attendance at a pre-application meeting. The pre-application meeting may assist the Developer in clarifying the application process requirements and may be required depending on the nature and scale of the development; refer to **Section 2.5**.
 - .2 Completion of amendment(s) to the Land Use Bylaw and/or Area Structure Plan/Outline Plan, if necessary.
 - .3 Submission of a Development Brief indicating conformance with the Municipal Development Plan, Strategic Plan, Land Use Bylaw, Area Structure Plan, and other municipal planning documents.
 - .4 Preparation and approval of preliminary drawings and supporting documentation.
 - .5 Submission of the subdivision plan and supporting documentation.
 - .6 Development and finalization of Easement and Municipal Reserve agreements.
 - .7 Preparation of detailed engineering and landscape drawings and specifications.
 - .8 Approval of engineering and landscape drawings and specifications.
 - .9 Consultation with the Municipalities environmental and regulatory advisors.
 - .10 Notification and approval from Alberta Government departments and other third parties as required.
 - .11 Negotiation and finalization of a Development Agreement.
 - .12 Collection of financial Securities and municipal fees.
 - .13 Application for and acquisition of any permits (refer to **Section 2.16**) which may be required. These may include:
 - .1 Clearing and Grading Permit,
 - .2 Utility Installation and Street Occupation Permit,
 - .3 Boulevard Crossing Permit,
 - .4 Utility Line Assignment Permit,
 - .5 Service Connection Permit,
 - .6 Water Meter Permit,
 - .7 Route Haul Permit,
 - .8 Demolition Permit,
 - .9 Development Permit,
 - .10 Building Permit, and
 - .11 Occupancy Permit.
 - .14 Tender and award by Developer.
 - .15 Completion of construction activities in accordance with these standards and the approved drawings and specifications.
 - .16 Submission of Record Drawings and supporting documentation/data.

- .17 Joint inspection by the Municipality, Developer's Representative, and Contractor and issuance of Construction Completion Certificate(s). A blank Construction Completion Certificate is provided at the end of **Section 2**.
 - .18 Preparation and registration of the Legal Plan of Subdivision.
 - .19 Partial release of financial Securities.
 - .20 Two-year Warranty Period(s).
 - .21 Final overlays, installation of permanent line marking, and correction of deficiencies.
 - .22 Joint inspection by the Municipality, Developer's Representative, and Contractor, and issuance of Final Acceptance Certificate(s), end of Warranty Period and takeover by the Municipality. A blank Final Acceptance Certificate is provided at the end of **Section 2**.
 - .23 Release of remaining financial Securities.
- .3 The Municipality uses an electronic permitting (E-Permitting) system for the processing and tracking of applications for development and the issuance of permits. Refer to the Municipality's website for E-Permitting information.

2.3.2 Development Approval Deviation Process

- .1 This document outlines development procedures and development standards.
- .2 Deviation from these standards is a defined process, as described in **Section 2.11**.
- .3 For any Deviation from the development approval process or procedures, as described in **Figures 2-2** and **2-3**, it shall be the responsibility of the Municipality, at the Municipality's discretion, to seek municipal Council approval.

2.3.3 Roadway Cross Section Deviations

- .1 Typical municipal roadway cross sections are provided in **Section 13**.
- .2 Some developments or redevelopment areas may include unique roadway cross sections that are not defined in this document.
 - .1 Where a roadway cross section has been approved in a statutory plan (i.e., Area Structure Plan or Area Redevelopment Plan), the cross section shown in the approved statutory plan shall supersede the cross sections in **Section 13**.

FIGURE 2-2 DEVELOPMENT APPROVAL PROCESS FOR DEVELOPMENT PROJECTS
SUBMISSION, REVIEW, AND APPROVAL

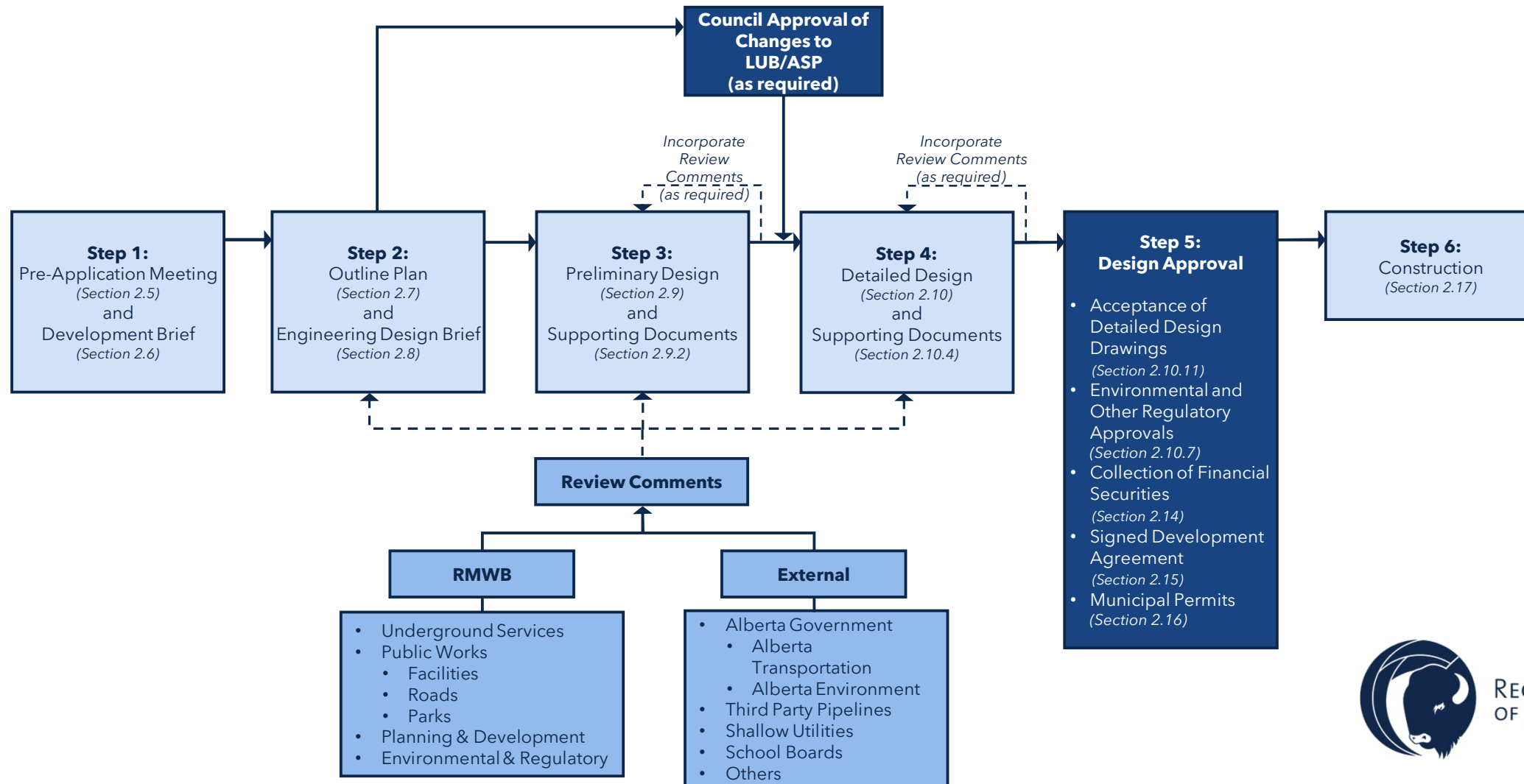
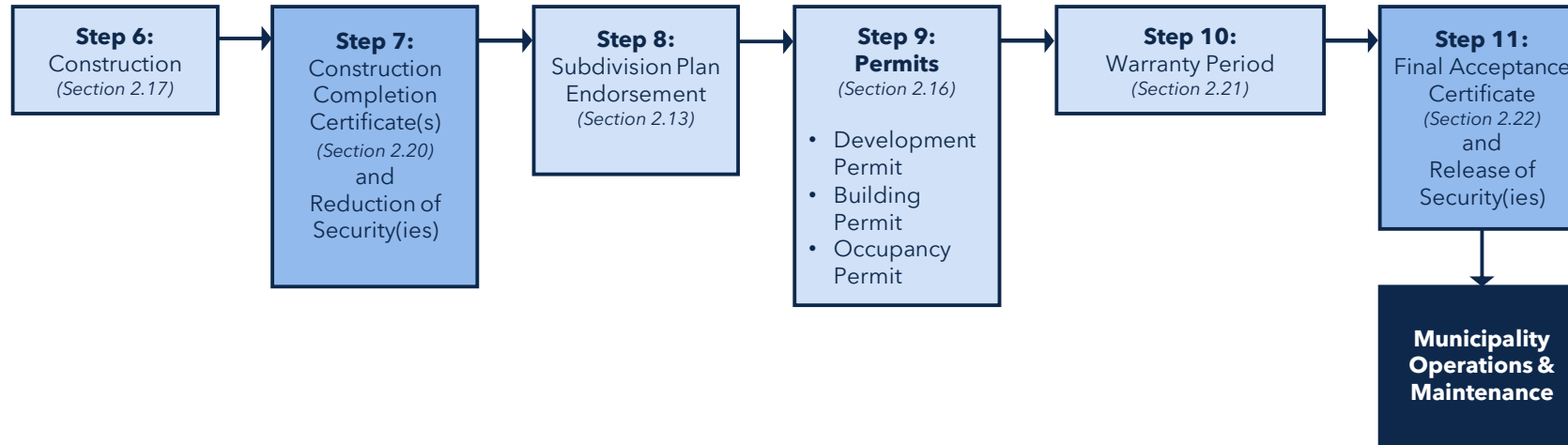


FIGURE 2-3 DEVELOPMENT APPROVAL PROCESS FOR DEVELOPMENT PROJECTS
—— CONSTRUCTION, CCC, PERMITS, AND FAC ——



2.4 Procedures for Capital Works Projects

2.4.1 Key Steps

- .1 The key steps from project initiation to final acceptance are outlined on **Figures 2-5** and **2-6**.
- .2 The key steps include the following:
 - .1 Project start-up meeting (project design initiation); confirmation of requirements for public engagement.
 - .2 Preparation and approval of conceptual (30%) design, preliminary (60%) design, and supporting studies.
 - .3 Preparation and approval of detailed (90%) engineering and landscape drawings and specifications.
 - .4 Consultation with the Municipalities environmental and regulatory advisors.
 - .5 Notification and approval from Alberta Government departments and other third parties as required.
 - .6 Review and approval of Issued for Tender (IFT) documents by Supply Chain Management (SCM) and all stakeholders.
 - .7 Tendering and award of construction contract.
 - .8 Acquisition of land for municipal rights-of-way or Easements, if required.
 - .9 Application for and acquisition of any permits which may be required. These may include:
 - .1 Clearing and Grading Permit,
 - .2 Utility Installation and Street Occupation Permit,
 - .3 Boulevard Crossing Permit,
 - .4 Utility Line Assignment Permit, and
 - .5 Route Haul Permit.
 - .10 Completion of construction activities in accordance with these standards and the approved plans and specifications.
 - .11 Preparation and registration of Legal Plan for new rights-of-way or Easements, if required.
 - .12 Joint inspection by appropriate municipal departments, the Contractor(s), and the Consulting Engineer; identification of deficiencies.
 - .13 Issuance of Substantial Performance Certificate (SPC) per *Prompt Payment and Construction Lien Act* requirements; refer to the Certificate of Substantial Performance form at the end of **Section 2**.
 - .14 Total Performance - rectification of deficiencies and issuance of Construction Completion Certificate; refer to the Certificate of Total Performance form and blank Construction Completion Certificate at the end of **Section 2**.
 - .15 Submission of Record Drawings and supporting documentation/data.
 - .16 Completion of two-year Warranty Period.
 - .17 Joint inspection by appropriate municipal departments, the Contractor(s), and the Consulting Engineer and issuance of Final Acceptance Certificate; refer to the blank Final Acceptance Certificate at the end of **Section 2**.

2.4.2 Design Approval Deviation Process

- .1 For a capital works project, the Consulting Engineer or Contractor may apply for a Deviation from these standards through the process outlined in [Section 2.11](#).

2.4.3 Substantial/Total Performance versus Construction Completion/Final Acceptance

- .1 Substantial Performance is not equivalent to Construction Completion, nor is Total Performance equivalent to Final Acceptance.
 - .1 Substantial and Total Performance reflect the percentage complete based on the total (dollar) value of the construction contract, as defined in the *Prompt Payment and Construction Lien Act*. There is no Warranty Period between Substantial Performance and Total Performance.
 - .2 Construction Completion represents that 100% of the work items in the construction contract are complete and verified by the Consulting Engineer. Construction Completion signals the start of the Warranty Period. Final Acceptance signals the expiration of the Warranty Period and take-over of Municipal Improvements by the Municipality.
 - .3 Total Performance and Construction Completion are roughly equivalent.
 - .4 [Figure 2-4](#) provides a comparison of Substantial/Total Performance and Construction Completion/Final Acceptance.
- .2 In a capital works project, Substantial/Total Performance are between the Contractor and the Municipality as part of the construction contract. Construction Completion/Final Acceptance Certificates are issued by the Municipality for the capital works project.
 - .1 For comparison, in a development project, Substantial/Total Performance are between the Contractor and the Developer, separate from the Municipality, as part of the construction contract. The Developer must also submit Construction Completion/Final Acceptance Certificate applications for Municipal Improvements to the Municipality, for issuance by the Municipality.

Figure 2-4 Substantial/Total Performance and Construction Completion/Final Acceptance

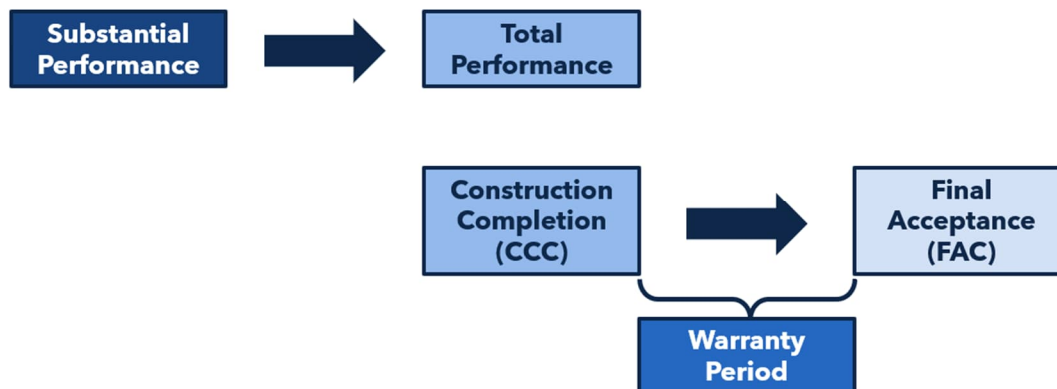


FIGURE 2-5 DEVELOPMENT APPROVAL PROCESS FOR CAPITAL WORKS PROJECTS

SUBMISSION, REVIEW, AND APPROVAL

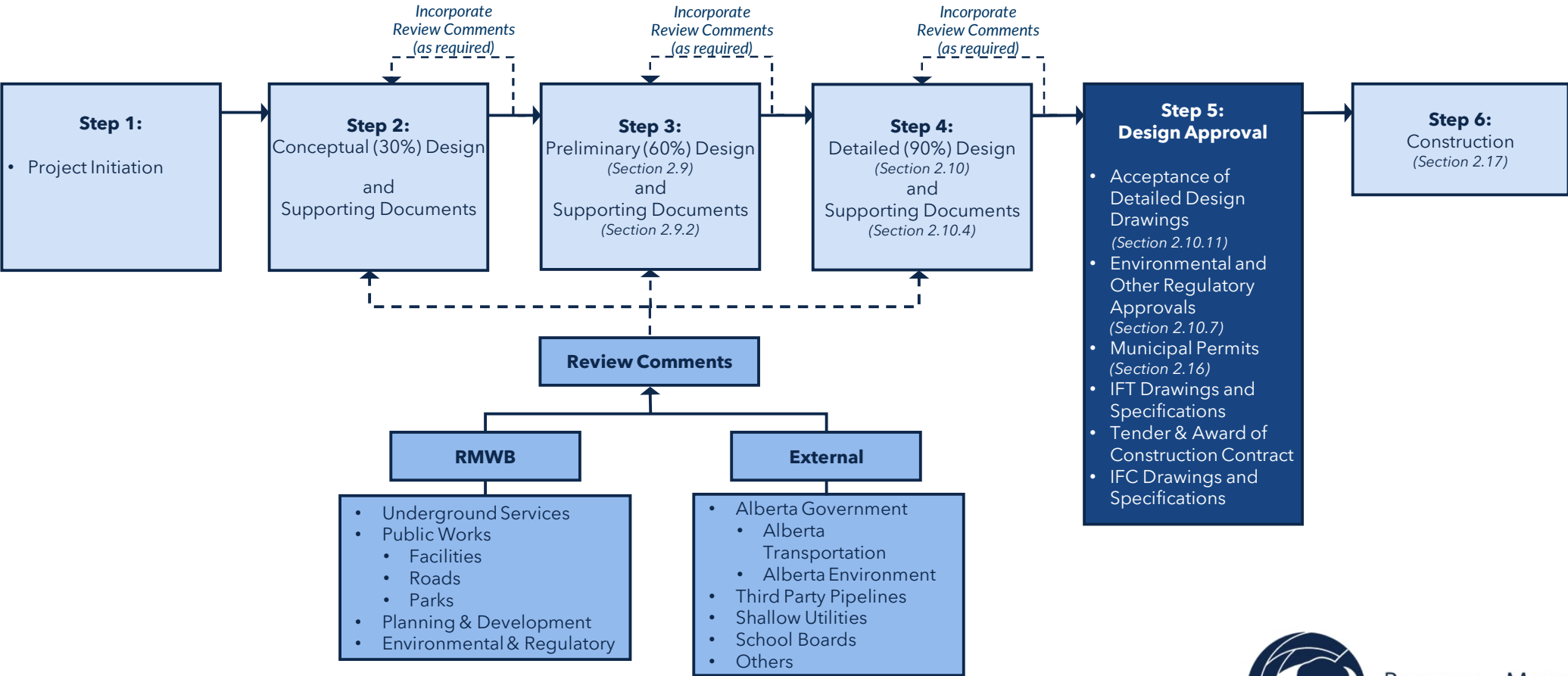
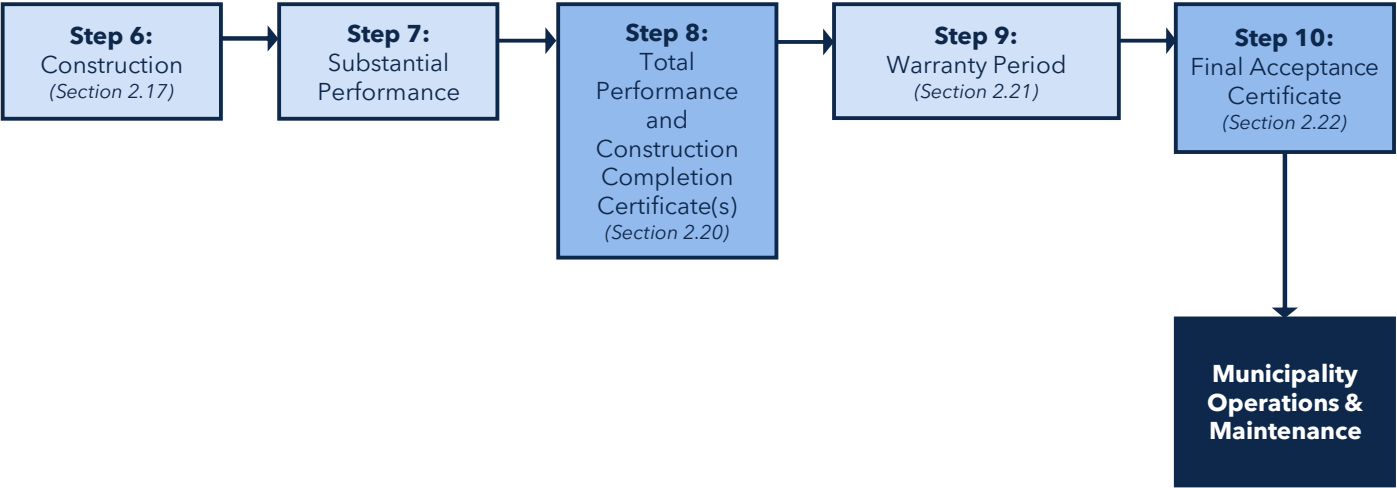


FIGURE 2-6 DEVELOPMENT APPROVAL PROCESS FOR CAPITAL WORKS PROJECTS
CONSTRUCTION, CCC, AND FAC



2.5 Pre-Application Meetings

- .1 At the discretion of the Municipality, pre-application meeting(s) will be held for any development project proposed within the Municipality.
 - .1 Pre-application meetings may occur prior to undertaking any stage of the development process, such as Area Structure or Redevelopment Plan, Outline Plan, Engineering Design Brief, and/or preparation of preliminary engineering and landscape design drawings.
- .2 The primary purpose of a pre-application meeting is to provide the Developer with specific information on application requirements. The pre-application meeting is intended to provide an opportunity for the Developer to receive preliminary feedback from relevant stakeholders, such as municipal departments, the Fort McMurray Wood Buffalo Economic Development and Tourism Corporation, Shallow Utility companies, School Boards, and Alberta Government departments.
- .3 A pre-application meeting is required for any of the following types of developments. Other types of development may require a pre-application meeting, at the discretion of the Municipality:
 - .1 Multi-lot subdivisions,
 - .2 Multi-family residential,
 - .3 Commercial/industrial,
 - .4 Institutional,
 - .5 Projects requiring a Traffic Impact Assessment (TIA),
 - .6 Projects requiring laydown areas that are located on municipal land,
 - .7 Projects requiring an Environmental Site Assessment, and
 - .8 Developments within areas identified by the Province of Alberta as being in the floodway or flood fringe zones.
- .4 The Developer shall contact the Municipality for scheduling and coordination of the pre-application meeting.
- .5 Regular communication between the Developer and the Municipality throughout the approvals process may expedite the time for approval.

2.6 Development Brief

- .1 The Developer is required to submit a Development Brief to the Municipality for the purpose of providing an overview of the project.
- .2 The Municipality will be given the opportunity to review the proposed road network and suggest changes to accommodate public operations such as snow removal, solid waste collection, and emergency services.
- .3 The Development Brief shall serve as the basis for the preliminary discussion of the project between the Developer and the Municipality and may avoid expenditure by the Developer and/or their agents of time, effort, and money on concepts and plans that are unacceptable to the Municipality.

- .4 The Development Brief is to include the following:
 - .1 Site conditions and topography, including man-made and natural constraints to development,
 - .2 Existing land uses, building conditions, and location of utilities,
 - .3 Future land uses, lot sizes, and densities,
 - .4 Proposed population and housing types, if applicable,
 - .5 Adequacy of existing schools, parks, Open Spaces, and community services to accommodate the proposed development,
 - .6 Provision for development levies, if required,
 - .7 Transportation requirements, including upgrades to roadways, noise attenuation, and pedestrian connectivity in accordance with the Active Transportation Functional Plan,
 - .8 Requirements for upgrading water, sanitary, and stormwater infrastructure, including proposals for financing these upgrades,
 - .9 Architectural controls, if required,
 - .10 Historic Resource Impact Assessment, if required,
 - .11 Indication of how issues and opportunities raised during the public engagement process are to be addressed (if applicable),
 - .12 Neighbourhood Wildfire Hazard Assessment, including vegetation management per FireSmart Canada, if applicable,
 - .13 Accessibility Assessment, and
 - .14 Any other requirements deemed appropriate by the Municipality.
- .5 Depending on the nature, scale, and scope of the proposed development, the requirements of the Development Brief may be met in the preparation of the Area Structure Plan or Outline Plan, and the respective supporting documentation.
- .6 A Development Brief Submission Checklist is provided at the end of **Section 2** for reference.

2.7 Outline Plan

2.7.1 General

- .1 If an Outline Plan does not exist for the proposed development, the Developer may be required to prepare an Outline Plan that conforms to the Municipal Development Plan (MDP) and the applicable Area Structure Plan or Area Redevelopment Plan, at the discretion of the Municipality.
 - .1 If an Area Structure Plan or Area Redevelopment Plan does not exist for the Outline Plan area, the Developer may also be required to prepare an Area Structure or Redevelopment Plan, at the discretion of the Municipality.
- .2 The Outline Plan shall address land use, transportation, barrier-free accessibility, and servicing issues, and shall establish a framework for the development.
- .3 This section discusses the process for preparing and submitting an Outline Plan and discusses the studies and supporting documentation that the Developer may need to submit with an Outline Plan.

2.7.2 Process

.1 Pre-Application Meeting

- .1 The Developer and Developer's Consultant(s) are required to have a pre-application meeting with the Municipality to discuss their proposal or interest in development of land.
- .2 Issues of concern, as well as major steps and general timing will be discussed.
- .3 The Municipality will highlight the statutory documents and key planning policies that apply to the property based on the type of development being considered.
- .4 The Municipality will also outline which supporting studies may be required to be included with the Outline Plan submission. These studies, depending on the scope of the development and the characteristics of the land parcel, may include:
 - .1 Biophysical Assessment,
 - .2 Environmental Impact Assessment,
 - .3 Traffic Impact Assessment,
 - .4 Slope Stability Geotechnical Study,
 - .5 Geotechnical Report,
 - .6 Engineering Design Brief,
 - .7 Neighbourhood Wildfire Hazard Assessment,
 - .8 Historic Resource Impact Assessment,
 - .9 Stormwater Management Report,
 - .10 Wetland Assessment, and
 - .11 Environmental Site Assessment.

.2 Preparation and Submission of an Outline Plan

- .1 The Developer shall prepare the Outline Plan and all required documentation.
- .2 The Developer shall include participation from all landowners in the proposed Outline Plan area to consider all parties' interests.
- .3 The Developer shall submit the Outline Plan along with the required studies, supporting documentation, and applicable fees to the Municipality.
- .4 The Municipality will review the submission for completeness and compliance with all existing policies and bylaws.
- .5 The Municipality will compile comments from internal stakeholders, external stakeholders, and adjacent landowners outlining any necessary changes and will provide these comments to the Developer.
- .6 The Developer shall make changes based on the comments and resubmit the Outline Plan for review until the proposal meets the Municipality's requirements.

.3 Public Engagement

- .1 Prior to hosting any meetings with the public, the Developer shall meet with the Municipality to determine what type of public engagement is required.
- .2 Typically, public engagement will consist of the Developer hosting a public meeting to describe the development and seek input.
- .3 Municipal staff may attend to observe and assist with any questions the public may have regarding municipal policies.
- .4 Following the meeting, the Developer shall create a summary of the comments for submission to the Municipality.
- .5 For more information, refer to the *Public Engagement Framework*, available on the Municipality's website.

.4 Approval of Outline Plan

- .1 Once the Outline Plan is completed to the Municipality's satisfaction, the Municipality will issue an approval and the Developer will be notified that the Outline Plan has been approved.

2.7.3 Submission Requirements

- .1 The Municipality will not review the Outline Plan until applicable fees, an application form, a recent certificate of title, and a Phase 1 Environmental Site Assessment is submitted as one package along with any other supporting studies required by the Municipality.
- .2 The Municipality will provide direction on items that must be addressed in the Outline Plan; however, at a minimum, the following items are to be included:
 - .1 Compliance with all statutory planning documents and policies.
 - .1 Include identification of any proposed amendments, if required.
 - .2 Identification of land ownership information within and adjacent to the Outline Plan area.
 - .3 Definition of the Outline Plan area, including legal description, location within the Municipality, and a map clearly identifying the boundary.
 - .4 Identification of all existing site conditions, including:
 - .1 Existing land uses within and adjacent to the site,
 - .2 All relevant biophysical site information,
 - .3 Contaminated soil or well sites, including required setbacks,
 - .4 Existing infrastructure, including roads, railways, and/or utilities and associated rights-of-way, etc.,
 - .5 Existing utility capacities and constraints, and
 - .6 Isolated land parcels neighbouring the site which must be considered for possible future development, if applicable.
 - .5 Identification of the Gross Developable Area and Net Developable Area of the development.
 - .6 A detailed land use plan showing all proposed land uses by type and location, as listed in the Municipality's Land Use Bylaw.
 - .7 A tabular summary of all land use statistics.

- .8 Identification of the location of parks and Open Spaces and all proposed reserved land, indicating the type of reserve (Environmental or Municipal).
- .9 Identification and location of any enhanced/optional neighbourhood amenities that are being proposed, including identification signs.
- .10 A proposed roadway system identifying road types, alleys, Public Utility Lots, layouts, road widening (if applicable), and Traffic Calming measures.
- .11 Proposed cross sections of roadways showing the carriageway, sidewalks, and street trees if variations from the standard cross sections in **Section 13** are proposed.
- .12 Identification of the location of sidewalks and pathways within the Outline Plan area as well as the point(s) of connection to the existing pedestrian network.
- .13 A walkability plan showing both a 400 m and 800 m walking shed.
- .14 Identification of all proposed utility rights-of-way.
- .15 Identification of the location of all proposed utility systems including water and sanitary servicing alignments, surface drainage, stormwater management facilities, and storm sewer alignments.
- .16 A proposed development phasing plan with the proposed sequence of development based on the logical extension of deep utilities, Shallow Utilities, and roadway access, including identification of any temporary roadways required for interim access to the proposed development.
- .17 Identification of the regulatory requirements applicable to the proposed development.

2.8 Engineering Design Brief

- .1 After the conclusion of, or in conjunction with, the Development Brief or Outline Plan approval process, the Developer shall prepare an Engineering Design Brief for submission to the Municipality.
- .2 The Engineering Design Brief shall contain all the technical documentation supporting the project as described in **Section 2.8**.
- .3 The Engineering Design Brief may require the following supporting documentation if not previously completed as part of the Outline Plan approval process.
- .4 After reviewing the scope of the project, the Municipality will provide the Developer with a list of requirements for the Engineering Design Brief, which may include the following items:
 - .1 Supporting design calculations,
 - .2 Geotechnical Report,
 - .3 Traffic Impact Assessment,
 - .4 Slope Stability Geotechnical Report,
 - .5 Neighbourhood Wildfire Hazard Assessment,
 - .6 Conceptual (30%) design drawings of the roadway network, including road classifications and typical cross sections, considering barrier free accessibility principles,
 - .7 Intersection designs, with consideration for the movements of municipal operations and emergency response vehicles,
 - .8 Water Network Analysis,
 - .9 Sanitary Sewer Analysis,

- .10 Stormwater Management Report,
 - .11 Biophysical Assessment,
 - .12 Environmental Site Assessment,
 - .13 Environmental Impact Assessment,
 - .14 Historic Resource Impact Assessment,
 - .15 Preliminary clearing and rough grading plans,
 - .16 Accessibility Assessment,
 - .17 Estimate of the cost of oversized and shared infrastructure, and
 - .18 Wetland Assessment.
- .5 Conceptual landscape plans may also be required, to provide an overview of the development, indicating community themes, reserve areas, open play areas, pedestrian linkage, and facilities including spray parks, playgrounds, gazebos, rest areas, and other park amenities.
- .6 At a minimum, the Engineering Design Brief shall illustrate preliminary alignments of proposed on-site and off-site infrastructure improvements required to support the development.
- .1 This is to include proposed alignments of roadways, alleys, watermains, sanitary sewers, storm sewers, and Shallow Utilities.
 - .2 The Engineering Design Brief shall also show any connections to existing infrastructure.
 - .3 At the discretion of the Municipality, typically on larger or more complex projects, the Engineering Design Brief must include the following:
 - .1 A roadway grading plan showing proposed roadway classification, complete with roadway cross sections and preliminary roadway grades considering barrier free accessibility principles.
 - .2 A water distribution plan showing proposed main sizes and preliminary hydrant locations.
 - .3 A sanitary sewer system plan showing proposed main sizes, manhole invert elevations, grades between manholes, and proposed manhole depths.
 - .4 A major drainage system plan showing major overland drainage routes, major drainage areas, and proposed stormwater management facilities, complete with location, shape, size, and storage related data.
 - .5 A minor storm sewer system plan showing proposed main sizes, manhole invert elevations, grades between manholes, and proposed manhole depths.
- .7 New ("greenfield") developments and any infill developments which will increase the density on a parcel of land require a Sanitary Sewer Analysis, unless otherwise approved by the Municipality.
- .1 The purpose of this analysis is to confirm if the downstream system has sufficient capacity to accommodate the new development area or the increased flow from an infill development.
 - .2 The Municipality will provide the Consulting Engineer with a copy of the most up-to-date sanitary model to complete this analysis.
 - .3 The Consulting Engineer is to include both the proposed dry weather and the peak wet weather flows.
 - .4 The modeling results are to be summarized in a report and provided to the Municipality for review and approval.
- .8 An Engineering Design Brief Submission Checklist is provided at the end of **Section 2**, for reference.

2.9 Preliminary Engineering and Landscape Design

2.9.1 Preliminary Design

- .1 At the discretion of the Municipality, a preliminary (60%) design submission may be required to be submitted for review and approval in advance of the detailed (90%) design submission.
- .2 Upon acceptance of the conceptual (30%) engineering and landscape plans, and if the Municipality deems a preliminary design submission is required, the Owner shall prepare a 60% design submission for review and approval.
- .3 The submission is to include preliminary plans of the road network, site servicing layouts, and landscape improvements.
- .4 For development projects, the plans are to show all proposed rights-of-way, Easements, and PULs and shall be accompanied by preliminary calculations supporting how the development will be serviced.
- .5 For development projects, the preliminary design drawings shall indicate the proposed layout of the development and the layout shall consider overall development of the Municipality and future expansions.
- .6 Proposed Municipal Improvements for new developments shall not overload existing systems and, should there be future development planned upstream of the project site, the Developer shall oversize the deep utilities accordingly, to provide sufficient capacity for the planned future upstream developments.
- .7 The preliminary engineering plans for development projects shall indicate the site layout, size of lots, road network with the widths of road rights-of-way and road classifications identified, typical road cross sections, size and location of parks, population densities, land use districts, and other planning requirements of the Municipality.
- .8 The preliminary design shall be accepted in principle prior to submission of the detailed design drawings, to allow necessary or desirable revisions to be incorporated without requiring major changes to the detailed design drawings.
- .9 Preliminary engineering plans are to include a servicing layout (water, sanitary, storm) with preliminary pipe sizing. Additionally, the volume of stormwater to be stored, and the method of storage, for development projects shall be indicated.
- .10 Preliminary landscape plans for development projects are to provide an overview of the development, indicating community themes, reserve areas, open play areas, pedestrian linkage, and facilities including spray parks, playgrounds, gazebos, rest areas, and other park amenities.

2.9.2 Supporting Documents

- .1 The preliminary design package is to be accompanied by a preliminary geotechnical investigation, prepared by a qualified geotechnical Engineer, highlighting any design constraints which may need to be considered during detailed design.
- .2 Other supporting documents required to be submitted with the preliminary design package may include:
 - .1 Preliminary design calculations,
 - .2 Preliminary clearing, stripping, and road grading plans*,
 - .3 Neighbourhood Wildfire Hazard Assessment*,

- .4 Environmental Impact Assessment*, and
- .5 Historical Resources review*.

***Consideration for Small-Scale Developments**

Proposed developments less than 4 ha in size shall be considered small-scale development. The Municipality, on a case-by-case basis, may relax the requirement for the level of detail provided with some of the required technical studies. If the requirements are relaxed for a small-scale development, it is not intended to set a precedence for future small-scale developments. The Municipality must be consulted to confirm the required supporting documentation for the proposed development prior to submission of the preliminary design package.

.3 Requirements for Facility/Mechanical Plant Pre-Design Reports:

- .1 A pre-design report must be prepared by the Owner's Consultant and submitted to the Municipality for approval prior to undertaking the detailed design of new facilities or mechanical plants.
- .2 The pre-design report must include all relevant text, tables, and figures outlined below and the pre-design report must be Authenticated by the Owner's Consultant.
- .3 A pre-design report for a new facility/mechanical plant should include the following elements:
 - .1 **Introduction** – describe the proposed development and include a figure illustrating the project area. Include a description of land ownership and identify if land acquisition is required.
 - .2 **Topography** – describe the topography and any notable features; include a map of the topography.
 - .3 **Existing Conditions** – describe existing infrastructure adjacent to the proposed facility/mechanical plant as well as the findings from the geotechnical report.
 - .4 **Boundary Conditions** – summarize the boundary conditions used in the analysis. Boundary conditions are to be requested from the Municipality.
 - .5 **Description of Proposed Facility/Mechanical Plant** – describe the proposed facility/mechanical plant, including sizes for individual rooms and overall size, occupancy classification as per the *National Building Code*. Describe any site-specific considerations which may impact the design of the facility/mechanical plant.
 - .6 **Design Criteria** – describe modelling software (if applicable) and state assumptions to be used.
 - .7 **Environmental Considerations** – describe any environmental permits or approvals that may be required for the proposed development.
 - .8 **Class D Cost Estimate** – provide a high level (Class D) opinion of probable costs to construct the proposed facility/mechanical plant.

2.9.3 Submission and Approval

- .1 Submission of preliminary design drawings and supporting documentation is to be made to the Municipality through the E-Permitting system.

2.10 Detailed Engineering and Landscape Design

2.10.1 Detailed Design

- .1 Upon approval of the preliminary (60%) engineering and landscape plans, the Owner shall prepare a detailed (90%) design submission for review, followed by an Issued for Tender (100%) submission for review and approval.
- .2 The Owner shall retain an Engineer, and other registered professionals (such as a Landscape Architect) as required, who will be responsible for the design and preparation of drawings and specifications for all Municipal Improvements.
- .3 All Municipal Improvements shall be designed in accordance with these standards.
- .4 The design drawings shall show all existing and proposed infrastructure.
- .5 The Owner's Consultant shall be responsible for coordinating with the utility companies to establish the location of their existing and proposed infrastructure.
- .6 The Government of Alberta's *Stepping Back from the Water, a Beneficial Management Practices Guide for New Development Near Water Bodies in Alberta's Settled Region* document shall be consulted when determining the appropriate setback from a waterbody.
 - .1 Setbacks shall be determined on a case-by-case basis by a person or persons qualified to make these assessments.
- .7 Final (approved) engineering drawings, specifications, and reports must be Authenticated by a Professional Engineer in good standing with APEGA.
- .8 Landscape plans are to be submitted with the engineering drawings. Final (approved) landscape plans must be stamped by a Landscape Architect in good standing with AALA.
- .9 Detailed engineering and landscape design drawings are to be prepared in accordance with the drafting procedures outlined in **Section 3**.
- .10 Other information may be required to be submitted during the review and approval process, including:
 - .1 Design calculations,
 - .2 Copy(ies) of any environmental approval(s),
 - .3 Intersection designs, with consideration of emergency response vehicle movements*,
 - .4 Traffic Impact Assessment*,
 - .5 Water Network Analysis*,
 - .6 Sanitary sewer analysis,
 - .7 Stormwater management plan,
 - .8 Detailed clearing, stripping, and grading plans,
 - .9 Snow storage considerations*,
 - .10 Geotechnical and environmental reports applicable to the construction stage,
 - .11 Copy(ies) of any Crossing/Proximity Agreements issued by third party pipeline companies,
 - .12 Cost estimates for oversized and/or cost-shared infrastructure*,
 - .13 Approved Shallow Utility design, including a utility right-of-way plan and,
 - .14 Construction specifications.

***Consideration for Small-Scale Developments**

Proposed developments less than 4 ha in size shall be considered small-scale development. The Municipality, on a case-by-case basis, may relax the requirement for the level of detail provided with some of the required technical studies. If the requirements are relaxed for a small-scale development, it is not intended to set a precedence for future small-scale developments. The Municipality must be consulted to confirm the supporting documentation requirements for the proposed development prior to submission of the detailed design package.

- .11 Technical reports/calculations (such as Traffic Impact Assessments, Water Network Analyses, sanitary sewer analyses, stormwater management calculations, geotechnical reports, and any other technical reports) shall be valid for a maximum of 5 years, provided that the site conditions and intended use of the proposed development have not changed.
 - .1 The use of a technical report more than 5 years after the technical report was issued will require a letter Authenticated by a qualified Engineer indicating that the information and recommendations within the technical report are still valid.

2.10.2 Responsibility for Existing Structures and Utilities

- .1 The presence and location of underground utilities indicated on the plans, which have been determined from existing records, are not guaranteed and shall be investigated and verified in the field by the Owner's Consultant.
- .2 The Municipality takes no responsibility for errors or omissions represented on record information.
- .3 The Owner shall contact the Municipality, Utility Safety Partners and all other applicable utility owners without membership in Utility Safety Partners, for utility locates prior to proceeding with any ground disturbance.
- .4 The Owner will be held responsible for any damage to, and for maintenance and protection of, existing structures and utilities during construction.
- .5 Existing utilities are to be protected from damage or unauthorized use by means of boundary valves for watermains and plugs for sanitary and storm sewers.

2.10.3 Responsibility for Temporary Structures for Construction Support

- .1 The Developer and/or Contractor shall conduct works in accordance with Best Management Practices for the use of temporary facilities. Temporary facilities include structures which have been mobilized to a construction site to support the construction activities. These may include, but are not limited to, trailers, storage units, modular units or other related amenities purposed to support construction.
- .2 Best Management Practices include, but are not limited to, wildlife intrusion, security and theft prevention, fire prevention, pollution control, and environmental control.

2.10.4 Format for Engineering and Landscape Drawings

- .1 Engineering and landscape drawings submitted to the Municipality for approval are to meet the requirements outlined in [Section 3](#).

2.10.5 Supporting Documents

2.10.5.1 Requirements for Geotechnical Investigations

- .1 A geotechnical report, Authenticated by a geotechnical Consulting Engineer, is required for all projects.
- .2 Geotechnical investigations shall be undertaken by a qualified engineering firm and specifically prepared for the development/project according to the scope and magnitude.
- .3 At a minimum, geotechnical investigations and reports shall include the following characteristics and content:
 - .1 Data collection,
 - .2 Geotechnical investigative program,
 - .3 Field investigation, soil sampling, and groundwater monitoring,
 - .4 Laboratory testing,
 - .5 Evaluation of soil conditions, soil parameters (physical and mechanical properties), and groundwater levels,
 - .6 Design parameters (including water tables, sulphates, frost zone, and seismic classification),
 - .7 Identification of any hazards that may affect the safe development of the site, including:
 - Flooding
 - Groundwater flows
 - Landslide
 - Subsidence
 - Underground voids (e.g., coal mines)
 - Erosion
 - .8 Conclusions and recommendations, and
 - .9 Appendices.
- .4 The geotechnical report shall provide:
 - .1 Recommendations to reduce the risk of damage to the land, buildings, and works on the subject property and adjacent lands/developments.
 - .2 Recommendations for remediation of any unstable and potentially unsuitable soils.
 - .3 Recommendations for restricting the use of the land as a result of geotechnical conditions.
 - .4 A recommended inspection program during the development of the land and identification of any parts of the development that require inspection by specialized personnel.
 - .5 Identification of tops of banks and other geotechnically sensitive features and the setbacks from these features for land clearing and grading, roadways, buildings and structures, stormwater management facilities, and other forms of development.
 - .6 Clearing and grading limits, compaction requirements, and any special construction requirements.
 - .7 Building foundation design, including sub-surface drains/weeping tiles, if required, in the case of a development.
 - .8 Recommendations for grade beams, slab on grade, and radon rock, in the case of a development,
 - .9 Recommended road structure(s) and pavement design based on a 20-year design life.
 - .10 Trenching and bedding requirements for utilities, including a soil corrosivity assessment for use in the design of cathodic protection.

- .11 The results of groundwater testing to establish the quantity and quality of groundwater for water supply and sewage disposal projects, if applicable.
- .12 Retaining wall designs.
- .13 Recommendations for further geotechnical investigations and/or reporting requirements before, during, and post-construction.
- .5 The recommendations and conclusions in the geotechnical report must acknowledge that the Municipality, its approving officer, as well as building inspectors may rely upon the report for decision-making.
- .6 Geotechnical reports shall be valid for a maximum of 5 years, provided that the site conditions and intended use of the proposed development have not changed. The use of a geotechnical report more than 5 years after the report was issued will require a letter Authenticated by a qualified Engineer indicating that the information and recommendations within the report are still valid.

2.10.5.2 Requirements for Slope Stability Geotechnical Reports

- .1 A slope stability geotechnical report is required for all sites where slope stability may be a concern.
- .2 The report should be provided as part of the Area Structure Plan/Outline Plan submissions for development that borders an escarpment or embankment.
- .3 Geotechnical report requirements to be applied, relative to the proposed land use, shall include the following:
 - .1 The assessment of the factor of safety for the existing slope or for the proposed design slope profile, with respect to a safe setback or buffer zone from the crest or the toe of the slope. The following minimum factors of safety shall be used, unless the geotechnical Consulting Engineer determines that higher factors of safety are warranted.
 - .1 The rear property line shall be set based on a factor of safety of at least 1.3.
 - .2 The location of structures shall be set based on a factor of safety of at least 1.5.
 - .2 The soil parameters used for the stability analysis may be subject to review and acceptance by the Municipality and shall be based on:
 - .1 Actual laboratory strength tests, or
 - .2 Back analyses of existing slope failure on the property, or
 - .3 On correlation with the soil physical and mechanical properties based on published literature or local experience.
 - .3 It is the responsibility of the Developer and/or Builder to ensure compliance with the development conditions identified in the slope stability geotechnical report.
- .4 Slope stability geotechnical reports shall include the following:
 - .1 Setback limits or development recommendations based on the recommended factor of safety. The minimum recommended setback shall be shown on the final development plan.
 - .2 Clear definition of the basis for the presented conclusions and selection of the method of analysis, relative to site-specific conditions, project type and size, and public interests.
 - .3 Consideration of the following items, as well as any other site-specific issues identified by the geotechnical Consulting Engineer:

- .1 Property lines and setbacks as per the Land Use Bylaw.
- .2 A slope stability factor of safety with respect to the most probable adverse groundwater table and loading conditions.
- .3 Top of embankment or escarpment.
- .4 Toe of slope.
 - .1 When proposed development is located at the toe of slope, the report is to address the effect and extent of slope failure on the subject land and the adjacent properties and the protection of same.
- .5 Erosion control and other mitigation measures (i.e., drainage works, grading, etc.) in proximity to, along, and on the crest, toe, and face of slope.
- .6 Appropriate recommendations pertaining to re-vegetation, dewatering, and slope reconfiguration (e.g., cutting, filling, re-grading, French drain, retaining walls, etc.), considering short-term stability (during construction and immediately thereafter) and long-term stability.
- .7 Building location and foundation design.
- .8 Utility and road infrastructure.
- .9 The effect of surcharge due to proposed structures, retaining walls, and future site grading.
- .5 The Developer shall retain the geotechnical Consulting Engineer for inspection of the site and verify conformance with the report.

2.10.5.3 Requirements for Water Network Analyses

- .1 A Water Network Analysis (WNA), Authenticated by a qualified Engineer, is required to support proposed Land Use Bylaws, Area Structure Plans, subdivision applications, and detailed engineering drawings.
- .2 A WNA report should include the following elements:
 - .1 **Introduction** – describe the proposed development and include a figure illustrating the project area.
 - .2 **Topography** – describe the topography and any notable features; include a map of the topography.
 - .3 **Proposed Staging** – describe the proposed construction staging and estimated timelines.
 - .4 **Existing Water Network** – describe the existing water network.
 - .5 **Boundary Conditions** – summarize the boundary conditions used in the analysis. Boundary conditions are to be requested from the Municipality.
 - .6 **Land Use Districts** – include a land use map with the required fire flows indicated.
 - .7 **Demands** – state the assumptions used to estimate the demands for each scenario and summarize the demands in a table; include a figure with the demand nodes and consumption boundaries.
 - .8 **Proposed Pipe Network** – describe the proposed pipe network and include a map of the proposed pipe network with model facility names and pipe sizes.
 - .9 **Design Criteria** – describe the modelling software used for the design, state the assumptions used in the design (pipe material, Hazen-Williams C-factor, etc.), state the requirements for the area (fire flows, velocities, pressures).

- .10 **Results** – describe the simulations that were run and compare the results to the required values, explain why specific nodes were chosen for the analysis, and identify any deficiencies and necessary corrections.
- .11 **Appendices** – show appropriate tables for the model simulations.
- .3 A WNA report must be prepared by the Owner's Consultant and submitted to the Municipality for approval.
- .4 The WNA report must include all relevant text, tables, and figures outlined above and must be in conformance with the current *Water Master Plan*.
- .5 **Additional Requirements for Area Structure Plan WNAs:**
 - .1 The scope of an Area Structure Plan (ASP) WNA is to include the entire ASP area and the WNA report must be submitted concurrently with the submission of the ASP to the Municipality.
 - .2 The purpose of an ASP WNA is to:
 - .1 Guide all future development in the area,
 - .2 Identify major watermains for the area,
 - .3 Consider the development of the looped distribution system as stages are constructed,
 - .4 Recognize areas of extreme or deficient pressures and deficient fire flows, and
 - .5 Identify requirements to service adjacent areas.
 - .3 The Developer's Consultant must clearly state the design assumptions required to create the model in the WNA report and shall ensure that all pipes are sized to meet velocity criteria during peak flows.
 - .4 Main feeds for neighbourhoods within the ASP area as well as mains servicing areas of extreme elevation must be included in the ASP WNA.
- .6 **Additional Requirements for Subdivision Stage WNAs:**
 - .1 The scope of a subdivision stage WNA is to include the proposed stage of development.
 - .2 The purpose of a subdivision stage WNA is to verify that the proposed stage of development will meet all servicing and fire flow requirements in the interim.
 - .1 If the proposed stage is not the first stage of development, it shall consider the water distribution system(s) of the previous stage(s).
 - .3 The Developer's Consultant must clearly state the design assumptions required to create the model in the WNA report and shall ensure that all pipes are sized to meet velocity criteria during peak flows.
 - .4 The Developer's Consultant must include all watermains required to service the proposed stage of development and must ensure that looping is provided to minimize the number of lots that would be isolated in the event of a watermain break or watermain shutoff for maintenance purposes.

2.10.5.4 Requirements for Traffic Impact Assessments

- .1 Traffic Impact Assessments (TIAs) shall be prepared by the Owner's Consultant, in accordance with the Municipality's *Traffic Impact Assessment Guidelines* and, at a minimum, shall include the following items:
 - .1 Traffic Analysis,
 - .2 Traffic Demand Analysis Steps,
 - .3 Capacity Analysis,

- .4 Traffic Signal Warrant Analysis and Traffic Signal Design,
- .5 Intersection and Roadway Illumination Warrant Analysis,
- .6 Proposed Geometry of Study Intersections and Roadway Sections, and
- .7 Safety Analysis.
- .2 TIAs shall be Authenticated by a qualified Engineer.
- .3 Notification of approval of the TIA will be provided, in writing, by the Municipality to the Owner's Consultant.
- .4 In addition to the criteria outlined in the Municipality's *Traffic Impact Assessment Guidelines*, a TIA is required when an existing development proposes a new access or introduces major modifications to traffic circulation, internal to the development, which results in the traffic thresholds listed in the guidelines.

2.10.5.5 Requirements for Biophysical Assessments

- .1 Subject to the scope, scale, and location of the proposed works, the Municipality may require that a Biophysical Assessment be completed to identify potential ER or MR lands.
 - .1 This may be requested during the development of an Area Structure Plan, Outline Plan, and/or Subdivision application.
- .2 The assessment must be completed by a qualified professional (P.Biol. or P.Ag.) and requires consultation with the Municipalities environmental and regulatory advisors.
- .3 Biophysical Assessments shall include the following:
 - .1 **Project Description:** identification of the subject property location and definition of the scope of the project.
 - .2 **Qualifications:** a summary of the qualifications of the person who completed the assessment and reporting.
 - .3 **Description of Environmental Features:** a description, including maps, of the environmental features within the property including natural sub-regions, terrain, surface water resources (floodplains, creeks, wetlands, etc.), groundwater, terrestrial resources (wildlife, vegetation), rare or endangered species, soil characteristics, climate, and historical resources.
 - .4 **Methodology:** a discussion about the methodology used (e.g., information review, field surveys, inventories, etc.).
 - .5 **Legislation:** outline the applicability of federal, provincial, and municipal legislation.
 - .6 **Assessment Results:** present the results of the assessment, including historic air photos, landscape characteristics, species lists (plants and wildlife), landform classification, surficial geology classification soil classification, surface and groundwater hydrology, and wetland delineation and classification.
 - .7 **Conservation Recommendations:** provide recommendations for lands to be dedicated as MR and ER, potential upland habitats for ecological connectivity, wetland mitigation, and potential restricted activity periods with consideration for upland and in-stream habitat.

2.10.5.6 Requirements for Environmental Impact Assessments

- .1 Subject to the scope, scale, and location of the proposed work, the Municipality may require that an Environmental Impact Assessment be completed to identify the environmental sensitivities of the site and provide recommendations to avoid, protect, and/or mitigate potential impacts to the environment.
 - .1 This may be requested during the development of an Area Structure Plan, Outline Plan, Subdivision application, Engineering Design Brief, and/or for Development Permit applications.
- .2 The assessment must be completed by a qualified professional (P.Biol. or P.Ag.).
- .3 The Environmental Impact Assessment shall include the following:
 - .1 **Project Description:** definition of the scope of the project.
 - .2 **Baseline Conditions:** a detailed discussion of the site and/or previous assessments, including a review of the chemical or biophysical data with respect to the assessment criteria. Include a discussion on existing or historic environmental features.
 - .3 **Qualifications:** a summary of the qualifications of the person who completed the assessment and reporting.
 - .4 **Description of Environmental Features:** a description, including maps, of the environmental features within the property including natural sub-regions, terrain, surface water resources (floodplains, creeks, wetlands, etc.), groundwater, terrestrial resources (wildlife, vegetation), rare or endangered species, soil characteristics, and historical resources.
 - .5 **Methodology:** a discussion about the methodology used to determine and evaluate environmental features.
 - .6 **Short- and Long-Term Impacts:** a discussion of the potential short- and long-term- impacts, including cumulative effects of developing the land.
 - .7 **Mitigation Measures:** identification of appropriate and feasible mitigation measures to reduce the impacts to environmental features.
 - .8 **Conclusion & Recommendations:** a clear and concise summary of the conclusions of the study and/or recommendations to avoid, protect, and/or mitigate impacts to the natural environment with respect to the property and adjacent properties, for all phases of development, including clearing and grubbing, construction, reclamation, and operation, as well as any recommendations for further investigation and/or remediation.
 - .9 **Environmental Restriction Periods:** considerations of specific environmental restriction periods (i.e., nesting periods for birds or sensitive owls, restricted activity periods for fish, timing restrictions associated with ungulate moving corridors) relating to the construction schedule.
 - .10 **Regulatory Framework:** outline any regulatory requirements, with respect to the environmental aspects of the project, which are to be considered during all phases of the project.
- .4 The assessment must also establish requirements of an Environmental Construction Operations (ECO) Plan, as per the *RMWB ECO Plan Framework*, that:
 - .1 Will guide specific aspects of environmental protection for the work.
 - .2 Is prepared by the Contractor.

- .3 Includes a description of site activities, potential environmental impacts, controls including erosion and Sedimentation control measures, soil and water management, emergency spill response, and all regulatory permitting items required for construction to proceed.
- .4 Sets out the remediation and reclamation plan for disturbed areas.
- .5 The Environmental Impact Assessment shall also consider conservation recommendations for the property, where appropriate, through Environmental Reserves, conservation Easements, and setback areas (i.e., riparian areas).
- .6 The Environmental Impact Assessment shall clearly identify which lands are considered as Environmental Reserve and the quantitative or qualitative criteria used to establish this.
- .7 A complete package of supporting documentation and appendices including plans, site photos, aerial photos, borehole logs, test results, checklists, etc.
- .8 The Environmental Impact Assessment shall include a statement of limitations for the report related to the reliability and availability of data.
- .9 Environmental Impact Assessments shall be stamped and signed by the professional responsible for authoring the document.
- .10 Environmental Impact Assessments shall be valid for a maximum of 5 years, provided that site conditions, regulatory requirements, permitting requirements, and intended use of the proposed development have not changed. The use of an Environmental Impact Assessment more than 5 years after the document was issued will require a letter signed by a qualified environmental professional indicating that the information and recommendations within the assessment are still valid.

2.10.5.7 Requirements for Phase 1 Environmental Site Assessments

- .1 Phase 1 Environmental Site Assessments (ESAs) shall be prepared in accordance with the requirements outlined in CSA Z768 and the *Alberta Environmental Site Assessment Standard* and the following. Should the below requirements contradict CSA Z768 or any other industry standards or regulatory requirements, the more stringent requirements shall apply.
 - .1 The completed CSA Z768 mandatory records review list and justification for any Deviation from this list.
 - .2 A list of completed optional record reviews recommended in CSA Z768, if applicable.
 - .3 A record of the site visit, including photos of the site (preferably not when the land is covered with snow) and adjacent sites and a detailed description of the site visit. Include an assessment of the exterior and interior of any structures.
 - .4 Details of interviews with people knowledgeable of current and historic environmental site conditions.
 - .5 A review of reasonably available historic data, including data related to solid, liquid, and hazardous waste, oil and gas activities, and any other activities that may have had an impact on the environment of the site.
 - .6 A thorough review of the licensee's corporate files for any oil or gas sites or rights-of-way on or within 200 m of the subject property. Any areas of potential environmental concern (APEC) must be listed (e.g., flare pit, drilling sump, surface and/or subsurface storage tanks, spills, pipelines, process facilities, emissions, noise, etc.).

- .7 A list of water wells on or within 200 m of the subject property. Information such as well depth, depth of aquifer, well use, owner's name, etc. shall also be included.
- .8 Aerial photos for well or facility sites shall include one pre-disturbance photo, one post-disturbance photo, and one photo for every 5 to 7-year interval during operation, if available. The photos are to be at a minimum scale of 1:5000, when possible. Include a copy of the aerial photos and a summary table with a description of each photo, the land use, and any notable activities and/or features.
- .9 Data searches and interviews shall include provincial regulatory agencies, municipalities, past and present site owners, adjacent landowners, tenants, and lease holders on the site, as well as anyone else with knowledge of the environmental conditions of the site.
- .2 If the Phase 1 ESA is more than one year old, or significant development has occurred on or around the subject property, it must be updated. An update is to include a site visit, assessment of new development on and around the subject property, changes to environmental standards, and a statement from the property owner regarding knowledge of any contamination.
- .3 If the Phase 1 ESA is more than three years old, a new Phase 1 ESA is required.
- .4 The Owner is required to address the recommendations in the Phase 1 ESA.

2.10.5.8 Requirements for Phase 2 Environmental Site Assessments

- .1 Phase 2 Environmental Assessments (ESAs) shall be prepared in accordance with the requirements outlined in CSA Z769 and the *Alberta Environmental Site Assessment Standard*.
- .2 Phase 2 ESAs shall include the following items. Should the below requirements contradict CSA Z769 or any other industry standards or regulatory requirements, the more stringent requirements shall apply.
 - .1 A sampling plan with field and laboratory QA/QC test results, including field duplicates and blanks.
 - .2 Identification of and justification for the placement of boreholes and monitoring wells.
 - .3 Justification for any exceedances that are determined to not be of environmental concern.
 - .4 Justification of the applicable land use and grain size in the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* to which the samples are compared.
 - .5 Identification of monitoring wells installed downgradient of all known or expected contamination sources, or justification for not installing monitoring wells at those locations.
 - .6 Consideration of background conditions of soil and groundwater.
 - .7 A record of site condition to accurately reflect the status of the site.
 - .8 Sufficient and appropriate information for remediation and/or risk management.
- .3 Requirements for **groundwater monitoring wells**:
 - .1 The installation of groundwater monitoring wells shall be in accordance with CSA Z769, the Government of Alberta's *Technical Guideline Agdex 096-51*, and the *Alberta Environmental Site Assessment Standard* and shall be overseen by a qualified environmental professional.
 - .2 The risk for vertical movement of water or contaminants from the surface or between aquifers shall be minimized.

- .3 The depth, geology, hydrogeology, and receptor sensitivity shall be reviewed and effective procedures for the abandonment of groundwater monitoring shall be completed by a qualified environmental professional.
- .4 The decommissioning and reclamation of groundwater monitoring wells shall be in accordance with the Alberta Government's *Technical Guideline Agdex 096-50* and shall be overseen by a qualified environmental professional.
 - .1 The well shall be thoroughly flushed and purged using a dedicated bailer.
 - .2 The well casing shall be pulled or drilled from the borehole.
 - .3 Sealing material shall be compatible with the well material and shall not be lost into the formation.
 - .1 The borehole shall be backfilled with bentonite to 0.5 mbgs and hydrated with potable water to ensure an effective seal.
 - .2 Compacted clay consistent with the surrounding land use shall be used to seal from 0.5 mbgs to ground surface.
 - .4 The well shall be monitored after abandonment to confirm settlement has not occurred.
 - .5 A record of the decommissioning shall be prepared and submitted to the Municipality in addition to the Municipality's "Monitoring Well Reclamation Worksheet" (available upon request).

2.10.5.9 Requirements for Remediation and Risk Management Plans

- .1 Remediation/Risk Management Plans shall be prepared in accordance with the *Alberta Risk Management Plan Guide* and shall meet the requirements of Alberta Environment, including the *Alberta Tier 1 and Tier 2 Soil and Groundwater Remediation Guidelines*, and Alberta Health Services, as applicable.
- .2 Remediation/Risk Management Plans shall include the following items. Should the below requirements contradict the Alberta Environment standards or any other industry standards or regulatory requirements, the more stringent requirements shall apply.
 - .1 Summary of background information.
 - .2 Full delineation of identified contaminants of concern (COCs) and APECs.
 - .3 Conceptual site model (CSM) to determine risks to potential receptors and development of effective management options.
 - .4 Clear conclusions that support there are no unacceptable risk to receptors.
 - .5 Remediation Action Plan & Record of Site Condition (RoSC).

2.10.5.10 Requirements for Stormwater Management Reports

- .1 Stormwater Management Reports shall identify drainage areas and provide a mathematically supported design of the stormwater management system, including the location, capacity, and geometric footprint of stormwater management conveyance, storage, and treatment facilities.
- .2 Facility capacity sizing must meet or exceed the minimum design requirements of these standards and all applicable federal, provincial, and municipal regulations.

- .3 Generally, the subject parcel will only cover a portion of the watershed defined by natural topographic features. The watershed will; however, continue to act as a single integrated system during rainfall and snowmelt events.
 - .1 The Consulting Engineer shall incorporate urban drainage systems into the natural watershed in such a way as to account for flows from remaining undeveloped areas. Consequently, urban drainage design and modelling must be carried out on a total watershed basis.
- .4 Planning and design for major drainage systems must include the incorporation of surface drainage and overland flow routes, ponding areas, stormwater management facilities (SWMFs) and, where possible, overland escape routes to receiving watercourses.
- .5 New developments must provide stormwater detention to minimize the risk of surcharging in the existing downstream storm sewer system and to contain major drainage within the development area, to be released at the controlled release rate.
- .6 The Stormwater Management Report shall meet the requirements outlined in **Section 6** and shall:
 - .1 Identify the impact of the proposed development on the watershed.
 - .2 Identify and quantify the amount of upstream drainage entering the proposed development lands and all points of entry.
 - .3 Identify all existing flow channels, drainage patterns or routes, and containment areas.
 - .4 Compare pre-development flows and post-development flows.
 - .5 Identify the point(s) of discharge from the lands, as well as the type and calculated capacity of the receiving drainage facility(ies) whether natural, man-made, or a combination of both.
 - .6 Provide details of required stormwater retention/detention facilities.
 - .7 Provide details of stormwater quality enhancement facilities.
- .7 The Consulting Engineer shall include a SWMF summary table for notable pond elevations and rainfall frequencies for each pond in the development area. **Table 2-1** presents a sample SWMF summary table.

Table 2-1 Sample Stormwater Management Facility Summary Table

Design Parameter	Elevation (m)	Water Surface Area (ha)	Pond Volume (m ³)	Outlet Discharge (L/s)	Notes
Original Ground	884.3	3.6	N/A	N/A	
(1:100) Plugged Outlet	882.2	2.8	42,000	0	LTF ¹ Elevation
1:100	881.6	2.7	28,500	510	
1:50	881.2	2.1	27,300	490	
1:25	881.1	2.0	18,600	420	
1:10	880.8	1.8	12,400	380	
1:5	880.2	1.6	7,500	350	
Pond Bottom	880.1	1.2	500	250	Nominal Pond Bottom
Inlet Crest	880.0	0	0	245	
Invert By-Pass Pipe	878.0	0	0	0	

¹ Lowest Top of Footing

2.10.6 References

- 1 All references to specifications, standards, or methods of technical associations must be the latest adopted revision, including all amendments, in effect at the time, except where a date or issue is specifically noted.

2.10.7 Community Mailboxes

- 1 If applicable to the subdivision, the Developer's Consultant shall submit an overall subdivision layout plan (Area Structure Plan or Outline Plan) to the local Canada Post Delivery Planning office to establish the location, size, and details of community mailboxes.
- 2 For further information and requirements, refer to [Section 4](#) of these standards and the *Canada Post Postal Delivery Planning Standards Manual for Builders and Developers* document available from Canada Post.
- 3 Upon approval of location and details by Canada Post, community mailboxes are to be shown on all applicable drawings.

2.10.8 Approval by Other Agencies

2.10.8.1 General

- 1 Depending on the nature and scope of the proposed development or capital works project, approval may be required by other agencies, such as provincial and/or federal regulators or other third parties.
- 2 The Municipality is to be included in all communication with regulators.
- 3 The Owner shall submit documentary evidence to the Municipality that approval has been received from the appropriate authorities for the crossing of pipelines, railways, highways, or other facilities, if such crossings are proposed. These supporting documents shall be submitted in conjunction with submission of the detailed design drawings and specifications or soon thereafter; but, in any event, prior to construction.

- .4 Approval by other agencies in no way waives the responsibility of the Owner to comply with these standards and to obtain the Municipality's approval of the detailed plans and specifications.

2.10.8.2 Environmental Approvals

- .1 The Consulting Engineer, on behalf of the Owner, shall submit the detailed plans and specifications to applicable provincial and/or federal regulatory body(ies) for approval.
 - .1 The Municipality must review environment and/or regulatory applications prior to submission of the applications to the regulator(s) by the Owner.
 - .2 A copy of the submission(s), together with the approval(s), shall be supplied to the Municipality.
- .2 The applicable environmental approvals are required prior to execution of the Development Agreement for development projects and prior to approval of the detailed design drawings and specifications for capital works projects.
- .3 Regulatory compliance considerations that may apply to capital works or development projects are listed in **Table 2-2**. This table is not all-inclusive and other legislation may apply. Contact the municipal department responsible for regulatory compliance for more information or clarifications.

Table 2-2 General Regulatory Compliance Considerations

Act	Applicability
Provincial	
Water Act	The <i>Water Act</i> focuses on planning, use, and enforcement needed to protect the quality and quantity of Alberta's water resources, including surface water (rivers, lakes, streams, and wetlands) and groundwater. A development involving impacts to a water body requires appropriate approvals or licensing under this Act; in some cases, additional requirements under the Alberta Wetland Policy may apply.
Public Lands Act	Crown land, including the bed and shore of all permanent water bodies, are regulated under the <i>Public Lands Act</i> . Activities occurring on Crown land may require a Temporary Field Authorization or a Disposition.
Historical Resources Act	This Act provides for the use, designation, and protection of historic resources, including archaeological, paleontological, and historical or natural sites, structures, or objects.
Environmental Protection and Enhancement Act (EPEA)	This Act regulates activities associated with air, water, land, and biodiversity supporting the protection, enhancement, and wise use of the environment. Development of designated activities under this Act are regulated with requirements for Approval, Registration, or Notification. Some regulated activities include storm, water, and/or sanitary systems, landfills, and pesticide use.
Weed Control Act	The <i>Weed Control Act</i> regulates the specific weed species that are listed in the Weed Control Regulation, including prohibited noxious weeds (Schedule 1) and noxious weeds (Schedule 2). The Act requires the destruction of prohibited noxious weeds, the control of noxious weeds, and prohibits the spread and proliferation of weeds.
Wildlife Act	This Act provides for the protection and conservation of wild animals in Alberta, including controls for hunting, trapping, and possession of wildlife. Molestation, disruption, or destruction of wildlife, or a house, nest, or den of wildlife, are all prohibited by the provincial <i>Wildlife Act</i> .
Federal	
Fisheries Act	This Act provides a framework for the management of fisheries and conservation of fish and fish habitat. Any activities with potential to cause harmful alteration, disruption, or destruction to fish or fish habitat are regulated under the <i>Fisheries Act</i> .
Canadian Navigable Waters Act	Activities on waterbodies listed in the Schedule of the <i>Canadian Navigable Waters Act</i> or on waterbodies considered to be navigable, as defined under the Act, are regulated.
Species at Risk Act (SARA)	Activities with potential to impact a species at risk/species of concern and/or its habitat are regulated under the <i>Species at Risk Act</i> .
Migratory Birds Convention Act	Any activities with the potential to disturb migratory birds, their nests, or their eggs (including potential removal of vegetation) must comply with the requirements under the <i>Migratory Birds Convention Act</i> .

2.10.9 Crossing and Proximity Agreements for Crossing of Third Party Utilities

- .1 A Crossing, Proximity, and/or Encroachment Agreement and/or an Excavation Permit may be required when proposed Municipal Improvements require the crossing of and/or construction activity adjacent to the following:
 - .1 Oil or gas pipelines,
 - .2 High pressure gas mains,
 - .3 Overhead or underground telecommunications lines,
 - .4 Overhead or underground power lines,
 - .5 Creeks or rivers,
 - .6 Streets or highways,
 - .7 Railways, and
 - .8 Other registered rights-of-way.
- .2 The Owner's Consultant shall submit documentary evidence to the Municipality that permission has been received from the appropriate authorities for crossing of their facilities if such crossings are proposed.
 - .1 These supporting documents shall be submitted in conjunction with submission of the detailed plans and specifications or soon thereafter; but, in any event, prior to construction.
- .3 All costs related to preparation of application(s), application fees, and third-party inspection(s) during the crossing (if required) shall be borne by the Owner.

2.10.10 Third Parties Crossing Municipal Utilities and Roadways

2.10.10.1 General

- .1 The following sections outline the requirements for third party (oil and gas) pipeline and Shallow Utility crossings of municipal utilities or roadways.
- .2 Refer to the Standard Details provided in **Section 13** for additional information.

2.10.10.2 Pipeline Crossing of Municipal Underground Utilities

- .1 The third-party pipeline company is required to apply for and receive approval of a Utility Line Assignment Permit (refer to **Section 2.16.5**) for the crossing of municipal underground utilities, prior to construction.
- .2 Crossings shall be constructed in accordance with CSA Z662 and as per the requirements of the authorities having jurisdiction.
- .3 Pipelines shall be constructed with the following minimum clearances to other utilities:
 - .1 Vertical: 1 m, and
 - .2 Horizontal: 3 m.
- .4 Pipelines shall be constructed along a straight alignment and shall extend 8 m beyond the limits of the road right-of-way.
 - .1 If the utilities being crossed are within an Easement, the pipelines shall extend 4 m beyond the limits of the Easement.
- .5 Pipeline marker tape shall be placed over the pipeline(s).

- .6 Backfilling operations shall attain the original compaction around the municipal utilities, or as specified by the Municipality.
- .7 The Municipality shall be notified at least 48 hours prior to commencement of excavation to allow for the coordination of municipal inspection.
- .8 The Municipality shall be notified upon construction completion to allow for the coordination of municipal inspection.
- .9 Record Drawings shall be provided to the Municipality upon construction completion.

2.10.10.3 Pipeline Crossing of a Municipal Roadway

- .1 The third-party pipeline company is required to apply for and receive approval of a Utility Installation and Street Occupation Permit (refer to **Section 2.16.3**) for the crossing of a municipal roadway, prior to construction.
- .2 Crossings shall be constructed in accordance with CSA Z662 and as per the requirements of the authorities having jurisdiction.
- .3 Pipeline marker tape shall be placed over the pipeline(s).
- .4 Municipal utilities, if present, shall be located prior to commencing construction.
- .5 All crossings shall be constructed in accordance with the requirements of the Transportation Safety Board of Canada, the Energy Resources Conservation Board (ERCB), and any other authority having jurisdiction.
- .6 The pipeline alignment shall be straight, with no vertical or horizontal bends within 8 m of the boundary of the municipal roadway.
- .7 The crossing deflection angle shall be as close to 90 degrees as is practical but shall not be less than 70 degrees nor more than 110 degrees.
- .8 The Municipality shall be notified at least 48 hours prior to commencement of excavation to allow for the coordination of municipal inspection.
- .9 The Municipality shall be notified upon construction completion to allow for the coordination for municipal inspection.
- .10 Record Drawings shall be provided to the Municipality upon construction completion.
- .11 Backfill details shall be as per **Table 2-3**.

Table 2-3 Backfill Details for Third Party Pipeline Crossings of Government Road Allowances

Road Allowance	Minimum Cover	Compaction	Recommended Construction Method
Undeveloped (no future development planned)	1.2 m	maintain original	may use open cut
Undeveloped (future development anticipated)	2.0 m	95%	may use open cut
Developed	1.5 m (from lowest ditch bottom)	95% or greater (per direction from the Municipality)	trenchless

2.10.10.4 Shallow Utility Crossing of Municipal Underground Utilities

- .1 The Shallow Utility company is required to apply for and receive approval of a Utility Line Assignment Permit (refer to [Section 2.16.5](#)) for the crossing of municipal underground utilities, prior to construction.
- .2 Crossings shall be constructed in accordance with the requirements of the authorities having jurisdiction.
- .3 Shallow Utilities shall be constructed with the following minimum clearances to other utilities, unless otherwise required by the authorities having jurisdiction.
 - .1 Vertical: 1 m, and
 - .2 Horizontal: 3 m.
- .4 Backfilling operations shall attain the original compaction around the municipal utilities, or as specified by the Municipality.
- .5 The Municipality shall be notified at least 48 hours prior to commencement of excavation to allow for the coordination of municipal inspection.
- .6 The Municipality shall be notified upon construction completion to allow for the coordination of municipal inspection.
- .7 Record Drawings shall be provided to the Municipality upon construction completion.

2.10.10.5 Shallow Utility Crossing of a Municipal Roadway

- .1 The Shallow Utility company is required to apply for and receive approval of a Utility Installation and Street Occupation Permit (refer to [Section 2.16.3](#)) for the crossing of a municipal roadway, prior to construction.
- .2 Crossings shall be constructed in accordance with the requirements of the authorities having jurisdiction.
- .3 Municipal utilities, if present, shall be located prior to commencing construction.
- .4 All crossings shall be constructed in accordance with the requirements of the Transportation Safety Board of Canada and any other authority having jurisdiction.
- .5 The crossing deflection angle shall be as close to 90 degrees as is practical.
- .6 The Municipality shall be notified at least 48 hours prior to commencement of excavation to allow for the coordination of municipal inspection.

- .7 The Municipality shall be notified upon construction completion to allow for the coordination for municipal inspection.
- .8 Record Drawings shall be provided to the Municipality upon construction completion.
- .9 Backfill details shall be as per **Table 2-3**.

2.10.11 Underground Infrastructure in the Vicinity of a Municipal Highway

2.10.11.1 General

- .1 The following standards apply to underground infrastructure (including watermain, sewer main, Shallow Utilities, and oil/gas pipelines) crossing, adjacent to, or otherwise in the vicinity of those portions of Highway 63 (Memorial Drive) and Highway 69 (Saprae Creek Trail) that fall under the jurisdiction of the Municipality. The Municipality will engage Alberta Transportation and other jurisdictional authorities relevant to the project and convey the requirements to be satisfied.
- .2 No infrastructure construction work (including installation and/or modification) shall be undertaken within 30 m of the municipal highway rights-of-way without approval from the Municipality.
- .3 Applications must be submitted to the Municipality and must include Authenticated plan/profile drawings of the proposed work, including legal land description, utility identification, proposed location and alignment, installation method, depth of cover, casing material, and carrier pipe material.
- .4 The Owner shall allow up to 30 working days for processing and review of the application.
- .5 An Easement is required from the Municipality in conjunction with the engineering submission for proposed utilities that parallel the existing municipal highway and are within the highway right-of-way.
- .6 The Owner shall contact the Municipality at least two working days prior to commencement of construction as well as prior to construction completion to allow for the coordination of municipal site inspection, if required.
- .7 The Owner shall be responsible for all costs to repair any damages to highway infrastructure resulting from the installation, maintenance, or operation of the underground utilities within the highway right-of-way.
- .8 Following any work done by the Owner, their representatives, or Contractors, the Owner shall restore the municipal highway right-of-way, to original or better condition.
- .9 The Owner shall be responsible for proper and adequate line marking as well as maintenance of the line markers within the municipal highway right-of-way for the duration of the work.

2.10.11.2 Crossing Requirements

- .1 The open cut method for utility installation crossing a municipal highway shall not be permitted; trenchless installation shall be required.
 - .1 The Owner must identify the proposed method(s), undertake the appropriate geotechnical investigation, and accept all risk associated with the trenchless installation method(s).
- .2 The open cut method for utility installation may be used for utility installation parallel to a municipal highway, at the Municipality's discretion.

- .3 The minimum depth of cover shall be as per these standards and may be modified based on utility crossings and third-party utility owner requirements.
- .4 The crossing deflection angle shall be as close to 90 degrees as is practical, but shall not be less than 70 degrees, nor more than 110 degrees, at the discretion of the authority having jurisdiction.
- .5 No horizontal and/or vertical pipe bends are permitted within a cased crossing, including within 30 m outside the limits of the municipal highway right-of-way.

2.10.11.3 Cased Crossings

- .1 Where casing pipe is used, it shall be continuous and inserted by boring, augering, jacking, or another appropriate method.
- .2 Casing pipe shall be designed to be of equal to or greater than the lifespan of the carrier pipe.
- .3 The casing shall be of sufficient size to accommodate the installation of the carrier (product) pipe with appropriate joint restraints and casing spacers.
- .4 The casing shall extend across the full width of the municipal highway right-of-way. The slope and impact of the excavation to the right-of-way shall be considered. Casing length may require extension if ground disturbance is not permitted within the right-of-way.
- .5 Vents, if required, shall not be placed within the limits of the municipal highway right-of-way.
- .6 Casing pipe shall be sealed at both ends via the use of a casing seal; otherwise, the casing shall be grouted. Grouting is at the discretion of the Consulting Engineer.
- .7 All cased crossings shall be provided with sufficient spacer insulators to prevent the carrier pipe from touching the casing pipe and to prevent transmission of electric currents between the carrier pipe and the casing pipe.

2.10.11.4 Carrier Pipe Materials

- .1 **Watermains, Sanitary Sewer Mains, and Storm Sewer Mains:**
 - .1 Carrier pipe materials for watermains, sanitary sewer mains, and storm sewer mains shall be as per the Municipality's *Standard Construction Specifications*.
- .2 **Oil and High-Pressure Gas Pipelines:**
 - .1 Cased and uncased crossings shall be constructed in conformance with CSA Z662 and as per the requirements of the authorities having jurisdiction.

2.10.12 Submission, Review, and Approval

- .1 Submission of detailed design drawings and supporting documentation is to be made to the Municipality through the E-Permitting system.
 - .1 Drawing Submission Compliance and Detailed Design Submission Checklists are provided at the end of **Section 2**, for reference.
- .2 Upon receipt of the detailed design submission from the Consulting Engineer, the Municipality shall inform the Consulting Engineer, within 21 days, whether the submission has been approved.

- .3 The review by the Municipality is for the sole purpose of ascertaining conformance to these standards, the Municipal Development Plan, Land Use Bylaw, and other municipal plans, standards, and guidelines (such as FireSmart and BearSmart guidelines and municipal Master Plans).
- .4 Following the Municipality's review of the submitted drawings and documents, review comments will be forwarded to the Owner's Consultant.
- .5 Prior to resubmission of any drawings and/or documents, the Owner's Consultant is to prepare a response letter outlining the comments received from the Municipality and how each comment has been addressed. The Owner's Consultant shall submit the response letter to the Municipality in support of the revised drawings and/or documents. The review period will begin again upon receipt of the resubmission.
- .6 Once revisions have been made to the satisfaction of the Municipality, the detailed design submission will be approved.
- .7 Approval of the submission does not relieve the Owner's Consultant of their responsibility for errors or omissions or of their responsibility of meeting all requirements of these standards and other federal and provincial rules and regulations.
- .8 Once all drawings and plans are approved, the Owner's Consultant shall submit electronic files (in an acceptable format as outlined in **Section 3**) to the Municipality.
- .9 The Owner may proceed to install the Municipal Improvements upon:
 - .1 Receipt of approval of the drawings and specifications, and on the satisfactory execution of the Development Agreement and payment of Security(ies), in the case of a development project.
 - .2 Receipt of approval of the drawings and specifications, in the case of a capital works project.
- .10 A copy of all approved drawings and specifications shall be maintained at the construction site during the installation of Municipal Improvements.

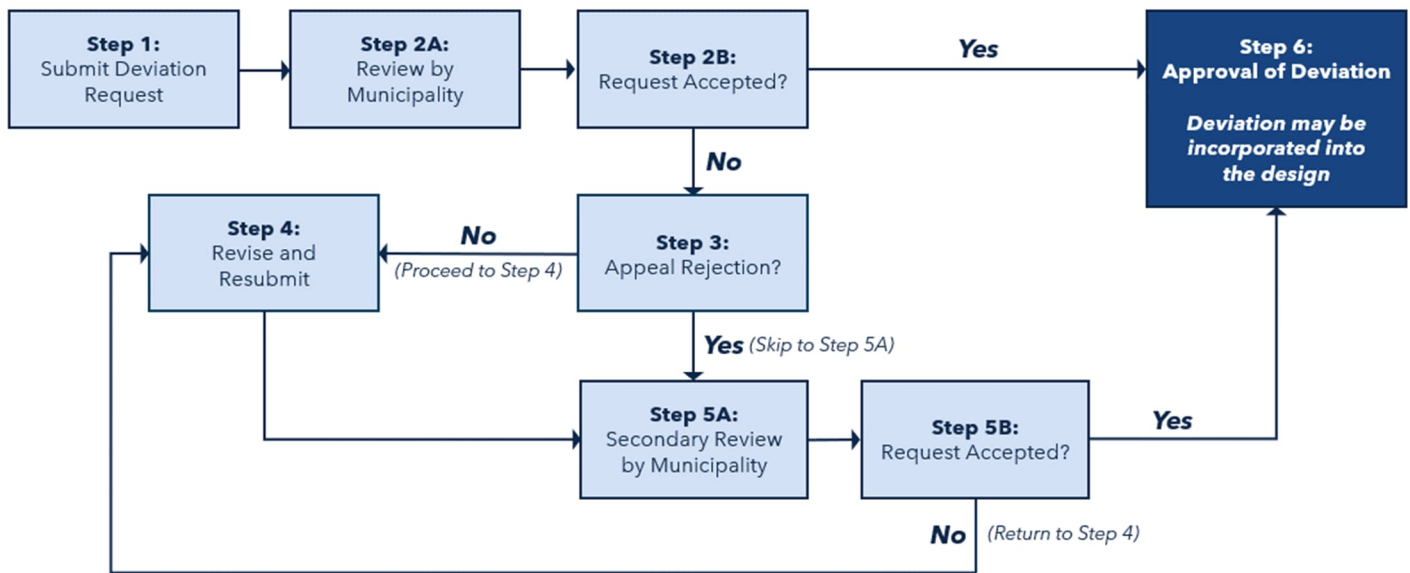
2.11 Design Servicing Standards Deviation Process

- .1 The Municipality encourages creativity and innovation in the design of Public Infrastructure, subject to provincial and federal standards, building codes, and accepted industry best practices applicable to the region.
 - .1 Notwithstanding the above statement, the Municipality has the ultimate authority with regards to setting minimum standards and not approving Deviations from these standards.
- .2 The application process for a Deviation to these standards or the Municipality's *Standard Construction Specifications* is described in **Figure 2-7**.
- .3 The Consulting Engineer shall identify and provide justification for any proposed Deviations from or nonconformances with these standards or the Municipality's *Standard Construction Specifications* as part of the submission of the detailed design drawings.
- .4 All applications for Deviation shall be supported with an Authenticated letter of recommendation from the Consulting Engineer and all applications shall be accompanied by a completed Deviation Form, a blank copy of which is provided at the end of **Section 2**.
- .5 Note that under no circumstances will a Deviation from these standards or the Municipality's *Standard Construction Specifications* be considered by the Municipality without the submission of detailed

documentation demonstrating the justification for the Deviation. The added benefit (to the Municipality) of the Deviation must be equal to or better than that described in these standards.

- .6 For development projects, costs incurred by the Municipality for review of submissions and re-submissions, and third-party reviews as required, are the responsibility of the Developer.
- .7 Upon approval of an approved Deviation to these standards, the Municipality will forward a copy of the approval to the Consulting Engineer.

Figure 2-7 Deviation Review Process



2.12 Review Costs

- .1 The cost for basic review by municipal staff is covered by the subdivision application fee.
- .2 The Developer will be responsible for any review costs, over and above the cost for basic review by municipal staff, deemed appropriate by the Municipality.
- .3 Review costs may be incurred:
 - .1 When specialized consulting expertise is required by the Municipality to review development proposals, concept plans, or drawings.
 - .2 When additional staffing is required to review developments.
 - .3 For the review of complex resubmissions and Deviations from these standards.
 - .4 When excessive errors and omissions are encountered.
 - .5 When insufficient information is provided.
 - .6 When improper procedures are followed.
- .4 The cost of review may take several forms including:
 - .1 A lump sum fee charged to the Developer,
 - .2 A time and materials fee charged to the Developer, or

- .3 An invoiced cost by specialized consultant, plus mark-up for handling and administration.
- .5 Each submittal by the Developer will be reviewed by the Municipality and the Developer will be informed of the anticipated review costs.
- .6 The Developer shall reimburse the Municipality prior to review of resubmissions.

2.13 Subdivision

2.13.1 General

- .1 Proposed subdivisions must follow the Municipality's Land Use Bylaw, Municipal Development Plan, and relevant Area Structure Plan, Area Redevelopment Plan, or Outline Plan.
- .2 If no plan exists for the subject parcel, the Developer may be required to complete an Area Structure Plan and/or an Outline Plan prior to the Municipality considering a subdivision application.

2.13.2 Process

.1 Prepare and Submit Subdivision Package

- .1 The Developer shall prepare and submit a complete application package for subdivision as per the requirements of the *Municipal Government Act, Matters Related to Subdivision and Development Regulation*, the Subdivision Authority for the Municipality, and these standards.
- .2 The submission is to be done through the E-Permitting system.
- .3 The Municipality will review the submission for completeness/compliance with municipal requirements.
- .4 The application will be referred to the Municipality's internal stakeholders, any applicable external stakeholders, and adjacent landowners (if required), for comment on the proposal.
- .5 The Developer will be informed of any issues that result from the referral process.

.2 Presentation of Subdivision

- .1 The Municipality will prepare a report and present the proposed Tentative Plan of Subdivision to the Subdivision Authority for decision.

.3 Conditional Approval of Subdivision

- .1 The Subdivision Authority may approve or refuse an application.
- .2 In the case of approval, the Subdivision Authority may impose conditions that must be fulfilled before the subdivision can be registered at the Alberta Land Titles Office.

.4 Final Endorsement

- .1 The Developer must meet all conditions of the subdivision approval prior to final endorsement of the Legal Plan of Subdivision.
- .2 The Developer shall submit a subdivision endorsement package to the Municipality within the timeframe referred to in the *Municipal Government Act*.
- .3 The Municipality will endorse the Subdivision Plan following the issuance of the CCC(s) for both the underground and surface construction works.

- .4 In the absence of issued CCC(s), the Municipality may endorse a Subdivision Plan if the Developer increases the Security from 50% to 120% for any Municipal Improvements outlined in the Development Agreement which have not yet been completed and accepted.

2.13.3 Submission

- .1 The Developer must submit the following information with the subdivision application:
 - .1 Original subdivision application form signed by the registered owner(s) of the land or a person authorized to apply on the owner's behalf.
 - .2 Application fee.
 - .3 Location map showing the site. Submit digital copy (PDF format).
 - .4 Tentative Plan of Subdivision drawn by a registered Alberta Land Surveyor. If the drawing is unclear, or otherwise unsuitable for circulation and review, the application will be returned as incomplete.
 - .1 The Tentative Plan of Subdivision shall be drawn in accordance with the *Matters Related to Subdivision and Development Regulation*, and will typically include the following information:
 - .1 Scale and north arrow.
 - .2 Dimensions of the title area(s) and the sizes and dimensions of the proposed lots, including Environmental Reserves, Municipal Reserves, and Public Utility Lots.
 - .3 Location, use, and dimensions of existing buildings and structures and their distances from property lines.
 - .4 Location and dimensions of utility rights-of-way or Easements on or adjacent to the property.
 - .5 Location and name of existing roadways.
 - .6 Location of proposed roadways, accesses, and utility rights-of-way or Easements.
 - .7 Location of natural features within the site, such as water features (including sloughs, rivers, creeks, etc.), wooded areas, muskeg areas, swamp areas, and/or crests and toes of bank slopes to water bodies or valleys.
 - .8 Location of other features within the site, such as constructed water bodies and ditches, oil and gas wells/pipelines, gravel workings, and/or landfills.
 - .5 Current copies (within the last 30 days) of each relevant certificate of title as well as any registered instruments on each certificate of title.
 - .6 Depending on the type and location of the proposed subdivision, other information may be required to determine subdivision conditions as legislated by the *Municipal Government Act*.
 - .1 If there is no approved Outline Plan and/or an approved Engineering Design Brief in place for the subject parcel, there may be a requirement to complete additional studies to support the application, at the discretion of the Municipality.
 - .2 Studies which may be required to support the application are listed in **clause 2.7.3.1**.

2.14 Development Agreement

2.14.1 General

- .1 The Developer shall coordinate with the Municipality for the requirements, preparation, and execution of the Development Agreement.

- .2 The construction of Municipal Improvements within a development area is subject to the terms and conditions of a Development Agreement, including all financial, construction, and Maintenance requirements of the Developer.
- .3 The construction of Municipal Improvements shall be borne by the Developer.
- .4 The Developer must have an approved Development Agreement in place before construction of a development area may begin (except for clearing, topsoil stripping, and rough grading).
- .5 The Municipality shall determine financial Security requirements, off-site levies, administration fees, and other fees in accordance with the terms and conditions of the Development Agreement.

2.14.2 Process

.1 Draft Development Agreement

- .1 Once the subdivision has been conditionally approved, the Developer may submit a request, in writing, for the Municipality to initiate a Development Agreement.
- .2 The Municipality will issue the final Development Agreement for signature once detailed engineering and landscape drawings are approved and all issues resolved.

.2 Executed Development Agreement

- .1 The Municipality will send copies of the final Development Agreement to be signed, sealed, and returned by the Developer.
- .2 The Developer shall complete the following when returning the signed/sealed Development Agreement:
 - .1 Provide financial Securities to the Municipality, in accordance with the Development Agreement.
 - .2 Provide an original certificate of insurance and submit payment of inspection fees and off-site levies (if any), in accordance with the Development Agreement.
- .3 Upon receipt of the above and upon removal or waiver of any conditions, the Municipality will execute the Development Agreement and return one copy to the Developer.

2.15 Security Calculations

- .1 In conjunction with the Development Agreement process, the Developer is required to submit the estimated costs of all Municipal Improvements for calculation of the Security.
- .2 The costs should also include estimates for the total cost of consulting services through construction, including construction inspection, contract administration, quality assurance, and Record Drawing production.
- .3 If the Developer or the Consulting Engineer has not provided estimates, the Municipality may establish costs in its sole discretion for the purpose of establishing the required Security.
- .4 The Security is calculated as 50% of the estimated construction cost of the Municipal Improvements, plus 100% of the landscaping costs.
- .5 Security must be in the form of an Irrevocable Letter of Credit from a Charter Bank or Treasury Branch or as a cash Security deposit, or combination thereof.

- .6 The Developer must deposit the Letter of Credit to the Municipality upon or before the execution of the Development Agreement and, in any event, prior to commencement of construction of the development area.
- .7 The Municipality's GIS/TCA Asset Catalogue tool may be used to inventory the infrastructure as part of the cost estimate. Contact the Municipality for more information.

2.16 Municipal Permits

2.16.1 General

- .1 The Municipality issues permits for construction works for development projects as well as capital projects. These permits are as follows:
 - .1 Clearing and Grading Permit (refer to [Section 2.16.2](#))
 - .2 Utility Installation and Street Occupation Permit (refer to [Section 2.16.3](#))
 - .3 Boulevard Crossing Permit (refer to [Section 2.16.4](#))
 - .4 Utility Line Assignment Permit (refer to [Section 2.16.5](#))
 - .5 Service Connection Permit (refer to [Section 2.16.6](#))
 - .6 Water Meter Permit (refer to [Section 2.16.7](#))
 - .7 Route Haul Permit (refer to [Section 2.16.8](#))
 - .8 Demolition Permit (refer to [Section 2.17.6](#))
 - .9 Development Permit (refer to [Section 2.23.2](#))
 - .10 Building Permit (refer to [Section 2.23.3](#))
 - .11 Occupancy Permit (refer to [Section 2.23.4](#))
- .2 In general, all works performed under these permits shall be required to conform to these standards.
- .3 Applications for permits are to be made through the Municipality's E-Permitting system.

2.16.2 Clearing and Grading Permit

- .1 Owners are required to apply for and receive approval from the Municipality for clearing, grubbing, and grading under the following conditions:
 - .1 Cuts/fills greater than 400 m³,
 - .2 Existing slopes greater than 20% on the subject property or adjacent properties,
 - .3 Sites below the 1:100 year flood level of adjacent water bodies,
 - .4 Sites near water bodies, streams, rivers, or wetlands, at the discretion of the Municipality,
 - .5 Clearing greater than 1,000 m²,
 - .6 Sites with the potential to impact wildlife features or habitat, and
 - .7 Work that will result in publicly owned and operated infrastructure.
- .2 The following information is to be provided to the Municipality with the application for a Clearing and Grading Permit:
 - .1 Erosion and Sedimentation control plan,
 - .2 Cut/fill plan, showing existing contours and proposed elevations,

- .3 Route Haul Permit (if required),
- .4 Locations of all stockpiles on a site plan overview of the area,
- .5 Stockpile sizes (width, length, height) and estimated quantity,
- .6 Duration the stockpile(s) will occupy the space, and
- .7 The proposed method(s) for surface restoration once the stockpile(s) is/are removed.
- .3 Stockpiles will only be allowed on proposed (undeveloped) school sites or Municipal Reserves if prior approval has been granted by the Municipality.
- .4 Legislative and due diligence requirements pertaining to tree clearing must be determined on a case-by-case basis and are influenced by the time of year the clearing is proposed, whether the tree clearing is proposed on Crown land, and whether the trees provide habitat for sensitive owls or migratory birds.
 - .1 Sweeps for due diligence proposed under the *Migratory Birds Convention Act* and the *Wildlife Act* may be required; consult with an environmental professional for project-specific details.
- .5 The general migratory birds nesting period in the Municipality is mid-April to early August. This period is a general guideline of the likelihood of encountering migratory birds. Sensitive owls may nest in the Municipality between mid-February and late August.
 - .1 More specific annual dates can be obtained from Environment Canada, Canadian Wildlife Service.
- .6 The Federal *Migratory Birds Convention Act* and the provincial *Wildlife Act* regulate disturbance to migratory and non-migratory birds, their nests, and their eggs; neither of these *Acts* regulate tree clearing. Due diligence requirements under these *Acts* should be evaluated on a case-by-case basis to determine whether bird or wildlife sweeps are required.
- .7 Migratory bird and/or wildlife sweeps and/or surveys must be completed by an environmental professional. A valid research and collection licence/permit issued under the *Wildlife Act* may be required. It is the responsibility of the environmental professional to carry out sweep and/or survey methods as approved under the issued permit.
- .8 Refer to the Municipality's website for more information.

2.16.3 Utility Installation and Street Occupation Permit

- .1 All construction projects that will occupy or block access to municipal lands are required to apply for and receive an approved Utility Installation and Street Occupation Permit at least 5 days prior to starting construction, except for an emergency dig up (e.g., watermain break).
- .2 For any work to take place within a municipal right-of-way (i.e., roadway, alley, etc.), the Developer and/or the Shallow Utility company(ies), Contractor(s), or RMWB Project Manager must apply for and obtain an approved Utility Installation and Street Occupation Permit from the Municipality, at least 3 working days for partial road closures, and at least 5 working days for full road closures, prior to commencement of the work.
- .3 Any modifications to be made to Public Infrastructure must be reviewed and approved by the Municipality before work commences.
 - .1 For a development project, this is typically done through drawing reviews completed by the Municipality as part of the Development Agreement process.

- .2 For a capital works project, this is typically done through drawing reviews completed by the Municipality's Project Manager and relevant municipal departments.
- .3 For any proposed modification to Public Infrastructure that has not been previously approved by the Municipality, a Utility Installation and Street Occupation Permit will not be issued until the proposed modifications are circulated and approved by the Municipality.
 - .1 In these situations, the Utility Installation and Street Occupancy Permit must include drawings showing the proposed modifications and must be circulated to the Municipality for approval.
 - .2 Allow 3 weeks for circulation, review, and comments.
 - .3 Once the modifications are completed, Record Drawings, compliant with the drafting requirements outlined in **Section 3**, are required to be submitted to the Municipality.
- .4 All excavations under roadways and alleys under this Permit are to be backfilled with unshrinkable fill (i.e., fillcrete). Larger excavations may use granular or approved native fill provided that geotechnical testing and documentation demonstrating 98% SPMDD has been achieved.

2.16.4 Boulevard Crossing Permit

- .1 Construction, modification, or removal of driveway accesses require an approved Boulevard Crossing Permit from the Municipality prior to commencement of construction.
- .2 Procedures and guidelines for the installation of boulevard crossings can be found with the Permit application.
- .3 Refer to the Municipality's website for more information.

2.16.5 Utility Line Assignment Permit

- .1 The installation of Shallow Utilities, monitoring wells, or any third-party infrastructure within public road rights-of-way by external agencies and private utilities require an agreement with the Municipality.
- .2 The agreement usually takes the form of a Right-of-Way Consent & Access Agreement or a Franchise Agreement.
 - .1 A standard condition of the agreement is that all utility installations require the Municipality's approval in the form of a Utility Line Assignment (ULA) Permit.
- .3 Applications for ULA Permits must include utility alignment plans showing where new underground or aerial utility lines will be built, or where environmental testing will occur within municipal road rights-of-way.
- .4 The Consulting Engineer proposing the installation, the Municipality, other utility companies and agencies, and any other relevant stakeholders all play a role in reviewing, approving, constructing, inspecting, and/or recording information on these installations.

2.16.6 Service Connection Permit

- .1 A sewer and water Service Connection Permit is required from the Municipality under the provincial *Safety Codes Act* when connecting to sewer and water infrastructure within municipal rights-of-way, such as for:
 - .1 Service connections, and/or

- .2 Foundation drains/weeping tile connections.

2.16.7 Water Meter Permit

- .1 A Water Meter Permit is required prior to a water meter being installed on a service connection and is a mandatory prerequisite to using any water from the service.
- .2 For service connection details, refer to **Section 7**.
- .3 Contact the Municipality for more information.

2.16.8 Route Haul Permit

- .1 Any person intending to haul materials or equipment on any roadway, excluding a truck route, shall make an application to the Municipality for a Route Haul Permit.

2.17 General Construction Requirements

2.17.1 General

- .1 All work for construction of Municipal Improvements carried out by the Developer shall be in accordance with all federal, provincial, and local statutes, acts, bylaws, and regulations, and shall meet the following general requirements.
- .2 Note that the General Conditions and Supplementary Conditions contained in the construction contract between the Owner and the Contractor may provide further requirements than the items listed below.

2.17.2 Occupational Health and Safety

- .1 The Developer, Contractor, Consulting Engineer, and Landscape Consultant shall comply with current Occupational Health and Safety Legislation and the Municipality's health and safety management system.
- .2 The Contractor and the Consulting Engineer shall have either full certification in the Alberta Labour approval "Certificate of Recognition" (COR) Program appropriate to their industry or a Temporary Letter of Certification (TLC).

2.17.3 Right-of-Way Documents

- .1 When Easement, right-of-way, or restrictive covenant documents are deemed necessary, the Legal Plan and necessary documents shall be prepared by an Alberta Land Surveyor, the Right-of-Way Agreement shall be prepared, approved, signed, and registered at the Alberta Land Titles Office before issuance of the Construction Completion Certificate(s).
 - .1 The costs associated with the preparation and registration of Right-of-Way Agreements and associated Legal Plans and documents shall be borne by the Developer.
- .2 Easements or rights-of-way shall be of sufficient size to allow access for maintenance purposes. It is the sole responsibility of the Developer to prepare and submit such documents to the satisfaction of the Municipality.
- .3 The Municipality has general guidelines for Right-of-Way Agreements.

2.17.4 Construction Commencement Notice

- .1 **Development projects:** upon receipt of approved drawings and specifications, satisfactory execution of the Development Agreement, and submission of the Letter of Credit to the Municipality, the Developer may proceed to install the Municipal Improvements.
- .2 **Capital works projects:** upon approved drawings and specifications, the Municipality may proceed to install the Municipal Improvements.
- .3 The Owner shall give the Municipality at least two weeks' notice prior to commencing construction to allow for time to arrange for inspection staff.

2.17.5 Site Protection, Preparation, and Restoration

- .1 The Owner is responsible for the protection of existing infrastructure, municipal assets, survey monuments, and natural areas which are to remain.
- .2 The Owner is responsible to locate all utilities prior to commencing construction.
- .3 Any disturbed areas within a municipal right-of-way are to be restored by the Owner to existing or better condition.

2.17.6 Demolition Requirements

- .1 Any site demolition requires a permit from the Municipality.
- .2 The Demolition Permit application must account for service terminations (i.e., cutting and capping of underground utilities as described in **Sections 5.11.2, 6.7.2, and 7.13.2**), site safety, site access, traffic and pedestrian accommodation, impacts to adjacent sites, site remediation, and hazardous waste material handling and disposal, as applicable.
 - .1 Refer to the Municipality's website for specific permit requirements.
- .3 All site demolition works must adhere to the *National Building Code*.

2.17.7 Project Supervision

- .1 The Owner's Representative shall be responsible for the layout, field surveys, inspection, approval of materials, and the supervision of all Municipal Improvement installations which are the responsibility of the Owner.
- .2 The Owner's Representative shall be on site at all times during the installation of services to certify that all Municipal Improvements are in conformance with these standards and the approved drawings and specifications.
 - .1 The Owner will be held responsible to the Municipality for Contractor nonconformance, construction errors, and/or omissions.
- .3 The Owner's Representative shall be prepared to provide Daily or Weekly Inspection Reports, at the request of the Municipality, to document work progress and confirm work is in conformance with the approved drawings and specifications.
- .4 In addition to supervision carried out by the Owner's Representative, the Municipality may periodically inspect the work and assist in coordinating the Municipal Improvements with any related municipal work.

- .1 The Municipality will bring the use of any unacceptable materials or practices to the attention of the Owner's Representative.
- .2 If remedial action is not taken to the satisfaction of the Municipality, a Stop Work Order may be issued and all work will cease. The unacceptable work will be corrected and/or replaced by the Owner, with direction given from the Owner's Representative to the Contractor.

2.17.8 Staged Construction

- .1 The Municipality understands that staged construction is an acceptable business approach, either between phases and stages or over the course of the seasonal cycles within a single phase or stage.
- .2 The Owner shall prepare a Site Management Plan for any staged construction activities and shall be responsible for Maintenance of all partially completed works that have been opened for use. The Site Management Plan shall address:
 - .1 The intended functionality of the site (i.e., whether the site is open to the public, third-party tradespeople working on the site, the Owner's own staff, Contractors, and agents, or closed-off completely).
 - .2 Access for:
 - .1 Emergency vehicles,
 - .2 Residents and/or local businesses (if applicable),
 - .3 Construction equipment (if applicable), and
 - .4 Maintenance equipment.
 - .3 Access control requirements, including signage, barricades, and fencing.
 - .4 Maintenance requirements, including frequency or level of service to be maintained by the Owner.
 - .5 Any interim measures required to be undertaken by the Owner to safeguard the public and the environment as a result of the interim conditions.
- .3 Deficiencies in partially completed work shall be rectified prior to commencement of the next stage of construction.
- .4 The use of completed portions of staged construction shall be subject to the conditions of the Partial Construction Completion Certificate.

2.17.9 Stockpile Locations

- .1 The location of all stockpiles shall be subject to approval by the Municipality.
- .2 The Municipality's approval of a stockpile location does not alleviate the Owner's responsibility to ensure safety, dust control, and weed control.
- .3 Stockpile locations may need to be temporarily fenced, depending on the circumstances.
- .4 Silt fencing, placed around the perimeter of the stockpile, is required for stockpiles adjacent to a stormwater management facility, ditch, road, neighbouring property, Municipal Reserve, or Environmental Reserve.

2.17.10 Dust Control

- .1 The Owner shall be solely responsible for controlling dust nuisance resulting from the installation of Municipal Improvements.

2.17.11 Street and Sidewalk Cleaning

- .1 During the construction and Warranty Period, and until the issuance of the Final Acceptance Certificate, the Owner shall be solely responsible for the removal and disposal of mud and debris from streets, sidewalks, trails, and laydown areas within the project boundary and outside the project boundary when mud tracking from the project site occurs.

2.17.12 Barricades, Temporary Fencing, and Safety Provisions

- .1 The Owner is responsible to protect persons from injury and to avoid property damage.
- .2 The Owner shall place and maintain barricades, construction signs, warning lights, and temporary fencing at all times until the work is safe for traffic and/or pedestrian use.
- .3 Barricades, temporary fencing, and other safety provisions shall be in conformance with Transportation Association of Canada (TAC) guidelines and Occupational Health and Safety Legislation.
- .4 All commercial and multi-family sites require perimeter chain link fencing and gated access control.
 - .1 The Consulting Engineer shall coordinate with the Municipality in planning the fence location, pedestrian safe areas, overhead protection as necessary, access points, and parking areas.

2.17.13 Erosion and Sedimentation Control

- .1 The Owner shall have erosion and Sedimentation control (ESC) measures in place to prevent erosion and transport of sediment from the project site. Refer to the requirements outlined in **Section 12**.

2.17.14 Traffic Accommodation Plan

2.17.14.1 General

- .1 Refer to the Municipality's *Utility Installation and Traffic Control Manual* and TAC's *Manual of Uniform Traffic Control Devices for Canada*.

2.17.14.2 Approval

- .1 Prior to any work being done within a municipal right-of-way, the Owner must obtain approvals from the Municipality in accordance with the requirements for a Utility Installation and Street Occupation Permit.
- .2 Traffic Accommodation Plans shall be reviewed by any other affected jurisdictions or authorities.

2.17.14.3 Traffic Disruption

- .1 Hydrants, valve pit covers, valve boxes, curb stop boxes, and other utility controls shall be unobstructed and accessible during the construction period.
- .2 All construction related operations on or near a public roadway shall be conducted to cause the least interruption to traffic.
- .3 The Owner shall provide and maintain safe and suitable temporary bridges at street and driveway crossings where traffic must cross open trenches and/or excavations.

2.17.14.4 Flagpersons

- .1 At locations of traffic disruption, certified flagpersons, able to handle traffic safely and effectively, may be required to minimize traffic disruption to the public.

2.17.14.5 Adjacent Property Owner Notification

- .1 All property owners affected by the construction of Municipal Improvements shall:
 - .1 Be identified in consultation with the Municipality,
 - .2 Be informed by the Owner prior to any construction operations which will impact access, and
 - .3 Be advised of the probable time when access will be restored.
- .2 The Owner shall provide the Municipality at least 2 weeks' notice prior to commencement of construction to allow for development of a Construction Notice for the proposed work.
- .3 Affected property owners will be informed of access interruptions and probable time when access will be restored via Construction Notices.
 - .1 Construction Notices shall be distributed 72 hours prior to any disruption to access, or as per specific project requirements, at the discretion of the Municipality.
 - .2 Construction Notices shall be placed in easily accessible and clearly visible locations.
- .4 The Contractor(s) and Owner's Representative shall not communicate directly with residents or businesses. Any residents or businesses which have complaints shall be directed to Pulse.
 - .1 The Municipality has Pulse business cards which can be provided to Contractors and/or the Owner's Representative upon request. Alternatively, the contact information for Pulse is available on the Municipality's website.

2.17.14.6 Detours

- .1 Prior to any road closure, the Owner must submit a Traffic Accommodation Plan, including a Utility Installation and Street Occupation Permit application, for approval by the Municipality.
- .2 Public safety is of the utmost importance and an acceptable Traffic Accommodation Plan must include provisions outlining safe vehicular passage and pedestrian movement.
- .3 If the proposed road closure is within an 800 m radius of a provincial highway, Alberta Transportation must be notified, and Alberta Transportation's approval of the Traffic Accommodation Plan must be obtained and provided to the Municipality in support of the Traffic Accommodation Plan.

- .4 The Municipality's approval of the Traffic Accommodation Plan does not relieve the Owner of their responsibility for maintaining the provisions outlined in the Traffic Accommodation Plan during construction.
- .5 The Owner shall be solely responsible for supplying, placing, and maintaining detour signage, barricades, flagpersons, etc. at all times for the duration of construction.
- .6 Emergency access must be maintained at all times.
- .7 It is solely the Owner's responsibility to contact the Regional Emergency Services Department a minimum of 72 hours prior to the planned road closure and to satisfy in full any additional requirements Regional Emergency Services may have.
- .8 Road closures/detours must be advertised to the public at least 72 hours prior to the road closure and commencement of the detour, or as per specific project requirements, at the discretion of the Municipality.
- .1 Any required changes to the date(s) of the road closure/detour will require a new 72-hour notification period prior to the road closure and commencement of the detour, or as per specific project requirements, at the discretion of the Municipality.

2.17.14.7 Signage

- .1 The Owner must provide, erect, and maintain all signs, barricades, etc. to the satisfaction of the Municipality.
- .2 Any damaged or lost signage shall be repaired or replaced immediately.
- .3 All signage shall be placed in accordance with the *Manual of Uniform Traffic Control Devices for Canada* and shall be inspected and maintained on a regular basis for legibility and/or damage.
- .4 All signage shall be mounted on fixtures appropriate for the intended use. Measures shall be taken to ensure that the signage remains erect during inclement weather.

2.17.14.8 Staged Construction

- .1 To permit movement of traffic across the streets where new pavement is being constructed, the Municipality may require that the Owner construct some intersections one-half at a time. This will allow traffic to cross the road through a gap in the pavement until traffic is allowed to cross on the new pavement, at which time the gap in the pavement can be filled in.

2.17.15 Municipal Utility Controls

2.17.15.1 General

- .1 Refer to the Municipality's *Utility Installation and Traffic Control Manual*.

2.17.15.2 Approval

- .1 Prior to any work being done within a municipal right-of-way, the Owner must obtain approvals from the Municipality in accordance with the requirements for a Utility Installation and Street Occupation Permit.

2.17.15.3 Utility Disruption

- .1 Adequate provision must be made for the flow of sewers, drains, and the supply of potable water during construction.
- .2 Valves and other controls on the existing utility system shall only be operated by the Municipality.

2.17.15.4 Adjacent Property Owner Notification

- .1 All property owners affected by the construction of Municipal Improvements shall:
 - .1 Be identified in consultation with the Municipality,
 - .2 Be informed by the Owner before any service interruption, and
 - .3 Be advised of the probable time when service will be restored.
- .2 Affected property owners will be informed of service interruptions and probable time when service will be restored via Construction Notices.
 - .1 Construction Notices shall be distributed 72 hours prior to any service disruption, or as per specific project requirements, at the discretion of the Municipality.
 - .2 Construction Notices shall be placed in easily accessible and clearly visible locations.
- .3 The Contractor(s) and Owner's Representative shall not communicate directly with residents or businesses. Any residents or businesses which have complaints shall be directed to Pulse.
 - .1 The Municipality has Pulse business cards which can be provided to Contractors and/or the Owner's Representative upon request. Alternatively, the contact information for Pulse is available on the Municipality's website.

2.17.16 Boundary Controls

- .1 A boundary valve is to be placed at the tie-in to the existing water distribution system. The valve is to remain closed until a CCC is issued for the water distribution system.
 - .1 The exception is when the boundary valve is opened to fill the new watermain for testing and chlorination purposes.
- .2 Valves and other controls on the existing utility system shall only be operated by the Municipality.
 - .1 The Municipality must be given a minimum of 72 hours notice when requested to operate valves.
- .3 Filling and Flushing Plans are required for each project and are to be submitted to the Municipality for approval prior to undertaking watermain testing. Copies of all bacteriological tests performed are to be forwarded to the Municipality.
- .4 Plugs are to be placed at the downstream end of new pipes at the tie-in manholes to the existing sanitary and storm sewer systems. The plugs are to remain in place until a CCC is issued for the sanitary and storm sewer systems.

2.17.17 Noise and Vibration Control

2.17.17.1 General Requirements

- .1 Subject to the nature, scope, and scale of the Municipal Improvements, the Municipality may require a Noise and Vibration Control Study to protect sensitive land uses from noise and vibration disruptions.
- .2 Sensitive land uses adjacent to a residential area (such as highways, arterial roadways, railways, or industrial land uses) may require a Noise and Vibration Control Study.
- .3 The Noise and Vibration Control Study shall be prepared by the Owner at the request of the Municipality.
- .4 The Noise and Vibration Control Study may require monitoring of existing noise levels, and/or computer modelling to predict future noise and vibration levels.
- .5 The Noise and Vibration Control Study will determine the applicable jurisdictional and environmental limits and recommended control measures to be implemented as part of the Municipal Improvements.
 - .1 Control measures may include subdivision layout, dwelling orientation, sound insulating walls or windows, or noise attenuation barriers.
- .6 Noise levels are to be predicted for the 10-year traffic volume as forecast in the current *Transportation Master Plan*. Predicted traffic volumes for highways (e.g., Hwy. 63) should be obtained from Alberta Transportation.
- .7 The Noise and Vibration Control Study is to describe the findings of the assessment and include scaled drawing(s) of the site including the following:
 - .1 Building location(s),
 - .2 Receiver location(s),
 - .3 Road alignment,
 - .4 Proposed noise barrier(s),
 - .5 Coordinate grid (for F-WH equation),
 - .6 Scaled cross sections at each receiver location showing roadway, receiver, and ground elevation as required,
 - .7 Traffic volumes and percentage of heavy vehicles,
 - .8 Detailed calculations used to determine noise levels and barrier heights, and
 - .9 A table showing receiver noise levels with and without a barrier.

2.17.17.2 Noise Attenuation for New Developments

- .1 The Municipality has established a maximum design outdoor noise level of 65 dBA Leq (24 hour) for new development areas.
- .2 A Noise Impact Assessment, satisfactory to the Municipality, is required for all new residential developments proposed to be constructed within the vicinity of existing and proposed major (arterial) roadways.
- .3 The Noise Impact Assessment must address background noise levels, the impact of current traffic levels, and the noise attenuation measures necessary to not exceed the design outdoor noise level.

- .4 Noise attenuation for new residential development shall be provided for rear yard outdoor amenity areas and be achieved through building orientation, privacy walls, and fences.
- .5 Noise attenuation measures shall be designed and constructed by the Developer.

2.17.17.3 Noise Attenuation for Existing Residential Developments

- .1 Noise attenuation measures are required for residential developments where the measured outdoor noise levels exceed 65 dBA Leq (24 hour) at locations 5 m from the rear façade of a dwelling and 1.5 m above the ground or deck elevation.
- .2 No noise attenuation measures are required for outdoor spaces at second or subsequent storeys of houses if such noise attenuation can be achieved by a maximum 2.5 m wall on the existing grades at the road right-of-way limit unless noise attenuation is warranted as outlined in [clause 2.17.17.3.1](#).
- .3 Noise attenuation measures shall be designed and constructed by the Municipality for capital projects.

2.17.18 Wayfinding

- .1 The Developer and Contractor shall work with the Municipality to create a wayfinding plan for new developments.
- .2 Refer to the *Wood Buffalo Wayfinding Strategy*, available on the Municipality's website, for more information.

2.17.19 Progress Meetings

- .1 Prior to commencement of any construction activities, the Owner's Representative shall administer a pre-construction meeting with representatives of the Municipality, Contractor, and subcontractor(s) in attendance.
- .2 Subsequent progress meetings are to be held at a frequency to suit the timelines of the project.
 - .1 The frequency of progress meetings is to be determined between the Municipality and Owner.
- .3 Municipality representatives shall be invited to the pre-construction meeting and all subsequent progress meetings.
- .4 The Municipality shall be included in the meeting minutes distribution list.

2.17.20 Stop Work Order

- .1 The Municipality may issue a Stop Work Order to the Owner due to non-conformance. Non-conformance includes:
 - .1 Unsafe work practices,
 - .2 Risk of imminent danger,
 - .3 Lack of traffic control,
 - .4 Failure to submit required materials testing results,
 - .5 Construction not in accordance with the approved drawings, specifications, and these standards,
 - .6 Non-compliance with the Development Agreement (for development projects),

- .7 Damage to existing facilities,
 - .8 No Development Permit in place (for development projects), and
 - .9 Risk of environmental contamination and/or an adverse impact to the environment.
- .2 Should a Stop Work Order be issued, the Owner shall immediately cease operation, rectify the non-conformance, and obtain the Municipality's written approval prior to proceeding.

2.17.21 Material

- .1 The Owner shall only install materials which have been approved in these standards, the Standard Construction Specifications, or as otherwise approved in writing by the Municipality.
- .2 Materials are to be tested or otherwise certified to demonstrate that the materials conform to the project requirements and these standards. Materials testing shall be performed by an accredited materials testing firm.
- .3 If non-approved materials are being installed, a Stop Work Order will be issued immediately. A formal meeting will take place with the stakeholders involved and when the Stop Work Order is lifted, all materials installed without consent from the Municipality shall immediately be removed and replaced with municipal staff present before other work can commence.
- .4 As part of the post-construction submission package, the Owner shall submit certification by an accredited materials testing firm or manufacturer confirming that all materials conform to these standards (or any approved Deviations).

2.17.22 Survey Monument Control

- .1 The Owner shall be responsible to maintain and, if necessary, replace monuments that are destroyed, damaged, or removed by the operation of the Owner in carrying out the construction and installation of Municipal Improvements.

2.17.23 Maintenance of Existing Facilities

- .1 The Owner is responsible to ensure existing services, such as sewer mains, watermain, roadways, and landscaped areas are not disturbed or become inoperable as a result of actions by the Owner, their agents, or Contractors until the Final Acceptance Certificate is issued.
- .2 Existing services shall not be exposed to loadings beyond their design capacities.
- .3 Existing services shall be maintained in operating condition and cleaned as necessary by the Owner where their actions result in the need for additional maintenance.

2.17.24 Red-Line Submissions

- .1 Whenever it is necessary, for any reason, to make changes to the design drawings after they have been approved, one digital (PDF) copy of each drawing affected shall be submitted with the proposed changes shown in red, accompanied by a letter outlining the reasons for the required changes.
- .2 Red-line drawings shall be Authenticated by the Owner's Consultant.

- .3 The Municipality will review the red-line submissions. The timeline for Municipality approval of the proposed changes is dependent upon the complexity of the proposed changes and whether additional revisions to the red-line drawings are required to address any review comments.
- .4 Upon the Municipality's approval of the proposed changes, one copy of the requested change will be signed and returned to the Owner, accompanied by a letter authorizing the changes to be made on the original approved detailed design drawings.
- .5 No changes are to be made to any original approved drawings without following this procedure.

2.18 Record Drawings and Other Documents

2.18.1 General Requirements for Record Drawings

- .1 The Owner shall submit to the Municipality Record Drawings and other related information giving detailed measurements of the Municipal Improvements constructed.
 - .1 Every effort must be made to submit the Record Drawings to the Municipality within 90 days of execution of the Construction Completion Certificate(s).
 - .2 In no case can a Final Acceptance inspection be requested prior to the Municipality receiving the Record Drawings.
 - .3 The submission of all other data for record purposes is a condition of approval of the Construction Completion Certificate(s) by the Municipality.
- .2 Record Drawings shall be Authenticated and submissions shall be in accordance with **Section 3**.
- .3 The date, Prime Contractor, and subcontractors shall be indicated on Record Drawings.
- .4 The Consulting Engineer shall certify that all work has been completed in accordance with the approved drawings, specifications, and these standards, and that all work has been completed and all deficiencies have been rectified.
- .5 Upon completion of construction of the Municipal Improvements, and in one complete submission, the Owner shall submit the following documentation.
 - .1 Lot service records (refer to the Service Report form at the end of **Section 2**),
 - .2 Compaction test results,
 - .3 Pressure and leakage testing results,
 - .4 Chlorine residual test results,
 - .5 Bacteriological test results,
 - .6 CCC CCTV inspection report (digital format) for sanitary and storm sewers,
 - .7 Infiltration or exfiltration test results for sanitary and storm sewers,
 - .8 Concrete and asphalt mix designs,
 - .9 Density test results,
 - .10 Deflection test results,
 - .11 Concrete strength test results,
 - .12 Materials testing results,
 - .13 Asphalt core results,

- .14 Locations of groundwater monitoring wells installed,
 - .15 Operation and maintenance manuals (if applicable), and
 - .16 An accurate as-constructed bill of materials (quantities and costs) for the Municipality's TCA database.
- .6 Upon expiration of the Warranty Period and prior to issuance of the Final Acceptance Certificate, the Owner shall submit, in one complete submission, the following documentation.
- .1 A record of Maintenance completed during the Warranty Period,
 - .2 Asphalt test results for top lift,
 - .3 Materials testing results for work completed to address deficiencies during the Warranty Period, and
 - .4 FAC CCTV inspection report (digital format) for sanitary and storm sewers.
- .7 The Municipality's acceptance of the supporting documentation is required prior to issuance of the Construction Completion and Final Acceptance Certificates. CCC and FAC Application Submission Checklists are provided at the end of **Section 2**, for reference.
- .8 Incomplete submissions will be returned to the Owner.
- .9 Alternatively, the Record Drawing submission can be completed in two stages, as described in **Sections 2.18.4** and **2.18.5**.
- .10 For a list of submission requirements for Construction Completion Certificate (CCC), refer to the checklist at the end of **Section 2**.

2.18.2 Record Drawing Requirements for Surface Improvements

- .1 All data shown on the construction drawings shall be updated to as-constructed information, including:
 - .1 Elevations of catch basin grates, manhole covers, and curb returns on the plan/profile drawings, as well as any grade changes which exceed the design grade by more than 0.1% (or 25 mm),
 - .2 Curve radii, distances from back of walk to property line, and sidewalk widths on the plan/profile drawings,
 - .3 Type of curb (rolled face or straight face) on an overall plan,
 - .4 Elevations at either the roadway crown or lip of gutter, and
 - .5 Design lot corner elevations, swale centreline elevations at beginning and end as well as at property line crossings and any changes in alignment of the swale.
- .2 If the cross section design has changed in width or structure, as approved by the Municipality during construction, then this shall be indicated on the typical cross section(s).

2.18.3 Record Drawing Requirements for Underground Improvements

- .1 All data shown on the construction drawings shall be updated to as-constructed information, including:
 - .1 Location of drainage facilities; for example, manholes, catch basins, and end of pipe stubs,
 - .2 Size of manholes, and inverts and slopes of all pipes entering/exiting manholes,
 - .3 Location, material, diameter, inverts, and slope of watermains, sanitary and storm sewers, and culverts,
 - .4 Updated pipe capacity calculations based on the as-constructed pipe slopes,
 - .5 Horizontal and vertical alignments and sizes of watermains,

- .6 Locations of valves, hydrants, curb stops, and horizontal and vertical bends,
 - .7 Elevations of pond/wetland bottom, normal water level, high water level, and freeboard,
 - .8 Area at pond/wetland bottom, normal water level, high water level, and freeboard,
 - .9 Notification indicating the elevation of the lowest allowable building opening for lots abutting the stormwater management facility, and
 - .10 Measurements to locate submerged inlets, outlets, and sediment traps referenced to identifiable permanent features which are not submerged at normal water level.
- .2 Where the water table is located above the fire hydrant drain, the hydrant drain ports may require plugging. Hydrants with plugged drain ports must be clearly identified on the Record Drawings.

2.18.4 Interim Record Drawing and Data Submission Stage (Optional)

- .1 The Consulting Engineer shall certify that all work has been completed in accordance with the approved plans and specifications and these standards and that all work has been completed and all deficiencies have been rectified.
- .2 A single overall plan-view drawing of the extent of the completed works is to be provided.
- .3 On completion of all underground Municipal Improvements, including the sanitary and storm sewer systems, the water distribution system, the service connections for lot services, and all stormwater management facilities, the Owner shall submit Record Drawings of the completed underground works to the Municipality.
- .4 Together with the above, the Owner shall submit the monthly progress reports, lot service records, compaction test results, and successful pressure, leakage, and chlorination tests.
- .5 Upon the Municipality's acceptance of this data, the Owner may request a construction completion inspection for the underground Municipal Improvements.
- .6 The interim Record Drawing submission may be used to support the application for a Construction Completion Certificate - Underground Only.

2.18.5 Completed Record Drawing and Data Submission Stage

- .1 Within 30 days of satisfactory completion of all Municipal Improvements, including all surface improvements, the Owner shall submit to the Municipality the following information:
 - .1 Certification by the Consulting Engineer that all work has been completed in accordance with the approved plans and specifications and these standards and that all work has been completed and all deficiencies have been rectified.
 - .2 Set of Record Drawings in accordance with the requirements outlined in [Section 3](#).
 - .3 Data for Tangible Capital Assets.
 - .1 This includes an itemized inventory of all contributed assets (i.e., every pipe, valve, manhole, etc.), the cost of each asset, and the mapped location of each asset.
 - .2 Refer to [Section 3](#).

- .4 All previous certificates that were not submitted concerning materials inspection and testing, mix designs, deflection tests, concrete strength tests, compaction tests, CCTV inspection reports, as required by these standards and the Municipality.
- .5 Operation and maintenance manuals, spare parts, and lubricants (if applicable).
- .2 The Owner may request a construction completion inspection and, within 30 days of such request, the Municipality will carry out a municipal inspection for issuance of the Construction Completion Certificate.
- .1 Should seasonal conditions not permit the inspection and issuance of the Construction Completion Certificate by the Municipality, the process will be delayed until appropriate conditions exist and/or conditional acceptance may be granted based on the Consulting Engineer's certification.

2.19 CCC and FAC Inspections

2.19.1 Seasonal Conditions

- .1 Should seasonal conditions not permit the CCC or FAC inspection, issuance of the CCC or FAC by the Municipality will be delayed until appropriate conditions for inspection exist.
- .2 The Municipality is not responsible for notifying the Owner when inclement weather will delay the CCC or FAC inspection.
- .3 Examples of inclement weather which will delay inspections until appropriate conditions exist include snow, ice, and freezing conditions.

2.19.2 CCC Inspection

- .1 Prior to a construction completion joint inspection, the Owner's Consultant shall conduct a pre-inspection.
- .2 Any deficiencies identified at the pre-inspection are to be noted on a Pre-Inspection Checklist.
 - .1 Major deficiencies (as determined by the Owner's Consultant) shall be rectified prior to the municipal inspection.
 - .2 Effort is to be made to rectify minor deficiencies (as determined by the Owner's Consultant) prior to the municipal inspection.
- .3 The Pre-Inspection Checklist (a blank copy of which is provided at the end of **Section 2**) is to be submitted to the Municipality at least 72 hours prior to the construction completion inspection.
- .4 Upon satisfactory completion of the project, the Owner must request, in writing, to the Municipality, a joint municipal inspection of the work.
- .5 The Municipality will then schedule the site inspection based on the availability of all relevant stakeholders.
- .6 The Consulting Engineer and the Contractor shall be in attendance.
 - .1 The Contractor shall ensure they have staff available to operate Public Infrastructure appurtenances (e.g., pull manhole lids, operate valves, etc.).
- .7 When inspecting underground infrastructure, there must be a minimum of one representative from the Underground Services Branch.
- .8 When inspecting roadway infrastructure, there must be a minimum of one representative from the Public Works Department (Roads Branch).

- .9 If the project includes roadway boulevards or other park infrastructure, there must also be a minimum of one representative from the Public Works Department (Parks Branch).
- .10 Minutes for the inspection, enumerating all observed deficiencies, shall be prepared by the Consulting Engineer, to be reviewed and accepted by the Municipality and the other department(s) in attendance at the CCC inspection.
 - .1 The Consulting Engineer shall submit a sketch with the noted deficiencies and their corresponding deficiency number highlighted in conjunction with the minutes for the inspection.

2.19.3 FAC Inspection

- .1 Prior to a final acceptance inspection, the Owner's Consultant shall conduct a pre-inspection.
- .2 Any deficiencies identified at the pre-inspection are to be noted on a Pre-Inspection Checklist.
 - .1 Major deficiencies (as determined by the Owner's Consultant) shall be rectified prior to the municipal inspection.
 - .2 Effort is to be made to rectify minor deficiencies (as determined by the Owner's Consultant) prior to the municipal inspection.
- .3 The Pre-Inspection Checklist (a blank copy of which is provided at the end of **Section 2**) is to be submitted to the Municipality at least 72 hours prior to the final acceptance inspection.
- .4 Prior to the expiration of the Warranty Period, the Owner must request, in writing, to the Municipality, a joint municipal inspection of the work.
- .5 The Municipality will then schedule the site inspection based on the availability of all relevant stakeholders.
- .6 The Consulting Engineer and the Contractor shall be in attendance.
 - .1 The Contractor shall ensure they have staff available to operate Public Infrastructure appurtenances (e.g., pull manhole lids, operate valves, etc.).
- .7 When inspecting underground infrastructure, there must be a minimum of one representative from the Underground Services Branch.
- .8 When inspecting roadway infrastructure, there must be a minimum of one representative from the Public Works Department (Roads Branch).
- .9 If the project includes roadway boulevards or other park infrastructure, there must also be a minimum of one representative from the Public Works Department (Parks Branch).
- .10 Minutes for the inspection, enumerating all observed deficiencies, shall be prepared by the Consulting Engineer, to be reviewed and accepted by the Municipality and the other department(s) in attendance at the FAC inspection.
 - .1 The Consulting Engineer shall submit a sketch with the noted deficiencies and their corresponding deficiency number highlighted in conjunction with the minutes for the inspection.

2.19.4 CCC and FAC Inspection Costs

- .1 The Owner will be responsible for any inspection costs deemed appropriate by the Municipality.
- .2 Costs may include:

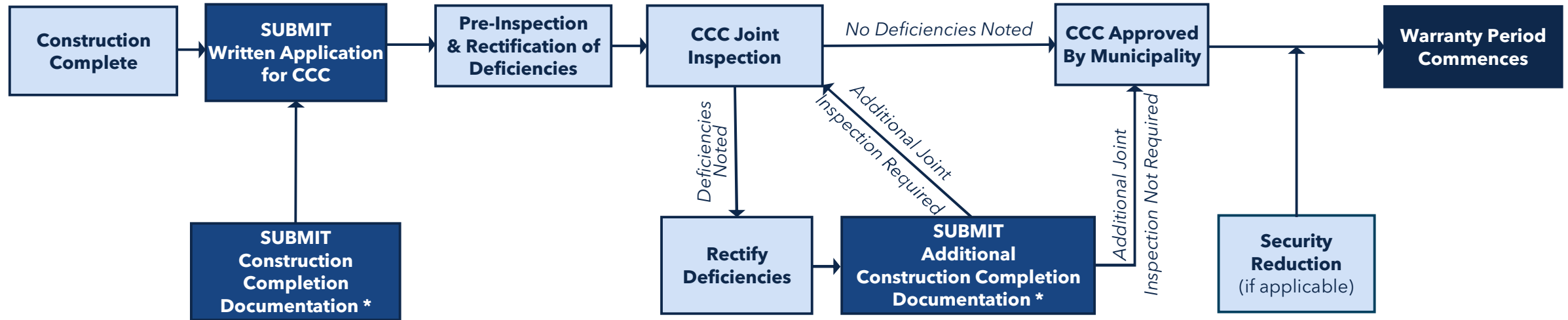
- .1 Consulting expertise required by the Municipality for specialized inspection needs, and/or
- .2 When excessive deficiencies are present and re-inspections are required.
- .3 Inspection costs may take several forms, including:
 - .1 A lump sum fee charged to the Owner,
 - .2 A time and materials fee charged to the Owner, or
 - .3 An invoiced cost by specialized consultant, plus mark-up for handling and administration.

2.20 Construction Completion Certificate (CCC)

2.20.1 General

- .1 The CCC procedure is illustrated in **Figure 2-8**.
- .2 A blank copy of the Construction Completion Certificate is included at the end of **Section 2** for completion by the Owner and the Consulting Engineer.
- .3 Upon satisfactory completion of the project, a satisfactory construction completion inspection, and after all deficiencies are corrected and submission received, to the satisfaction of the Municipality, the Municipality shall issue the Construction Completion Certificate submitted by the Owner or Consulting Engineer, notifying:
 - .1 Approval of the portion of work by the Municipality, and
 - .2 The commencement date of the Warranty Period.
- .4 At the discretion of the Municipality, separate Construction Completion Certificates and commencement of Warranty Periods may be issued for the following:
 - .1 Underground utilities and surface works,
 - .2 Underground utilities only,
 - .3 Landscaping, and/or
 - .4 Facilities.
- .5 Power energization and testing of gas mains shall be completed prior to the issuance of the full CCC.
- .6 The Safety Codes Branch shall inspect and approve power and gas installations.
- .7 At the discretion of the Municipality, a Construction Completion Certificate may be backdated to the date of inspection, rather than the date of issuance.

FIGURE 2-8 CONSTRUCTION COMPLETION CERTIFICATE PROCESS



* See Section 2.18.1.5 for a list of the required deliverables at CCC

2.20.2 CCC - Underground Utilities and Surface Works

- .1 This CCC is issued when all underground and surface work has been completed, inspected, and approved in accordance with the project specifications and development phasing.
- .2 The Warranty Period commences.
- .3 Some minor deficiencies may exist (e.g., a small, isolated crack in a sidewalk).
- .4 At the request of the Developer, the Security may be reduced to not less than 10% of the value of the project plus 100% of the value of deficient work (for development projects).
- .5 Development Permits can be issued (for development projects).
- .6 Municipal operations such as snow clearing, solid waste collection, and transit services commence, as appropriate, subject to the site being safe and uncluttered in the opinion of the Municipality.
- .7 Record Drawings shall be submitted to the Municipality as outlined in [Section 3](#).
- .8 An updated TCA and associated GIS data shall be submitted to the Municipality as outlined in [Section 3](#).

2.20.3 Partial CCC - Underground Utilities and Surface Works

- .1 This CCC is issued when all underground and surface work has been completed in a portion of the intended project phase, with the intention of completing the remaining work the following construction season.
- .2 Issuance of this CCC is subject to approval from the Municipality.
- .3 The Warranty Period shall not commence until the remaining portion of the intended project phase has been completed and approved.
- .4 There shall be no reduction in Security (for development projects).
- .5 There shall be no municipal operations for new roadways (development projects); the Owner shall be responsible for snow clearing and solid waste collection, as appropriate.
- .6 A Site Management Plan is required to address emergency, functionality, and operational issues.

2.20.4 Conditional CCC - Underground Utilities and Surface Works

- .1 This CCC is issued when significant portions of the work are incomplete, deficient, or have not been inspected due to seasonal conditions.
- .2 This CCC shall be subject to the same conditions as a partial CCC (refer to [Section 2.20.3](#)).
- .3 The entire phase shall be re-inspected when all work is complete.

2.20.5 CCC - Underground Only

- .1 This CCC is issued on completion of all underground utilities, including completion of all catch basins, as well as the stormwater management facility(ies) necessary to accommodate surface runoff from the identified catchment area.
- .2 At the request of the Developer, the Security for the underground component may be reduced to not less than 10% of the value of the underground component plus 100% of the value of deficient and incomplete work (for development projects).
- .3 The Warranty Period commences, for the completed underground works only.
- .4 The FAC will only be issued together with the FAC for the related surface works.
- .5 There shall be no municipal operations (for development projects).
- .6 A Site Management Plan is required to address emergency, functionality, and operational issues.
- .7 In some cases, Development Permits can be issued, subject to the approval of the Municipality (for development projects).
 - .1 *This is typically only applied to multi-family, commercial, industrial, institutional, or recreational buildings.*

2.20.6 CCC - Landscaping

- .1 This CCC is issued upon completion of parks and landscaped surfaces on all MRs, PULs, and boulevard and median spaces within the project site, including hard and soft landscaping, pathways and walkways, playground structures, fences, and irrigation systems. Some minor deficiencies may exist.
- .2 This CCC is contingent on an inspection conducted by the Municipality for:
 - .1 Tree clearing, including inspection of trees along the clearing fringes and perimeter and thinning of the underbrush in accordance with FireSmart guidelines.
 - .2 Conformance with BearSmart guidelines.
 - .3 Establishment of turf. Acceptance of sod can be completed once there have been three cuts on all sodded areas.
- .3 At the request of the Developer, the Security for parks and landscaping components may be reduced to not less than 10% of the value of the parks and landscaping components plus 100% of the value of deficient and incomplete work (for development projects).
- .4 The Warranty Period commences.
- .5 If the Owner installs sod in lieu of topsoil and seed across all turfed areas within the project site:
 - .1 The Municipality will take over maintenance of sod within the project site during the Warranty Period.
 - .2 The Owner shall be responsible for Maintenance items during the Warranty Period.
- .6 For additional information, refer to **Section 10**.

2.20.7 CCC - Facilities

- .1 This CCC is issued upon the completion of construction and commissioning of facilities to be taken over by the Municipality. The facilities shall be capable of being safely occupied and operated for their intended use. Some minor deficiencies may exist.
- .2 At the request of the Developer, the Security for the facilities component may be reduced to not less than 10% of the value of the facilities component plus 100% of the value of deficient and incomplete work (for development projects).
- .3 The Warranty Period commences.

2.21 Warranty Period

2.21.1 General

- .1 Subject to **clause 2.20.1.4**, the Warranty Period shall commence after the last CCC is issued, except in those instances when Seasonal Deficiencies result in multiple CCCs.
- .2 The construction cut-off date for underground and surface improvements, with the exception of landscape improvements, shall be as directed by the Municipality, but generally shall be no later than October 15.

2.21.2 Owner's Responsibilities

- .1 The Owner shall be responsible for any defect, fault, or deficiency in the completed work during a minimum 2 year Warranty Period and shall remedy any defects, faults, and deficiencies.
- .2 Third party damage occurring during the Warranty Period will be reviewed by the Municipality on a case-by-case basis; upon review and consideration by the Municipality, the Owner may be held responsible for third party damage.
- .3 See **Section 2.21.3** for municipal responsibility for snow removal and solid waste collection. The Owner shall be responsible for providing these services until the Municipality takes over these services, or as otherwise agreed to between the Owner and Municipality.
- .4 The Owner shall remain responsible for all other Maintenance and repair items, including Maintenance of street signs, flushing of sewer lines, and thawing and flushing of watermains.
- .5 The Municipality shall be notified prior to any repairs during the Warranty Period and shall be given the opportunity to inspect the deficiency to determine if there is an underlying issue that needs to be addressed.
- .6 All repairs shall be to the Municipality's satisfaction.

2.21.3 Snow Removal and Solid Waste Collection

2.21.3.1 Collector and Arterial Roads

- .1 Following issuance of a Construction Completion Certificate for new collector and arterial roads within the occupied portion of a development area, the Municipality will assume responsibility for snow removal and solid waste collection.
 - .1 This responsibility is subject to the roads and sidewalks being clear of construction materials and Contractor activity such that the Municipal Services can be safely and efficiently provided.

- .2 The roadways must be safe and uncluttered in the opinion of the Municipality.
 - .1 Otherwise, the Municipality may, following five days' notice to the Developer, contract out any site clean-up and/or winter operations as may be required to ensure public safety and the provision of adequate Municipal Services. This work will be completed solely at the Developer's expense with all costs deducted from the Developer's Security.
- .2 Municipal take-over is subject to a walk-through inspection jointly conducted with the Developer (or their Representative) and the Municipality. The purpose of this inspection is to review the safety and cleanliness of the streets for public operations. This inspection will only be scheduled between the period of May 15 to November 15 on an annual basis, subject to seasonal conditions.

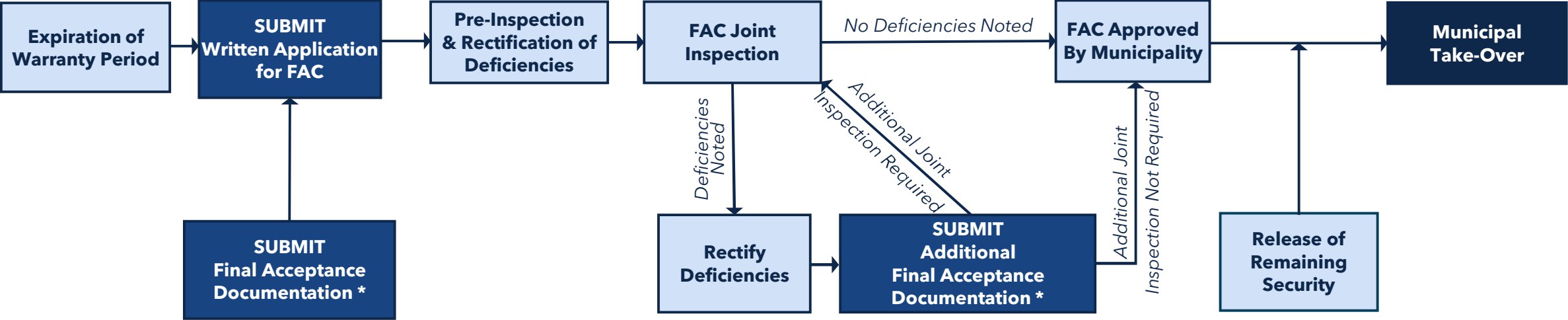
2.21.3.2 Local Roads

- .1 Following issuance of a Construction Completion Certificate for new local roads within the occupied portion of the development area, the Developer will assume responsibility for snow removal and solid waste collection until the subdivision is 50% occupied and the local streets are consistently clear of construction materials and Contractor activity, such that the Municipality can safely and efficiently provide Municipal Services within the subdivision, or until expiration of the Warranty Period, whichever comes first.

2.22 Final Acceptance Certificate (FAC)

- .1 The FAC procedure is illustrated in **Figure 2-9**.
- .2 Final Acceptance shall include underground, surface, and landscape improvements, and facilities (if applicable).
- .3 Upon correction of all deficiencies, one combined Final Acceptance Certificate will be issued, encompassing all Municipal Improvements, with the exception of landscape improvements which may be approved under a separate Final Acceptance Certificate.
- .4 A blank copy of the certificate is included at the end of **Section 2** for completion by the Owner and Consulting Engineer.
- .5 The Warranty Period shall remain in effect until the Final Acceptance Certificate(s) is issued by the Municipality.
- .6 At the request of the Developer, full Security will be returned after issuance of all Final Acceptance Certificates (for development projects).
- .7 For a list of requirements for FAC application, refer to the checklist at the end of **Section 2**.

FIGURE 2-9 FINAL ACCEPTANCE CERTIFICATE PROCESS



* See Section 2.18.1.6 for a list of the required deliverables at FAC

2.23 Development, Building, and Occupancy Permits

2.23.1 General

- .1 Unless otherwise agreed to by the Municipality, no Development Permits shall be issued until the Legal Plan of Subdivision, along with Easements, is registered and the CCC has been issued for the underground utilities, including Shallow Utilities.
- .2 The issuance of Development Permits in advance of the CCC for surface works is subject to approval of the Site Management Plan to address emergency, functionality, and operational issues, and at the discretion of the Municipality.

2.23.2 Development Permits

- .1 Development Permits are required for new projects, changes in the use of a property, or additions to existing structures.
- .2 Development Permits address issues of community planning, bylaws, land use, image, and compatibility.
- .3 The Land Use Bylaw prescribes when Development Permits are exempt.
- .4 The Development Permit process is based on the *Municipal Government Act* and the Land Use Bylaw.
- .5 The Municipality collects Securities for Development Permits. A copy of the current schedule of Security rates can be provided by the Municipality upon request.
- .6 The Municipality requires that a development completion inspection be completed prior to obtaining building occupancy.
 - .1 A development completion inspection is required for all new industrial, commercial, institutional, and multi-family development applications.
 - .2 The Municipality has a Development Completion Inspection Application form which needs to be filled out in support of the request for an inspection. The form is available on the Municipality's website.
- .7 For more information, and to apply, refer to the Municipality's website.

2.23.3 Building Permits

- .1 Building Permits are meant to ensure that structures conform with applicable building and safety codes.
- .2 Building Permits are issued for single-family, multi-family, commercial, industrial, and institutional developments.
- .3 In some situations, a Development Permit may be required before applying for a Building Permit.
- .4 Unless otherwise agreed to by the Municipality, no Building Permits shall be issued until the Legal Plan of Subdivision, along with Easements, is registered and the CCC has been issued for the surface works, including roads, sidewalks, and streetlights.
- .5 For more information, and to apply, refer to the Municipality's website.

2.23.4 Occupancy Permits

- .1 An Occupancy Permit is written permission allowing a building to be occupied after construction, alteration, or a change in occupancy of a building.
- .2 An Occupancy Permit shows that the building has passed all safety checks and complies with municipal bylaws.
- .3 Most renovations to existing buildings, and all new construction, require an Occupancy Permit.
- .4 For more information, and to apply, refer to the Municipality's website.

2.24 Review Checklists and Forms

- .1 The following checklists and forms, referenced throughout these standards, are provided in this section.

Completed By	Title
Consulting Engineer	Deviation Request Form
Municipality	Development Brief Submission Checklist
Municipality	Engineering Design Brief Submission Checklist
Municipality	Drawing Submission Compliance Checklist
Municipality	Detailed Design Submission Checklist
Owner's Representative	ESC Inspection/Maintenance Checklist
Owner's Representative	Service Report
Owner's Representative	Certificate of Substantial Performance
Owner's Representative	Certificate of Total Performance
Consulting Engineer	Engineering Pre-Inspection Checklist
Municipality	CCC Application Submission Checklist
Owner's Consultant	Construction Completion Certificate
Municipality	FAC Application Submission Checklist
Owner's Consultant	Final Acceptance Certificate



Deviation No.: _____

Development Project: _____

Capital Project: _____

TO BE COMPLETED BY APPLICANT

To:	Manager of Planning & Development Regional Municipality of Wood Buffalo 9909 Franklin Avenue Fort McMurray, AB T9H 2K4
Applicant Name: _____	
Company Name: _____	
Phone: _____	
Email: _____	
Mailing Address: _____	

Signature: _____ Date: _____	
Section and/or Article: _____ Page No.: _____	

Deviation Request Description:

(Indicate if the Deviation is pertaining to the *Design Servicing Standards and Development Procedures* or the *Standard Construction Specifications* or both documents.)



TO BE COMPLETED BY THE REGIONAL MUNICIPALITY OF WOOD BUFFALO

Reviewed by:

- | | |
|---|--|
| ☐ Planning & Development | ☐ Underground Services |
| ☐ Public Works | ☐ Regional Emergency Services |
| ☐ Environmental & Regulatory | |

Comments:

Signature: _____

Date: _____

Deviation Request:

- | | |
|-----------------------------------|-----------------------------------|
| ☐ Accepted | ☐ Rejected |
|-----------------------------------|-----------------------------------|

Operations and Maintenance Impact:

- | | |
|------------------------------|-----------------------------|
| ☐ Yes | ☐ No |
|------------------------------|-----------------------------|

If yes, please provide reason:

Reason for Rejection:

(Attach additional pages, if necessary.)

Signature: _____
(Manager of Planning & Development)

Date: _____

Notes:

- 1) All applications for Deviation shall be supported with an Authenticated letter of recommendation from the Consulting Engineer.
- 2) Any supporting documentation justifying the requested Deviation shall be submitted with the letter of recommendation and Deviation Request Form.
- 3) Incomplete submissions will be rejected.



Date of Submission: _____

Item	Acceptable	Revise & Resubmit	Reviewed By (Initials)	Date	Review Comments
Overall Layout and Site Plans submitted					
Existing conditions and land uses described					
Proposed land use plan and statistics provided					
Provision for development levies					
Architectural controls identified					
Historic Resource Impact Assessment provided					
Public engagement plan provided					
Neighbourhood Wildfire Hazard Assessment provided					
FireSmart review					
Accessibility Assessment provided					
Conforms to Area Structure/Redevelopment Plan					
Conforms to Outline Plan					
Conforms to Municipal Development Plan					
Conforms to Land Use Bylaw					
Conforms to Strategic Plan					
Conforms to Water Master Plan					
Conforms to Wastewater Master Plan					
Conforms to Stormwater Master Plan					
Conforms to Transportation Master Plan					
Conforms to Active Transportation Functional Plan					
Conforms to Transit Master Plan					
Conforms to Parks Master Plan					
Other (please specify)					

Note: If a supporting document is not applicable, indicate so in the Review Comments.



Date of Submission: _____

Item	Acceptable	Revise & Resubmit	Reviewed By (Initials)	Date	Review Comments
Conceptual drawings submitted					
Document is Authenticated					
Deviation from Standards (Application)					
Deviation from Standards (Approval)					
Supporting design calculations submitted					
Geotechnical Report submitted					
Slope Stability Geotechnical Report submitted					
Neighbourhood Wildfire Hazard Assessment					
FireSmart review					
Traffic Impact Assessment submitted					
Water Network Analysis submitted					
Sanitary Sewer Analysis submitted					
Stormwater Management Plan submitted					
Environmental Impact Assessment submitted					
Phase 1 Environmental Site Assessment submitted					
Historic Resource Impact Assessment submitted					
Wetland Assessment submitted					
Accessibility Assessment submitted					
BearSmart review					
Easement and/or Right-of-Way Agreements					
Cost Estimate for over-sized/shared infrastructure					
Other (please specify)					

Note: If a supporting document is not applicable, indicate so in the Review Comments.



Item	Included? (Yes/No)	Comments
PDF SUBMISSION		
General		
Drawing size: ANSI D (559 mm x 864 mm)		
North arrow correctly oriented		
Proper scale; bar scale included; "half size" note		
Limits of Construction and matchlines clearly shown		
Stationing shown and in correct orientation		
Legal pins/monuments/survey geometrics shown		
Street names clearly labelled		
Boxed construction notes		
Standard Detail references		
Proposed works clearly stand out from existing		
Existing conditions shown		
Decimal places shown correctly		
Dimensions shown where needed		
Drawing set is complete		
"Notes" included per Section 3.5.2		
Title Blocks		
Project Name correct and on all sheets		
Project Number correct and on all sheets		
Drawing Sheet Numbers correct and on all sheets		
Drawings are authenticated (IFT/IFC/Record only)		
Lettering		
Unobstructed by linework		
Correct text height and size used		
Arial Narrow for general annotation		
Plan/Profiles		
Proper layout (plan on top/profile on bottom)		
Utilities labelled in plan (size/type/material)		
Utilities labelled in profile (size/type/material/grade)		
Horizontal curve info included (BC/EC/PI/delta/L/R)		
Profile centreline parallel to curb or edge of road		
Profile grid with correct spacing and labelling		
Utility information at bottom of profile		
Road information at top of profile		
Vertical curve info included (BVC/EVC/PI/L/K)		
Plan and profile lined up vertically (where possible)		
Service connection inverts/locations table		
Services shown with dimensions to property line		
Information shown for crossings, property lines, etc.		
Groundwater monitoring wells		



Item	Included? (Yes/No)	Comments
PDF		
Roadwork, Underground, Details, and Cross Sections		
As per Design Servicing Standards		
DIGITAL SUBMISSION		
General		
Same as above, including:		
Digital copy of drawing and project files provided		
Sheets in paper space on individual layouts		
No purge or audit items - clean drawing		
RECORD DRAWING SUBMISSIONS		
PDF		
"Proposed" removed from all notes		
Record Drawing Rev. shown in revision box w/ note		
Record Drawings are authenticated		
Digital Files / Data Submission		
Same as all items above, including:		
Digital copy of drawing and project files provided		
Sheets in paper space on individual layouts		
No purge or audit items - clean drawing		
As-constructed survey points file with codes		
Correct AutoCAD version provided (incl. x-refs)		
Additional imagery, pen settings, etc. incl. if used		

(Date)

--



Date of Submission: _____

Item	Acceptable	Revise & Resubmit	Reviewed By (Initials)	Date	Review Comments
Drawings Authenticated (IFT/IFC only)					
Detailed engineering drawings submitted					
Detailed landscape drawings submitted					
Deviation from Standards (Approval)					
Deviation from Standards (Application)					
Contract specifications submitted					
Contract specifications Authenticated (IFT/IFC only)					
Geotechnical Report submitted					
Slope Stability Geotechnical Report submitted					
Supporting calculations provided					
Copy(ies) of environmental approval(s) provided					
Traffic Impact Assessment provided					
Water Network Analysis provided					
Sanitary Sewer Analysis provided					
Stormwater Management Report provided					
Snow storage considerations identified					
Environmental Impact Assessment submitted					
Phase 1 Environmental Site Assessment submitted					
Historic Resource Impact Assessment submitted					
Wetland Assessment submitted					
Copy(ies) of Crossing/Proximity Agreements provided					
Cost Estimate for over-sized/shared infrastructure					
Approved Shallow Utility design provided					
Easement and/or Right-of-Way Agreements					
Other (please specify)					

Note: If a supporting document is not applicable, indicate so in the Review Comments.



Project Name		File No.	
		Contract No.	
Inspection Date: Time:		Date of Last Inspection:	
Inspected By:			
Current Weather:		Weather Forecast:	
mm of rain in last week:		mm of rain in last 24 hrs:	
Stage of Construction:			
Contractor(s) on Site:			
Construction Activities on Site:			
Heavy Equipment on Site:			
INSPECTION CHECKLIST	YES / NO	COMMENTS	ACTION REQUIRED
Have stripping and grading been phased where possible?			
Have stripped areas/exposed soils/steep slopes been protected and stabilized?			
Have waterways and drainage ways been protected and stabilized?			
Are perimeter controls in place and functioning adequately?			
Are off-site/downstream properties/ waterways protected?			
Are construction entrances stabilized to minimize tracking of soil and mud off-site?			
Are Sedimentation Control BMPs in place and functioning adequately?			
Are Transport Control BMPs in place and functioning adequately?			
Are Erosion Control BMPs in place and functioning adequately?			

Note: BMP = Best Management Practice.

Other Comments:

SERVICE REPORTREGIONAL MUNICIPALITY
OF **WOOD BUFFALO**

Street _____

Lot _____ Civic No. _____

Development Permit No: _____

PUBLIC

	Water	Sanitary	Storm
Length:			
Material:			
Diameter:			
Colour:			
Depth @ Main (m):			
Depth @ PL (m):			
T.O.P. Elev. @ Main:			
T.O.P. Elev. @ PL:			
Main Diameter:			
Curb Stop to PL (m):			
PL to Stub (m):			

Contractor: _____
Inspected By: _____
Date: _____
Record Drawing #: _____

Insulation? ☐ Yes ☐ No
Anode? ☐ Yes ☐ No

RURAL DEVELOPMENTS

Driveway Culvert? ☐ Yes ☐ No
Precast Headwalls? ☐ Yes ☐ No

Driveway Culvert Diameter: _____
Material: _____

Additional Notes & Comments:**PRIVATE**

	Water	Sanitary	Storm
Length:			
Material:			
Diameter:			
Colour:			
Depth @ Bldg.:			

Contractor: _____

Inspected By: _____

Date: _____

Insulation? ☐ Yes ☐ No
Rock? ☐ Yes ☐ No
Sump Pump Connected
to Foundation Drain? ☐ Yes ☐ No

Sanitary Service Type? ☐ Gravity ☐ Pressure

Private Pump Station Info Lift: _____
Distance: _____

Additional Notes & Comments:

SEE REVERSE FOR SKETCH

SERVICE REPORT



REGIONAL MUNICIPALITY
OF **WOOD BUFFALO**

Street _____

Lot _____ **Civic No.** _____

PRIVATE

PUBLIC

SEE REVERSE FOR DETAILS



REGIONAL MUNICIPALITY
OF **WOOD BUFFALO**

Certificate of Substantial Performance

Project Name: _____

Tender Number: _____

Contract Number: _____

Owner:

Name: Regional Municipality of Wood Buffalo

Address: 9909 Franklin Avenue

Fort McMurray, AB T9H 2K4

Phone: 780-743-7000

Contractor:

Name: _____

Address: _____

Phone: _____

This Certificate of Substantial Performance is issued pursuant to General Condition 5.6 of the Contract Documents.

The Work performed under the Contract has been reviewed, and to the best of the Municipality's knowledge meets the requirements for Substantial Performance of the Work. Any review, comment, consent, acceptance, or approval, or lack thereof, by the Municipality shall not relieve the Contractor of any of its responsibilities or liabilities under the Contract.

The effective date of Substantial Performance of the Work is: _____

A Substantial Performance Contract Deficiency List (SPC Deficiency List) listing deficiencies to be completed, corrected, or submitted is attached. The SPC Deficiency List may also include outstanding Work agreed to by the Municipality to be performed after the date of Substantial Performance, notwithstanding that such outstanding Work may be specified to be completed in Schedule B Scope of Work.

Attain Total Performance of the Work by: _____

Consulting Engineer's Recommendation

I have reviewed the Certificate and recommend it for authorization by the Municipality.

Signature: _____ Date: _____

Name: _____
(printed name of the above representative) (printed name of consultant firm)

Municipality's Authorization

I authorize this Certificate of Substantial Performance of the Work.

Signature: _____ Date: _____

Name: _____
(printed name of the above representative) (title of the above representative)

Attachment: SPC Deficiency List



REGIONAL MUNICIPALITY
OF **WOOD BUFFALO**

Certificate of Total Performance

Project Name: _____

Tender Number: _____

Contract Number: _____

Owner:

Name: Regional Municipality of Wood Buffalo

Address: 9909 Franklin Avenue

Fort McMurray, AB T9H 2K4

Phone: 780-743-7000

Contractor:

Name: _____

Address: _____

Phone: _____

This Certificate of Total Performance is issued pursuant to General Condition 5.7 of the Contract Documents.

The Work performed under the Contract has been reviewed, and to the best of the Municipality's knowledge meets the requirements for Total Performance of the Work. Any review, comment, consent, acceptance, or approval, or lack thereof, by the Municipality shall not relieve the Contractor of any of its responsibilities or liabilities under the Contract.

The effective date of Total Performance of the Work is: _____

Consulting Engineer's Recommendation

I have reviewed the Certificate and recommend it for authorization by the Municipality.

Signature: _____

Date: _____

Name: _____

(printed name of the above representative)

(printed name of consultant firm)

Municipality's Authorization

I authorize this Certificate of Total Performance of the Work.

Signature: _____

Date: _____

Name: _____

(printed name of the above representative)

(title of the above representative)



Engineering Pre-Inspection Checklist

SANITARY SEWER

COMMENTS

Manholes

Channel	☐	
Base	☐	
Joints	☐	
Cover	☐	
Grade Rings	☐	
Clean	☐	

Gravity

Compaction Tests	☐	
CCTV Report	☐	
CCTV Review	☐	
Exfiltration / Infiltration Test	☐	
Mandrel Test	☐	

Force Main

Compaction Tests	☐	
Pressure / Leakage Test	☐	

STORM SEWER

Manholes

Channel	☐	
Base	☐	
Joints	☐	
Cover	☐	
Grade Rings	☐	
Clean	☐	

Main Line

Compaction Tests	☐	
CCTV Report	☐	
CCTV Review	☐	
Exfiltration / Infiltration Test	☐	
Mandrel Test	☐	

Catch Basins

Sump	☐	
Base	☐	
Joints	☐	
Grate	☐	
Location	☐	
Clean	☐	

SWMFs

Flared Ends (Inlet)	☐	
Flared Ends (Outlet)	☐	
Trash Rack	☐	
Rip Rap (Class, Size)	☐	
Topsoil	☐	
Seeding	☐	
Control Structure	☐	
General Clean-up	☐	

WATERMAINS

COMMENTS

Compaction Tests	☐	
Hydrant Operation	☐	
Valve Operation	☐	
Pressure / Leakage Test	☐	
Chlorine Residual Test	☐	
Bacteriological Test	☐	
Hydrant Caps Painted	☐	

SERVICES

Compaction Tests	☐	
Curb Stop Operation	☐	
Sanitary	☐	
Storm	☐	
Water	☐	
Marker Stakes	☐	
Service Reports	☐	

CONCRETE

Curb and Gutter	☐	
Sidewalk	☐	
Expansion Joints	☐	
Concrete Tests	☐	
Mix Design	☐	
Curb Stop Stamps	☐	
Backfill	☐	
Behind	☐	
Concrete	☐	
Clean	☐	

ASPHALT

Asphalt Surface Uniformity	☐	
Subgrade Compaction Tests	☐	
GBC Compaction Tests	☐	
Proofrolls	☐	
Asphalt Core Results	☐	
Mix Design	☐	
Thickness	☐	
Density	☐	
Clean	☐	

SITE GRADING

Ditches	☐	
Culverts	☐	
Swales	☐	
Clean	☐	
Positive Drainage	☐	

I, _____ of _____ certify that _____
(Consultant's Name) (Consultant's Firm) (Project Name)
has been pre-inspected and is ready for a _____ inspection of the _____ works.
(CCC / FAC) (Underground / Surface / Landscape)

Signature: _____

Date: _____



Date of Submission: _____ **Name of Development:** _____

Item	Approved By (Initials)	Review Comments
Record Drawings, as per Section 3		
Record Drawings of Shallow Utilities		
Lot Service Records		
Compaction Test Results		
Pressure and Leakage Test Results		
Chlorine Residual Test Results		
Bacteriological Test Results		
CCC CCTV Inspection Reports for sanitary and storm		
Infiltration or Exfiltration Test Results		
Concrete Mix Design		
Asphalt Mix Design		
Density Test Results		
Deflection Test Results		
Concrete Strength Test Results		
Materials Testing Results		
Asphalt Core Results		
Operation & Maintenance Manuals (if applicable)		
TCA Reporting Requirements, as per Section 3		
Weekly and/or Monthly Progress Reports		
CCC Certificate Authenticated by Consulting Engineer		
Minutes of CCC Joint Inspection		
Sketch with noted deficiencies highlighted		

Note: If a supporting document is not applicable, indicate so in the Review Comments.



REGIONAL MUNICIPALITY
OF WOOD BUFFALO

Construction Completion Certificate

This certificate shall be prepared and executed by the Owner and Consulting Engineer for submission to the Regional Municipality of Wood Buffalo.

Date: _____

Brief Project Description:

Owner:

Name: _____
Address: _____

Phone: _____

Consulting Engineer:

Name: _____
Address: _____

Phone: _____

The CCC Joint Inspection was performed on _____ and all noted deficiencies have been rectified.

I, _____ of _____
(Consulting Engineer's Name) (Consulting Engineer's Firm)

hereby certify that the contract for the above described project has been completed in general conformance with the Contract Documents and the Regional Municipality of Wood Buffalo's *Design Servicing Standards and Development Procedures* and *Standard Construction Specifications*.

Consulting Engineer's Seal

Company Permit to Practice Stamp

Regional Municipality of Wood Buffalo

Based on the above certification, the Regional Municipality of Wood Buffalo accepts that the project is complete.

The Warranty Period as it affects the Municipality will commence on _____

Name: _____

Signature: _____

Date: _____



FAC Application Submission Checklist

Date of Submission: _____

Name of Development: _____

Item	Approved By (Initials)	Review Comments
Record Drawings, as per Section 3 , with any changes from CCC shown		
Asphalt Test Results for top lift		
FAC CCTV Inspection Reports for sanitary and storm		
Record of Maintenance completed during Warranty Period		
Materials Testing Results for work completed to address deficiencies during Warranty Period		
Minutes of FAC Joint Inspection		
Sketch with noted deficiencies highlighted		

Note: If a supporting document is not applicable, indicate so in the Review Comments.



REGIONAL MUNICIPALITY
OF WOOD BUFFALO

Final Acceptance Certificate

This certificate shall be prepared and executed by the Owner and Consulting Engineer for submission to the Regional Municipality of Wood Buffalo.

Date: _____

Brief Project Description:

Owner:

Name: _____

Address: _____

Phone: _____

Consulting Engineer:

Name: _____

Address: _____

Phone: _____

The FAC Joint Inspection was performed on _____ and all noted deficiencies have been rectified.

I, _____ of _____
(Consulting Engineer's Name) (Consulting Engineer's Firm)

hereby certify that the contract for the above described project has been completed in general conformance with the Contract Documents and the Regional Municipality of Wood Buffalo's *Design Servicing Standards and Development Procedures* and *Standard Construction Specifications* and that all deficiencies have been rectified to the Municipality's satisfaction.

Consulting Engineer's Seal

Company Permit to Practice Stamp

Regional Municipality of Wood Buffalo

Based on the above certification, the Regional Municipality of Wood Buffalo accepts that the Warranty Period has expired effective _____ and that the Municipality assumes responsibility for the Municipal Improvements as they concern the Municipality.

Name: _____

Signature: _____

Date: _____

3 DRAFTING & DATA SUBMISSION STANDARDS

3.1 General

- .1 These standards are intended to facilitate the creation of complete engineering drawing packages with a consistent format for all Municipal Improvements to be constructed within the Municipality.
- .2 This section is to be used as a guide in the development of engineering drawings.
- .3 All drawings are to be produced electronically using AutoCAD.
- .4 This section assumes the reader has a basic knowledge of AutoCAD and drafting terminology and commands. Other than common abbreviations, words in ALL CAPS represent AutoCAD commands.

3.2 Before You Begin

- .1 Drafters shall confirm that their version of AutoCAD is compatible with the version of AutoCAD currently being used by the RMWB. This will enable all users including ArcGIS to utilize completed work. Digital files are to be submitted to the Municipality in approved version only.
- .2 The Municipality requires that all drawings reference standard details.
- .3 For land development projects the drawings and other digital information may be uploaded through E-Permitting. For capital works projects the drawings shall be submitted to the Project Manager electronically through FTP, USB, email or another private file transfer format. For more information on E-Permitting please refer to the RMWB website.

3.3 Requirements for Authentication

- .1 All Issued for Tender and Issued for Construction engineering drawings submitted to the Municipality must be Authenticated. An additional stamp may be placed on the drawings in a prominent location if the drawings are not meant for construction, such as:
 - "For Tender Only - Not For Construction"
 - "For Approval Only - Not For Construction"
- .2 Landscape plans are to be submitted as part of the engineering drawing package and shall be signed by the Landscape Consultant.
- .3 All Record Drawings submitted to the Municipality must be Authenticated.

3.4 Section Overview

3.4.1 Content

- .1 This section includes the following:
 - **AutoCAD File Standards** - to be used for all capital works projects and/or where digital AutoCAD files are required by the Municipality for integration into a database.
 - **Engineering Drawing Standards** - to be used for all engineering drawing submissions to the Municipality.
 - **Engineering Drawing Data Submission Requirements** - to be used for all engineering data submissions to the Municipality.

- **TCA/GIS Data Submission Requirements** - to be used for all Municipal Improvements projects, and/or where digital AutoCAD files are required by the Municipality for integration into a database.
- .2 Drawings prepared for development projects within the Municipality are not required to use the AutoCAD File Standards; however, this document encompasses many items considered by the Municipality to be best practices and may result in a more streamlined approval process.

3.4.2 National CAD Standards

- .1 Large portions of this section are based on the United States National CAD Standards (NCS). For additional information, please consult the NCS website.

3.4.3 Brand Standards

- .1 There are *Brand Standards* in place to specify how the Municipality's logo is to be used and scaled. Refer to the *Brand Standards* document, available on the Municipality's website, before using the Municipality's logo.

3.5 AutoCAD File Standards

3.5.1 Usage and Purpose

- .1 These standards govern the set-up and function of digital AutoCAD files for Municipal Improvements and for projects where the Municipality will be using the AutoCAD files for integration into a database.
- .2 These standards are intended to:
 - .1 Assist Consulting Engineers in maintaining visual consistency across projects, and
 - .2 Allow the Municipality to use the submitted files.

3.5.2 Version

- .1 Users of these standards shall confirm that their version of AutoCAD is compatible with the version of AutoCAD currently being used by the Municipality. This will enable all users, including GIS technologists, to use the submitted files.
- .1 Digital files are to be submitted to the Municipality in the approved software version only.

3.5.3 Drawing Templates

- .1 The Municipality's drawing templates for the creation of design drawings are available from the Municipality.
- .2 The drawing templates contain standard layer definitions and paper space layout definitions with standard title blocks, linetypes, text styles, symbols, and dimension styles.
 - .1 Two layouts are provided within the drawing templates: the Cover Sheet Template, and the Horizontal Title Block Template (to be used for all other drawings).
 - .2 The latest plot style tables are also available from the Municipality. The filename will be **RWMB-Engineering-XXXX.ctb**, where **XXXX** shall mean the year of release of the plot style tables.

3.5.4 General AutoCAD File Requirements

- .1 All AutoCAD files shall adhere to the following standards:
 - .1 Plans are to be drawn at 1:1 scale in model space with text, symbols, hatch patterns, and line widths adjusted by the required scale factor.
 - .2 Layouts should have North facing up or to the left.
 - .3 Title block sheets are to be inserted as a block in a layout (paper space) at 0,0,0 with a scale factor of 1 and a rotation angle of 0. Title block info that will change from one drawing to the next shall be inserted separately.
 - .4 Model space graphics are to appear in the layout in correctly scaled viewports.
 - .5 There shall be only one title block per layout.
 - .6 The title block shall not be exploded.
 - .7 While only one layout per .dwg file is generally recommended, there are times when multiple sheets and viewports are required to show detail for large sites or alignments.
 - .1 Multiple layouts per .dwg file are acceptable in this case if the type of drawing remains the same.
 - .2 For example, to show grading detail on a large site, four sheets may be required. These four sheets can share the same .dwg file.
 - .3 A key plan indicating the portion of the layout using hatching and matchlines shall be included on each sheet.
 - .8 Drawings shall adhere to the file naming standard as outlined in [Section 3.5.9](#).

3.5.5 Coordinate System and Survey Standards

- .1 All drawings submitted to the Municipality shall be in NAD83 UTM Zone 12N, grid coordinates.
- .2 AutoCAD files must contain projection/coordinate system descriptions as a note.
- .3 Any survey data submitted shall conform to Alberta Transportation and Utilities, Descriptor Codes for Total Station Surveying and be submitted in PNEZD, comma delimited, ASCII text file format. A description key file corresponding to point codes used by the survey crew, but not included in the above referenced material, shall also be provided

3.5.6 Base Plan Drawings (External References)

- .1 Base plans from the Municipality include “as-constructed” utilities, legal, surface details, and other data obtained from external sources. These base plans are generally used for several drawings and are continually updated; therefore, any information obtained from the Municipality to be used for “existing” information shall be externally referenced.
- .2 An Electronic Release Form is required for all data in digital format that is requested from the Municipality.
 - .1 The form must be signed before any digital base plans will be distributed to the public.
 - .2 The request form is available on the Municipality’s website.
- .3 Aerial photography used as background information shall be placed on a separate layer.

3.5.7 Layout Standards

- .1 The Municipality's drawing templates are to be used for setting up all new drawings. The templates include the correct paper size, cover sheet, and title block content.
- .2 The following requirements are to be used to set up new drawings:
 - .1 ANSI D (559 mm x 864 mm) (22"x34") paper size
 - .2 Title block inserted at 0,0
 - .3 Plot scale of 1:1

3.5.8 Drawing Sheet Numbering

3.5.8.1 Water & Wastewater Facility Format

- .1 The Municipality has established a standardized "Site Identifiers and Drawing Designation" that stipulates the required drawing and file naming convention for all Municipal facilities. Designers must acquire the most current "Site Identifiers and Drawing Designation" from the Municipality prior to starting work.

3.5.8.2 General Format

- .1 The Municipality uses the following format, with a maximum of 9 characters (including hyphens), for drawing set organization and number, which is based on the Uniform Drawing System (UDS) from the NCS.

A	A	N	N	N	-	U	U	U
---	---	---	---	---	---	---	---	---

3.5.8.3 Discipline Designator

A	A	N	N		N	-	U	U	U
---	---	---	---	--	---	---	---	---	---

- .1 The "AA" contained within the numbering format is the discipline designator; these characters are always letters.
- .2 Disciplines have an established order within the drawing set, following the cover sheet.
- .3 The following chart is to be used to determine the order and first letter of the discipline designator (also known as the Level 1 discipline designator) for all drawings.

Level 1 Discipline Designators	
G	General
H	Hazardous Materials
V	Survey/Mapping
B	Geotechnical
C	Civil
L	Landscape
S	Structural
A	Architectural
I	Interiors
Q	Equipment
F	Fire Protection
P	Plumbing
D	Process
M	Mechanical
E	Electrical
W	Distributed Energy
T	Telecommunications
R	Resource
X	Other Disciplines
Z	Contractor/Shop Drawings
O	Operations

- .4 The second letter is used to designate sub-specialties of the discipline as required; for example:

"TA" for Telecommunications, Audio-Visual

T	A	N	N	N	-	U	U	U
---	---	---	---	---	---	---	---	---

"TI" for Telecommunications, Intercom

T	I	N	N	N	-	U	U	U
---	---	---	---	---	---	---	---	---

- .5 The second letter is optional. If not required, the letter is to be replaced by a hyphen.

"C-" for Civil (no sub-speciality)

C	-	N	N	N	-	U	U	U
---	---	---	---	---	---	---	---	---

3.5.8.4 Sheet Type Designator

A	A	N	N	N	-	U	U	U
---	---	---	---	---	---	---	---	---

- .1 The sheet type designator is a single number that identifies the sheet type.
- .2 It is not necessary to use all the sheet types for a project or within a discipline.
- .3 The following chart relates the sheet type to its requisite number.

Sheet Type Designators	
0	General (legend, notes, etc.)
1	Plans (horizontal views and combination plan/profiles)
2	Elevations (vertical views)
3	Sections (cross sections)
4	Large-Scale Views (scaled up reproductions of plans, elevations, or sections that are not details)
5	Details (with the exception of Standard Details)
6	Schedules and Diagrams
7	User Defined (e.g., Standard Detail sheets)
8	User Defined (for types that do not fall in other categories)
9	3D Representations (isometrics, perspectives, photos)

- .4 The use of sheet type designators does not preclude combining different types of drawings on the same sheet for simplicity. For instance, it is acceptable to:
 - Place profiles on plan sheets,
 - Place same scale sections on the same sheet as large-scale plans,
 - Place schedules on a plan sheet when the information is closely related, and
 - Combine different types of drawings on the same sheet for small projects.

3.5.8.5 Sheet Sequence Number

A	A	N	N	N	-	U	U	U
---	---	---	---	---	---	---	---	---

- .1 The sheet sequence number is a two-digit number that identifies each sheet in a series of the same discipline and sheet type.
- .2 Sequence numbering starts with 01, followed by 02 through 99; sheet number 00 is not permitted.
- .3 For example, the second sheet of a Civil (no sub-specialty) Plan/Profile set would be:

C	-	1	0	2	-	U	U	U
---	---	---	---	---	---	---	---	---

- .4 As another example, the first sheet of a Mechanical (no sub-specialty) Details set would be:

M	-	5	0	1	-	U	U	U
---	---	---	---	---	---	---	---	---

3.5.8.6 User Defined Designators

A	A	N	N	N	-	U	U	U
---	---	---	---	---	---	---	---	---

- .1 User defined designators are completely optional and are included to give the user flexibility to add or append drawings without having to replace drawings already in the existing set.
- .2 Not all 3 characters need to be used and the format can be letters or numbers.
- .3 For example, the first revision of a partially revised Architectural (no sub-specialty) second floor plan would be:

A	-	1	0	2	-	R	1
---	---	---	---	---	---	---	---

3.5.9 AutoCAD File Naming

3.5.9.1 General

- .1 All AutoCAD files submitted to the Municipality shall adhere to these digital file naming standards.
- .2 Digital files fall under one of two categories:
 - **Model Files** - these files directly contain the digital representation of the items contained within the project, drawn at a 1:1 scale. They can be 2D or 3D.
 - **Sheet Files** - these files coincide with the physical sheets that make up a set of drawings. The naming convention for these digital files closely follows the sheet naming convention outlined in **Section 3.5.8**. Sheet files usually contain a title block, model files that have been referenced into the sheet, annotation, and additional drawing elements.

3.5.9.2 Model Files

- .1 The Municipality uses the following format, based on the Uniform Drawing System (UDS) from the NCS.

O	O	O	O	O	A	A	A	A	U	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .2 **User Defined Prefix**

O	O	O	O	O	A	A	A	A	U	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The first set of characters comprise the optional user defined prefix.
- .2 The optional prefix is not limited to or required to be 5 characters (as shown), to allow the user to give a unique identifier to the filename such as an internal or external project number; for example, a filename with the project number 2023-123 would be:

2	0	2	3	-	1	2	3	A	A	A	A	U	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

.3 **Discipline Designator**

O	O	O	O	O	A	A	A	A	U	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The next 2 characters are the discipline designators, as described in [Section 3.5.8](#).

.4 **Model Type**

O	O	O	O	O	A	A	A	A	U	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The next 2 characters are the drawing type designators, as per the following table.

Model File Types	
FP	Floor Plan
SP	Site Plan
DP	Demolition Plan
QP	Equipment Plan
XP	Existing Plan
EL	Elevation
SC	Section
DT	Detail
SH	Schedules
3D	Isometric/3D
DG	Diagrams
PR	Profile
PP	Plan/Profile
SV	Survey
FN	Foundation Plan
FR	Framing Plan

.5 **User Designated Suffix**

O	O	O	O	O	A	A	A	A	U	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The next 4 characters are optional and defined by the user; they must be excluded or exactly 4 characters.

.6 **File Extension**

O	O	O	O	O	A	A	A	A	U	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The final 4 characters denote what type of file it is. In general, digital AutoCAD files shall be .dwg unless otherwise requested by the Municipality.

.7 **Examples**

- .1 A Civil (no sub-specialty) Site Plan drawing number 1001, under project number 2023-123:

2	0	2	3	-	1	2	3	C	-	S	P	1	0	0	1	.	D	W	G
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .2 A Mechanical (no sub-specialty) Detail drawing, with neither an optional prefix nor a suffix:

M	-	D	T	.	D	W	G
---	---	---	---	---	---	---	---

3.5.9.3 Sheet Files

- .1 The Municipality uses the following format, which is based on the Uniform Drawing System (UDS) from the NCS.

O	O	O	O	O	A	A	N	N	N	-	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

.2 **User Defined Prefix**

O	O	O	O	O	A	A	N	N	N	-	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The user defined prefix is determined in the same way as the user defined prefix described in **Section 3.5.9.2**.

.3 **Discipline Designator**

O	O	O	O	O	A	A	N	N	N	-	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The discipline designator is determined in the same way as the discipline designator described in **Section 3.5.8**.

.4 **Sheet Type Designator**

O	O	O	O	O	A	A	N	N	N	-	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The sheet type designator is determined in the same way as the sheet type designator described in **Section 3.5.8**.

.5 **Sheet Sequence Number**

O	O	O	O	O	A	A	N	N	N	-	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The sheet sequence number is determined in the same way as the sheet sequence number described in [Section 3.5.8](#).

.6 **User Defined Designator**

O	O	O	O	O	A	A	N	N	N	-	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The user defined designator is determined in the same way as the user defined designator described in [Section 3.5.8](#).

.7 **File Extension**

O	O	O	O	O	A	A	N	N	N	-	U	U	U	.	E	X	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

- .1 The file extension is determined in the same way as the file extension described in [Section 3.5.9.2](#).

.8 **Example**

- .1 A Civil (no sub-specialty) Site Plan drawing, for project number 2023-123:

2	0	2	3	-	1	2	3	C	-	1	0	1	.	D	W	G
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

3.5.10 New AutoCAD Objects

3.5.10.1 General

- .1 In general, the Municipality's drawing templates will provide the required text styles, layers, label styles, dimension styles, linetypes, blocks, hatch types, etc. to meet the Municipality's AutoCAD requirements; however, the following conventions are to be used when creating new objects.

3.5.10.2 Layer Naming Conventions

- .1 New layer names shall follow the naming conventions outlined in the NCS.

3.5.10.3 Linetype Conventions

- .1 Drawings must not contain line types other than those defined in the supplied drawing templates.
- .2 Line types are to be converted to metric and formatted to display properly at a 1:1000 scale, with LTSCALE and PSLTSCALE each set to 1.

3.5.10.4 Block Conventions

- .1 Blocks shall be used for drawing objects which occur often. New blocks are to be created with linetype and colour "by layer". By default, the block will take on the properties of the layer it is placed on, but it can be changed to suit requirements independent of the layer settings.

- .2 Newly created blocks shall have the following properties:
 - Insertion point at 0,0,0,
 - All objects drawn on Layer 0, and
 - Contain a node at the center (or close to the center) point of the block.
- .3 Any blocks which are required but are not included in the drawing templates may be created if they prescribe to the above conditions and appear in a legend.

3.5.10.5 Hatching Conventions

- .1 The hatching types included in the drawing templates shall be used; no new hatching types are to be used.

3.5.11 Annotation

3.5.11.1 Text Styles

- .1 All text in drawings shall be Arial or Arial Narrow.
 - .1 **Arial Narrow** shall be used for general annotation.
 - .2 **Arial** shall be used for Title Block text.
- .2 The Municipality's drawing templates will have the appropriate styles and sizes assigned to items that require a default style to function.
- .3 The following chart shall be used as a guide for any items which are not pre-defined.

Height of Text (mm)	Description
2.0	Diameters, curve data, dimensions, grades/spot elevations, and other design information
3.0	Lot numbers
4.0	Road names, Phase labels, plan/profile labels
5.0	Block # text

3.5.11.2 Dimensions

- .1 All dimensioning must be created on entities in model space with associative dimensions.
- .2 There are two dimension styles in the Municipality's drawing templates:
 - .1 **RMWB_ExDeFu** - for dimensioning **Ex**isting, **De**molition/Abandonments, and **Fu**ture items, and
 - .2 **RMWB_Proposed** - for Proposed items.

3.5.12 Plotting Requirements

- .1 The following plot settings shall be used for all AutoCAD files:
 - .1 The default plotter shall be set to "DWG to PDF".
 - .2 The colour-dependent plot style table (CTB) shall be the latest version received from the Municipality.

- .1 This CTB will plot all items in greyscale, other than the Title Block and Cover Sheet, which will be the Municipality's brand colours.
- .2 Usage of colour for items other than the Cover Sheet and Title Block shall be discussed on a case-by-case basis with the Municipality.
- .3 Plot area to be "Layout".
- .4 Plot scale to be 1:1.

3.6 Engineering Drawing Requirements

3.6.1 Purpose

- .1 These engineering drawing standards are required for all drawings and allow the Municipality to have the information required to review, evaluate, and approve engineering drawings.
- .2 This section also includes best practices to help keep information unobscured and legible.
- .3 A Submission Compliance Checklist is provided at the end of **Section 2**, for reference.

3.6.2 General Drawing Requirements

- .1 All drawings shall be in metric (SI Units).
 - .1 Units shall be set to metres or millimetres, as appropriate.
 - .2 Degrees are to be labelled in decimal degrees and are to be measured in a clockwise direction.
- .2 North (0 degrees) shall face up within model space.
- .3 Numerical values shown on drawings shall be shown to two decimal places, unless three is specifically required (e.g., inverts) for construction.
- .4 Unless otherwise approved, the scale of drawings shall be:

Drawing Type	Scale(s)
Overall Plans	1:1000
Plan/Profiles	Horizontal: 1:500 Vertical: 1:50; can be increased to 1:25 for clarity, as required
Lot Grading Plans	1:500 or 1:750
Cross Sections	Horizontal: 1:100 Vertical: 1:50
Overall System Network Analysis	1:5000
Details	1:100

- .5 Drawing scales and relevant dimensions shall be shown on all drawings.
- .6 References to coordinates shall be made in **NAD83 UTM Zone 12N**, grid.
- .7 Elevations shall be relative to geodetic datum.

- .8 Benchmark numbers, locations, and elevations of benchmarks used shall be shown on the design drawings.
- .9 Allow a minimum of 40 mm for a binding edge along the left side; nothing shall be drawn in this area.
- .10 Construction notes shall be boxed and located around the perimeter of the drawing, tagged to the drawing feature, and in sufficient detail to facilitate construction.
- .11 The following notes shall be shown on either the index plan or the first drawing of the set:
 - .1 *All work and materials are to meet the Regional Municipality of Wood Buffalo "Design Servicing Standards and Development Procedures" and the "Standard Construction Specifications" or as otherwise approved by the Municipality.*
 - .2 *The Contractor is responsible for all detour and construction signage.*
 - .3 *Location and depth of all existing utilities to be confirmed by the Contractor in the field.*
 - .4 *Contractor to coordinate the efforts and scheduling of all utility companies and Regional Municipality of Wood Buffalo forces for their portion of the work, as required.*
 - .5 *Refer to the geotechnical report for existing conditions and construction requirements.*
- .12 Standard Details such as manholes, catch basins, hydrants, etc., that are included in this document need not be shown in detail on the drawings; it is sufficient to identify the Standard Detail number on the plan(s) for reference.
- .13 Each drawing shall have a legend with symbols pertaining to that drawing, or a legend containing all symbology on a separate sheet.
- .14 All drawing sets are to have erosion and Sedimentation control plans; refer to **Section 12** for more information.
- .15 The engineering drawings shall be supplemented with the following details, either on the relevant drawings themselves, or on additional detail sheets:
 - .1 Details of special protection for pipe sections which are exposed to high velocities or which require corrosion protection or insulation.
 - .2 Drawings required for obtaining permits for the crossing(s) of oil, gas, power transmission lines, railroads, and/or highways.
 - .3 Details for placement in fill or for trenchless installations if such special methods are required.
 - .4 Thrust block details.

3.6.3 Revisions

3.6.3.1 Revision/"Issued for" Tracking

- .1 Issues occurring prior to approval from the Municipality are to be recorded appropriately on the affected drawing(s), within the revision block, using letters starting from A. The drawing issue letter will change for each issue even if there is no change on the drawing.
- .2 Drawings Issued for Tender shall have all previous entries within the revision block removed and the revisions thereafter shall start from 0.

- .3 Each revision shall include a cloud outline encompassing the revised portion of the drawing with an adjacent revision triangle annotation indicating the issue number.

3.6.3.2 Post Approval Revisions (Red-Line Submissions)

- .1 All changes or additions to approved (Issued for Tender or Issued for Construction) drawings shall be clearly marked in red and by placing a triangular flag containing the current revision number adjacent to the location on the drawing where the change/addition was made. These drawings are referred to as red-line drawings.
 - .1 In addition to the triangular flag marking, it may be required to cloud the entire area where the addition or change was made.
- .2 For more information on requirements for red-line submissions, refer to **Section 2.17.24**.

3.6.4 Specific Drawing Requirements

3.6.4.1 General

- .1 The following information is generally required on all drawings.
 - .1 Property lines, including Public Utility Lots
 - .2 Lot and block numbers
 - .3 Easement lines
 - .4 Street names
 - .5 Alley names (if applicable)

3.6.4.2 Title Blocks

- .1 Title blocks shall include the following information:
 - .1 The Regional Municipality of Wood Buffalo logo
 - .2 Project name or name of development
 - .3 Project stage/phase
 - .4 Description of drawing
 - .5 Legal description
 - .6 Name and logo of the consultant
 - .7 Consultant's Permit to Practice stamp
 - .8 Consulting Engineer's stamp
 - .9 Identification of draftsperson and designer
 - .10 Drawing set issue number
 - .11 List of revisions
 - .12 Legend
 - .13 Scale(s)
 - .14 Dates
 - .15 Drawing Numbers
 - .16 Plan-specific notes

3.6.4.3 General Sheet(s)

- .1 General sheets may be combined into the same layout(s) as per project requirements.
- .2 **Cover Sheet**
 - .1 The Cover Sheet shall contain the following information:
 - .1 Names of the Owner and Consulting Engineer and/or Landscape Architect, logos optional
 - .2 Contract Number (for capital works projects)
 - .3 Consultant Project Number (if applicable)
 - .4 **Key Plan** - a simple overall location of the project within the Municipality (this may be contained on the Location Plan, depending on the project requirements)
- .3 **List of Drawings Plan**
 - .1 The List of Drawings Plan shall include a list of all drawing sheets contained in the drawing set.
- .4 **Legend Plan**
 - .1 The Legend Plan shall contain a legend defining the symbols, linetypes, and hatching used in the drawing set as well as general notes for the project.
 - .2 The Legend Plan is included in the drawing templates available from the Municipality.
- .5 **Index Plan**
 - .1 The Index Plan shall be a copy of the Legal Plan indicating which portion of a street is depicted on which plan/profile sheet.
 - .2 The following information shall be shown on the Index Plan:
 - .1 A Key Plan showing the location of the development/project area as it relates to the surrounding lands, complete with a north arrow
 - .2 Street names
 - .3 Phase/Stage boundary

3.6.4.4 Tentative Plan of Subdivision

- .1 In addition to the items listed in **Section 3.5.4.1**, the Tentative Plan of Subdivision shall include the following information.
 - .1 Lot dimensions
 - .2 Right-of-way width dimensions
 - .3 Easement dimensions (and/or a note indicating the typical width of Easements, if applicable)

3.6.4.5 Clearing, Stripping, and Interim Grading Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Clearing, Stripping, and Interim Grading Plan shall include the following information.
 - .1 Identification of the owners of all lands adjacent to or within the area to be cleared, stripped, and/or graded.

- .2 Identification of any anticipated clearing, stripping, or grading work to be completed on adjacent lands, including details of edge conditions, back sloping requirements, and areas where topsoil is to be placed and/or seeded until natural conditions are restored.
- .3 Cross sections along adjacent lands, at a maximum interval of 200 m as well as at locations where earthworks are anticipated to exceed 300 mm (cut or fill) in elevation from the existing ground surface.
- .4 Cross sections for temporary and/or permanent drainage swales showing basic dimensions, longitudinal grades, and side slopes.
- .5 Phase boundaries indicating the area anticipated to be constructed during the current year and the method of soil stabilization proposed for areas to be constructed in subsequent years.
- .6 Identification of any unusual site conditions (e.g., wells, structures, contaminated areas, etc.).
- .7 Existing survey control stations and markers.
- .8 Existing ground contours.
- .9 Test hole locations and original ground elevations at test hole locations.
- .10 Identification of natural features that are to be preserved and any natural features which are to be removed.
- .11 Details of topsoil stockpiles including height, width, length, and volume.
- .12 Location of all existing utilities (e.g., watermains, sanitary sewers, storm sewers, gas mains, electrical cabling/ducts, pipelines, etc.).
- .13 Location of groundwater monitoring wells (active and/or abandoned).
- .2 Add additional sheets as necessary, based on project requirements.

3.6.4.6 Overall Road, Alley, and Walkway Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Overall Road, Alley, and Walkway Plan shall include the following information.
 - .1 Carriageway widths (face of curb to face of curb or edge of pavement to edge of pavement, as applicable).
 - .2 Sidewalk width.
 - .3 Curb and gutter type(s).
 - .4 Boulevard widths.
 - .5 Direction of flow along roadways, alleys, and Public Utility Lots.
 - .6 Location and grades of drainage swales.
 - .7 Location of catch basin manholes and catch basins.
 - .8 Location of reinforced alley and/or driveway crossings.
 - .9 Location of curb ramps.
 - .10 Location of temporary access roads and/or turnarounds, including grades and direction of surface flow.
 - .11 Location of any stormwater management facilities, including location of access(es) for maintenance.
 - .12 Location of walkways (including locations of bollards or manual swing gates, as applicable).
 - .13 Location of safety barriers and railings (if applicable).

- .14 Identification of the cross section (Standard Detail number) for each roadway.
- .15 Location of community mailboxes (for development projects).
- .16 Identification of any enhanced amenities (e.g., subdivision entrance feature, sound wall, etc. for development projects).
- .17 Location of transit stops (if applicable).

3.6.4.7 Traffic Control Devices and Signage Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Traffic Control Devices and Signage Plan shall include the following information.
 - .1 Location of existing and proposed sidewalks, including curb ramps and roadway medians.
 - .2 Location of existing and proposed on-site trails and pathways, extending 30 m beyond the phase boundary at proposed connection point(s).
 - .3 Pavement markings, including roadway centre lines, stop bars, crosswalks, parking stalls, bike lanes, turn arrows, fire lanes etc., as applicable.
 - .4 Transit routing and bus stop signs as applicable.
 - .5 Traffic control signs.
 - .6 Street name identification signs.
 - .7 Decorative street name markers as applicable.
 - .8 Stormwater management facility warning signs.
- .2 For this plan, the traffic control devices, line painting, and signage linework/symbols shall be prominent; additional linework for providing context shall be shown in a lighter tone.

3.6.4.8 Overall Utility Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Overall Utility Plan shall include the following information.
 - .1 Existing and proposed water distribution system mains and trunks, including hydrants and valves.
 - .1 The diameter of each watermain shall be labelled, as well as a dimension from property line for each.
 - .2 Hydrant and valve numbers are to be labelled.
 - .2 Existing and proposed sanitary sewer mains and trunks, including manholes.
 - .1 The diameter and direction of flow of each sanitary sewer shall be labelled, as well as a dimension from property line.
 - .2 Manhole numbers are to be labelled.
 - .3 Existing and proposed storm sewer mains and trunks, including manholes, catch basin manholes, catch basins, catch basin leads, treatment units, inlets/outlets from stormwater management facilities, etc.
 - .1 The diameter and direction of flow of each storm sewer shall be labelled, as well as a dimension from property line for each.
 - .2 Manhole, catch basin manhole, and catch basin numbers are to be labelled.

- .4 Shallow Utilities, including duct crossings.
 - .1 The type (e.g., gas, telecommunications, overhead or underground power, etc.) of Shallow Utility shall be indicated.
- .5 The location of sidewalks, trails, curb lines, curb ramps, medians, community mailboxes, transit stops, and any enhanced features (e.g., subdivision entrance feature, sound wall, etc.), as applicable.
- .6 Stationing for roadway, alley, and Public Utility Lot centre lines.

3.6.4.9 Water Distribution System Disinfection and Flushing Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Water Distribution System Disinfection and Flushing Plan shall include the following information.
 - .1 Hydrants and hydrant identification numbers.
 - .2 Valves and valve identification numbers.
 - .3 Identification of the receiving sewer manholes and manhole identification numbers.
 - .4 The proposed sequence of flushing, including valve opening and closing sequence.

3.6.4.10 Stormwater Management Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Stormwater Management Plan shall include the following information.
 - .1 Catchment areas to catch basins and catch basin manholes.
 - .2 Major drainage routes, including natural overland drainage routes.
 - .3 Location of Trap Lows, including extents of water ponding and ponding depth.
 - .4 Storm sewer main alignments with length, diameter, pipe material, slope, and direction of flow indicated.
 - .5 Manholes, catch basin manholes, and catch basins with corresponding identification numbers.
 - .6 Location and type (i.e., internal or external) of any drop structures.
 - .7 Catch basin leads.
 - .8 Stormwater management facility, including water levels and utility infrastructure (i.e., inlet/outlet pipes, treatment units, etc.) and any proposed enhancement features (e.g., water fountain, boat launch (for a wet pond or constructed wetland), sports field (for a dry pond), etc.).
 - .9 Identification of the normal and high water levels, freeboard elevation, and emergency overflow route for the stormwater management facility.
 - .10 Location and alignment of the maintenance access road to the stormwater management facility, as well as the required road structure for the maintenance access road.
 - .11 Stationing for roadway, alley, and Public Utility Lot centre lines.
 - .12 A table outlining the calculations for sizing of the storm sewer collection system; if the table will not fit on this sheet, it can be included on its own sheet, immediately following the Stormwater Management Plan.
 - .13 A table outlining the surface area, volume, and discharge flow rates for the stormwater management facility; if the table will not fit on this sheet, it can be included on its own sheet, immediately following the Stormwater Management Plan.

3.6.4.11 Overall Shallow Utility Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Overall Shallow Utility Plan shall include the following information.
 - .1 Location of duct lines.
 - .2 Power, telecommunications, and gas main alignments.
 - .3 Underground residential distribution (URD) pull boxes, pedestals, transformers, streetlights, and streetlight cabling.
 - .4 Power supply and lighting for trails and enhanced landscaping features, as applicable.
 - .5 Proposed 4-party Easement to accommodate all Shallow Utilities, as applicable.

3.6.4.12 Lot Grading Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Lot Grading Plan shall include the following information. (Note: elevations referenced below refer to the proposed finished ground surface.)
 - .1 Elevations at lot corners.
 - .2 Intermediate side yard elevations along property lines at changes in grade or alignment.
 - .3 Water, sanitary, and storm service locations and invert elevations at property line.
 - .4 Location of insulated services, as applicable.
 - .5 Recommended lowest top of footing elevation.
 - .6 Lot drainage type for each residential lot.
 - .7 Lot drainage for multi-family and non-residential lots with elevations and grades; indicate the extents of any ponding and the depth of ponding in parking lots.
 - .8 Drainage patterns for green spaces (i.e., Municipal Reserves, noise attenuation berms, Public Utility Lots, park areas, etc.).
 - .9 Location of power, telecommunications, and gas services.
 - .10 Location of hydrants, streetlights, transformers, cubicles, URD boxes, and pedestals.
 - .11 Location of community mailboxes.
 - .12 Identification of which lots are to have Restrictive Covenants on title.

3.6.4.13 Plan/Profile Drawings

- .1 All underground and surface improvements are to be shown on the same plan/profile drawings, unless otherwise required by the Municipality.
- .2 The plan portion of the drawing shall be positioned at the top of the sheet and the profile portion of the drawing shall be located below the plan view.
- .3 **Plan View**
 - .1 The plan view shall include the following information related to **surface improvements**.
 - .1 The items listed in **Section 3.5.4.1**.
 - .2 Right-of-way widths.

- .3 Carriageway widths (face of curb to face of curb or edge of asphalt to edge of asphalt, as applicable).
- .4 Sidewalk width(s).
- .5 Curb and gutter type(s) and width(s).
- .6 Boulevard width(s).
- .7 Roadway vertical point of intersection (VPI) elevations.
- .8 The locations of boreholes.
- .2 The plan view shall include the following information related to **underground utilities**.
 - .1 Watermain sizes.
 - .2 Sanitary and storm sewer main sizes and direction of flow.
 - .3 Hydrant locations and identification numbers.
 - .4 Valve locations and identification numbers.
 - .5 Fitting types, sizes, and locations.
 - .6 Manhole, catch basin manhole, and catch basin locations and identification numbers.
 - .7 Catch basin lead sizes, lengths, and alignment.
- .4 **Profile View**
 - .1 The profile view shall include the following information.
 - .1 Stationing for roadway, alley, or Public Utility Lot centre lines (whichever is the subject of the drawing).
 - .2 VPI elevations for surface improvements.
 - .3 Length (indicated by the stationing) and grade (label) between VPIs for surface improvements.
 - .4 Vertical curve information.
 - .5 Crown elevations for watermain fittings and bends.
 - .6 Valve locations.
 - .7 Hydrant tee locations.
 - .8 Location, diameter, depth, and identification number of manholes.
 - .9 Manhole rim and invert elevations.
 - .10 Watermain lengths, sizes, and pipe materials.
 - .11 Sanitary and storm sewer main lengths, sizes, pipe materials, and slopes.
 - .12 Extents of any piping requiring insulation, as applicable.
 - .13 Location and type (internal or external) of drop structures, as applicable.
 - .14 Oil and gas pipelines, Shallow Utilities, and concrete duct banks, as applicable.
 - .15 Borehole information.

3.6.4.14 Landscape Plan

- .1 In addition to the items listed in **Section 3.5.4.1**, the Landscape Plan(s) shall include the following information.
 - .1 Existing contours at 0.5 m intervals within the site and extending 3 m beyond the project limits, as well as all other grading details described in **Section 3.5.4.12**.
 - .2 Site/phase boundaries/project limits.
 - .3 Location of temporary site access(es), laydown areas, and parking.
 - .4 Stockpile locations.
 - .5 Existing and proposed utility information (surface appurtenances).
 - .6 Identification of existing vegetation and/or other natural features to remain.
 - .7 Existing trees to be relocated.
 - .8 Proposed plant material illustrated at the mature spread or diameter, as noted in the *Canadian Nursery Stock Standards* published by the Canadian Nursery Landscape Association, shown in plan view, as well as in a table with the following indicated:
 - .1 Quantity of individual species,
 - .2 Botanical name and common name,
 - .3 Size of material (height and Caliper),
 - .4 Method of transport (balled and burlap, container stock, bare root, etc.), and
 - .5 Canadian Plant Hardiness Zone.
 - .9 Plant schedules, including overall quantities.
 - .1 This information may be added to the landscape details sheet in lieu of including on the Landscape Plan(s).
 - .10 Areas to be sodded and/or seeded with seed mix specified.
 - .11 Type and depth of Mulch for shrub beds and Tree Wells.
 - .12 Location of proposed site furnishings.
 - .13 Details of hard and soft landscape installation.
 - .14 Areas of concrete, asphalt, or special paving.
 - .15 Location of irrigation systems, as applicable.
 - .16 Location and type of fencing.
 - .1 Construction details may be added to the landscape details sheet in lieu of including on the Landscape Plan(s).
 - .17 Locations of bollards or manual swing gates along Public Utility Lots, walkways, or trails.
 - .18 Streetlights and park lighting, as applicable.
 - .19 Trail locations, signage, and proposed drainage patterns.
 - .20 Adjacent land use(s).
 - .21 Total areas (m²) of shrubs beds, flowerbeds, islands, buffers, Public Utility Lots, Municipal Reserves, Environmental Reserves, and parks.
 - .22 Total areas (m²) of locations to be sodded and/or seeded.

- .23 Any other details that relate to the landscape design.

3.6.4.15 Detail Sheets

- .1 Any additional details required for construction, which are not included in these standards, shall be included on detail sheets.
- .2 Standard Details such as manholes, catch basins, hydrants, etc., that are shown and described in the Standard Details included in these standards do not need to be shown on the drawings; it is sufficient to include a note indicating the Standard Detail number(s) on the plan(s) for reference.
- .3 Detail sheets shall be Authenticated, just like all other drawings included in the drawing set.
 - .1 This includes any revisions to the Standard Details; the revisions should be shown in bold for clarity.
- .4 All roadways shall include the typical roadway cross section(s) regardless of whether they follow these standards.

3.6.4.16 Record Drawings

- .1 Record Drawings shall include all the information as specified for the construction drawings (described in the previous sections) but shall be corrected upon completion of construction to note any infrastructure removed during construction.
 - .1 Alternatively, this information may be retained in the digital AutoCAD file on layer (C-SERV-D) in lieu of displaying the removed infrastructure on the final print.
 - .2 Note abandoned services (C-SERV-A) for permanent records.
- .2 All dimensions shown shall reflect the as-constructed conditions.
- .3 Record Drawings shall be to scale in accordance with the as-constructed dimensions.
- .4 The Revision Table shall be updated to indicate the drawings are Record Drawings.
- .5 All as-constructed features shall be surveyed, and the survey points imported into the digital AutoCAD drawing according to the appropriate layers.
 - .1 Record Drawings shall reflect the true elevation and location of all constructed features, in both the plan and profile views.
 - .2 Record (as-constructed) elevations shall be to 2 decimal places.
- .6 Linework for as-constructed works shall retain the thicker (proposed) line density for ease of determining the extent of works covered by the drawings.
- .7 Any future construction elements for the project are to be clearly identified and labelled as future on the Record Drawings.
- .8 Record Drawings shall also include the following information.
 - .1 The location and elevation of all existing utilities and services encountered during construction.
 - .2 The location and invert elevation at property line of all constructed service connections and the station of the service tee at the main.
- .9 All service connections shall be shown with dimensions to property lines.

- .10 Design data for which there is survey information is to be removed from the Record Drawings and replaced with the as-constructed data.
- .11 All hydrants, valves, curb stops, manholes, catch basin manholes, and catch basins are to be dimensioned in two directions or labelled with Northing and Easting coordinates.

3.6.5 Drawing Production Best Practices

3.6.5.1 Annotation Best Practices

- .1 The following best practices shall be followed in the production of drawings to be submitted to the Municipality.
 - .1 Letters and figures shall be clearly legible, well spaced, and properly formed and proportioned.
 - .2 Lines of the same type shall be uniform in weight.
 - .3 Proposed and existing features shall be readily distinguishable from each other.
 - .4 The colour and line type properties of objects shall be set to "by layer".
 - .5 Lettering shall be unobstructed by linework and other drawing information; there shall be no conflicts between linework, symbols, dimensioning, or text.
 - .6 The following symbols (along with the AutoCAD input string) shall be used in lieu of using the word.

Text	Symbol	Usage
%%C	∅	Diameter
%%D	°	Degrees
%%P	±	Plus or Minus

3.6.5.2 Dimensioning Best Practices

- .1 The following best practices shall be followed in the production of drawings to be submitted to the Municipality.
 - .1 Dimensioning is to be clearly legible. Dimensions shall be given from an iron pin, lot line, a face of curb, or other reference that can be readily established.
 - .2 Dimensions shall be located outside the floor plan or view being dimensioned.
 - .3 Dimensions located outside the view shall be located at the top and/or right side of the plans whenever possible.
 - .4 Dimensions shown on the interior of a plan or other view shall be arranged in continuous strings for clarity and consistency.
 - .5 Dimension lines, extension lines, and text leaders shall not cross each other.
 - .6 The longest dimensions shall be arranged such that they are the furthest away from the item being dimensioned to prevent crossing shorter dimensions.
 - .7 Use an equal spacing between a series of parallel dimensions.
 - .8 Avoid using object lines as dimension extension lines where possible.

3.7 Engineering Drawing Data Submission Requirements

3.7.1 Methods of Delivery

- .1 For **capital works projects**, the drawings and other digital information shall be submitted to the Municipality's Project Manager electronically through USB, email, or another private file transfer format.
- .2 For **development projects**, the drawings and other digital information shall be uploaded through E-Permitting.
 - .1 For more information on E-Permitting, refer to the Municipality's website.

3.7.2 File Presentation

- .1 Prior to sending any AutoCAD files to the Municipality, the following shall be completed on all files.
 - .1 The AUDIT command shall be run and any identified errors fixed.
 - .2 The drawing must be saved such as to be plotted to PDF without any additional page set-up.
 - .3 The main layout must be active and all viewports adjusted and locked to correct scale.
 - .4 The PURGE command shall be run to clean the drawing of all definitions not used.
 - .1 **Note:** This should not be run on files where further AutoCAD work is anticipated.

3.7.3 Preliminary Design Submissions

- .1 For preliminary design submission requirements, refer to **Section 2.9**.

3.7.4 Detailed Design Submissions

- .1 For detailed design submission requirements, refer to **Section 2.10**.

3.7.5 Record Drawing and Data Submissions

- .1 Record Drawings and supporting data shall be submitted through E-Permitting, unless otherwise required by the Municipality.
- .2 Record Drawings may be required in two stages, as indicated in **Section 2.18**.
- .3 The following electronic files are required as part of the record submission.
 - .1 A PDF copy of the drawing set, Issued for Record, Authenticated by the Consulting Engineer.
 - .2 All relevant AutoCAD files in a .zip file created using the ETRANSMIT function in AutoCAD.
 - .3 A .csv file of all survey information.
- .4 Survey data submitted to the Municipality shall be in PNEZD, comma delimited, ASCII text file format.
 - .1 A description key file corresponding to point codes used by the survey crew shall also be provided.
- .5 A Tangible Capital Assets Report as outlined in **Section 3.8.1**.
- .6 GIS files as outlined in **Section 3.8.2**.

3.8 TCA Report and GIS File Submission Requirements

3.8.1 TCA Report

- .1 A Tangible Capital Assets (TCA) report, in the format of an excel spreadsheet template, must be completed by the Consulting Engineer and submitted to the Municipality.
- .2 For **development projects**:
 - .1 A TCA report is required as part of the Development Agreement process.
 - .2 An updated TCA report is required for the CCC application and again for the FAC application.
 - .3 If the completed spreadsheet is not submitted, or is not complete to the satisfaction of the Municipality, the CCC or FAC will not be issued until such time as an acceptable submittal is received by the Municipality.
- .3 For **capital works projects**, a TCA report is required at FAC only.
- .4 Up-to-date copies of the excel asset catalogue and guide are available on the Municipality's website.

3.8.2 GIS Files

3.8.2.1 General

- .1 The Municipality requires that Record Drawing submissions include a digital GIS file format for all work completed by the Owner.
- .2 GIS layers shall include a spatial representation of all work completed as well as appropriate attribute information completed within the GIS layer.
- .3 A detailed data dictionary describing the required attribute information is available on the Municipality's website.

3.8.2.2 GIS Layers

- .1 Record Drawing submittals shall include the following GIS layers.
 - .1 **Water System:**
 - .1 Water Lines (all linear features)
 - .2 Water Nodes (all valves and fittings)
 - .3 Water Polygons (structures, etc.)
 - .2 **Sanitary Sewer System:**
 - .1 Sanitary Lines (all linear features)
 - .2 Sanitary Nodes (all fittings and manholes)
 - .3 Sanitary Polygons (structures, etc.)
 - .3 **Storm Sewer System:**
 - .1 Storm Lines (all linear features)
 - .2 Storm Nodes (all fittings, manholes, catch basin manholes, and catch basins)
 - .3 Storm Polygons (structures, stormwater management facilities, etc.)
 - .4 Open Channel Drainage (Culvert, Ditch, Swale)

- .4 **Shallow Utilities**
- .5 **Utility Duct System:**
 - .1 Duct Lines (all linear features)
 - .2 Duct Nodes (all structures, fittings, etc.)

3.8.2.3 GIS Data Template

- .1 A GIS template is available on the Municipality's website.
- .2 The GIS template is a GIS file geodatabase (.gdb file) titled "DS_SCHEMAONLY.gdb" which includes empty feature classes for Consulting Engineers to load record data into.
 - .1 These empty feature classes are to be used as a template so that record data submitted to the Municipality conforms to the Municipality's data standards.
 - .2 The file geodatabase format is used to maintain field data types, attribute domains, and the structure of the data.
 - .3 Shapefiles do not enforce the data rules as required and are not an acceptable format for record data to be submitted to the Municipality.
- .3 Altering the base template schema may result in data delivery to the Municipality being rejected until corrections are made.
 - .1 This includes changing field names or entering attribute values beyond those defined in the data dictionary available on the Municipality's website.

3.8.2.4 Sample GIS Data

- .1 A sample data set is available on the Municipality's website in a file geodatabase titled "DS_SAMPLE.gdb".
- .2 The sample file includes all the GIS data layers that are to be populated by record data as part of the Record Drawing submission.
- .3 Note that the sample data is not comprehensive and does not necessarily include all possible feature types or configurations and is therefore intended as a reference only.

3.8.2.5 GIS File Requirements

- .1 All data shall be projected in NAD83 UTM Zone 12N.
 - .1 The template and sample available on the Municipality's website are provided in this projected coordinate system.
- .2 Data should be drawn on top of a base legal layer (also known as a survey parcel) which can be clipped to the project area and provided to the Owner at their request.
- .3 The GIS data shall be an accurate representation of the as-constructed information.
- .4 The GIS data shall match the likeness of the lines and points as depicted in the .dwg and PDF files.
- .5 Point features associated with a line shall be snapped to and drawn on top of a line feature.
- .6 Line features shall be split at all nodes.
- .7 Line features shall be snapped to other line features (avoid overhangs and undershoots).

- .8 The GIS data shall adhere to the topography rules listed in the GIS Data Submission Package available on the RMWB website.
- .9 Only those features which have been added/removed or modified in the contract are to be provided in the record submission.
 - .1 Existing features which have not been added/removed or modified are not required to be included.
 - .2 A data dictionary which describes the attribute specifications required for each layer is available on the Municipality's website.
 - .1 Note that the domains tab lists the attribute values for each field in each layer.
 - .2 Note that all other tabs describe each layer and the appropriate domain for each field.
- .10 The data template available on the Municipality's website is configured with GIS "domains". These enable a dropdown list for use while editing that contain only the correct attribute values for each field.
- .11 Using "Other" or leaving attributes as NULL shall be avoided where possible and are only to be used as a last resort.
- .12 The submission to the Municipality shall include a .gdb file containing the delivery feature classes; the .gdb file shall be compressed into a .zip file.

3.9 Sheet Templates

- .1 Samples of the following sheet templates are provided on the following pages.
 - .1 Cover Sheet Template
 - .2 Horizontal Title Block Template
- .2 Please note that these templates have been reduced in size to print on 8.5"x11" paper for inclusion into this document and are therefore not to scale.



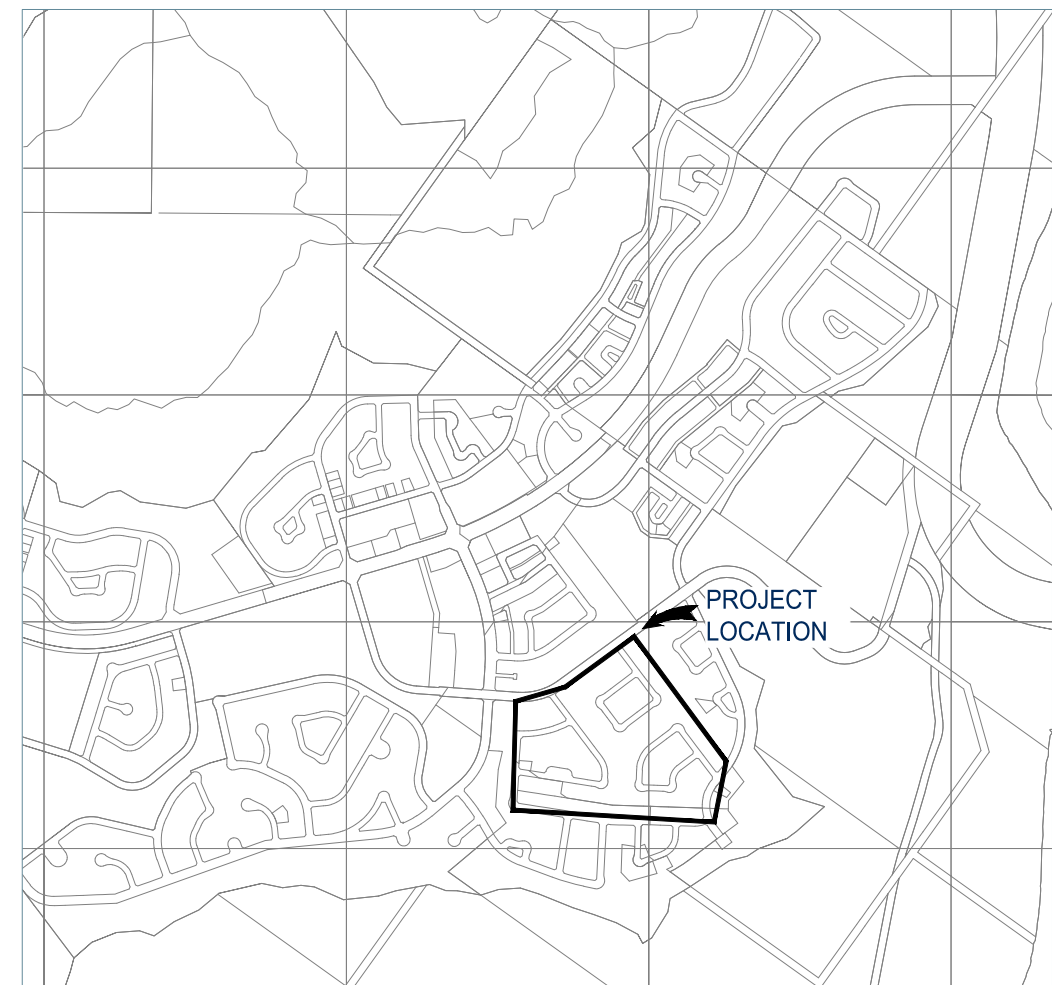
REGIONAL MUNICIPALITY
OF **WOOD BUFFALO**

PROJECT TITLE

PHASE X

DRAWING SET TITLE

CONTRACT NAME:	GENERIC CONTRACT NAME
CONTRACT #:	QU # 9999
CONSULTANT NAME:	GENERIC CONSULTANT
CONSULTANT PROJECT #:	9999-9999-99
DATE:	YYYY-MON-DD



KEY PLAN
SCALE: 1:XXXX

CONSULTANT

SEAL

PERMIT TO PRACTICE

DRAWING HISTORY		
REV.	DESC.	DATE
A	ISSUED FOR ISSUING	YYYY-MM-DD
0	ISSUED FOR ISSUING 2 LINE EXAMPLE	YYYY-MM-DD

PROJECT TITLE

DEVELOPMENT NAME1
DEVELOPMENT NAME2
DEVELOPMENT NAME2
DEVELOPMENT NAME2

CONSULTANT PROJECT NUMBER

XXXX-XXXX

MUNICIPAL PROJECT NUMBER

XXXX-XXXX

PROJECT LOCATION

NEIGHBOURHOOD, LOCATION

DRAWING TITLE

DRAWING TITLE LINE1
DRAWING TITLE LINE2
DRAWING TITLE LINE3
DRAWING TITLE LINE4

DRAWING SCALE:

H1:XXXX V1:XXXX

REV.

DRAWING NUMBER

X

XX-XXX-XX

1.

ALL WORK AND MATERIALS ARE TO MEET THE REGIONAL MUNICIPALITY OF WOOD BUFFALO "ENGINEERING SERVICING STANDARDS AND DEVELOPMENT PROCEDURES" AND THE "STANDARD CONSTRUCTION SPECIFICATIONS" OR AS OTHERWISE APPROVED BY THE MUNICIPALITY.
2.

THE CONTRACTOR IS RESPONSIBLE FOR ALL DETOUR AND CONSTRUCTION SIGNAGE.
3.

LOCATION AND DEPTH OF ALL EXISTING UTILITIES TO BE CONFIRMED BY THE CONTRACTOR IN THE FIELD.
4.

CONTRACTOR TO COORDINATE THE EFFORTS AND SCHEDULING OF ALL UTILITY COMPANIES AND REGIONAL MUNICIPALITY OF WOOD BUFFALO FORCES FOR THEIR PORTION OF THE WORK, AS REQUIRED.
5.

REFER TO THE GEOTECHNICAL REPORT FOR EXISTING CONDITIONS AND CONSTRUCTION REQUIREMENTS.

CONSULTANT

SEAL

PERMIT TO PRACTICE

PROJECT TITLE

PHASE X

NEIGHBOURHOOD, LOCATION

DRAWING TITLE

CONSULTANT PROJECT NUMBER
XXXX-XXXX

MUNICIPAL PROJECT NUMBER
XXXX-XXXX

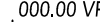
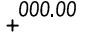
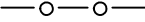
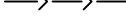
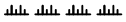
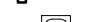
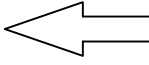
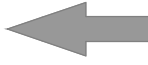
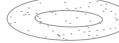
DRAWING HISTORY		
REV.	DESC.	DATE
A	ISSUED FOR ISSUING	YYYY-MM-DD
0	ISSUED FOR ISSUING 2 LINE EXAMPLE	YYYY-MM-DD

1. ALL WORK AND MATERIALS ARE TO MEET THE REGIONAL MUNICIPALITY OF WOOD BUFFALO "ENGINEERING SERVICING STANDARDS AND DEVELOPMENT PROCEDURES" AND THE "STANDARD CONSTRUCTION SPECIFICATIONS" OR AS OTHERWISE APPROVED BY THE MUNICIPALITY.
2. THE CONTRACTOR IS RESPONSIBLE FOR ALL DETOUR AND CONSTRUCTION SIGNAGE.
3. LOCATION AND DEPTH OF ALL EXISTING UTILITIES TO BE CONFIRMED BY THE CONTRACTOR IN THE FIELD.
4. CONTRACTOR TO COORDINATE THE EFFORTS AND SCHEDULING OF ALL UTILITY COMPANIES AND REGIONAL MUNICIPALITY OF WOOD BUFFALO FORCES FOR THEIR PORTION OF THE WORK, AS REQUIRED.
5. REFER TO THE GEOTECHNICAL REPORT FOR EXISTING CONDITIONS AND CONSTRUCTION REQUIREMENTS.

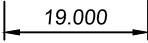
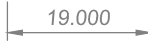
DRAWING SCALE:
H1:XXXX V1:XXXX

REV. X | DRAWING NUMBER
XX-XXX-XX

GENERAL AND MISCELLANEOUS SURFACE WORKS

	EXISTING	PROPOSED	FUTURE
FOUND IRON POST			
ALBERTA SURVEY CONTROL MONUMENT			
SURVEY CONTROL BENCHMARK			
BOREHOLE			
MONITORING WELL			
EDGE OF GRAVEL			
EDGE OF ASPHALT/CONCRETE			
VERTICAL POINT OF INTERSECTION (VPI)			
ELEVATION			
DRAINAGE DIRECTION			
EC/BC MARKS			
CONCRETE BARRIER (JERSEY BARRIER)			
FENCE			
BOLLARDS			
GUARD RAIL			
SILT FENCE			
RETAINING WALL			
CULVERT C/W END TREATMENT			
DITCH/SWALE (CENTERLINE)			
TOE OF SLOPE			
TOP OF SLOPE			
EXISTING GROUND CONTOUR			
INDIVIDUAL TREE			
RAILROAD			
RAILWAY GATE			
TRANSIT STOP			
MAILBOX			
PROPERTY LINE			
UTILITY EASEMENT			
LOT SERVICE C/W CC			
MAJOR DRAINAGE PATTERN			
SETTLEMENT BASIN			
GROUPING OF TREES			
BUILDING			
WETLAND AND SETBACK			
SIGNAGE (1 POST / 2 POST)			

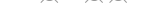
DIMENSION STYLES

EXISTING	PROPOSED	FUTURE
		

DEEP UTILITY WORKS

	EXISTING	PROPOSED	FUTURE
MANHOLE			
CATCH BASIN MANHOLE			
CATCH BASIN (GENERAL)			
CATCH BASIN (ON CURB FACE)			
CONCRETE/STEEL ENCASEMENT			
PLUG			
COUPLING			
HYDRANT			
VALVE (GENERAL)			
AIR RELEASE VALVE			
COMBINATION AIR/VACUUM VALVE			
REDUCER			
PARK WATER SERVICE BOX			
PIPE BENDS			
PIPE TEE/CROSS			
SANITARY SEWER			
STORM SEWER			
WATER MAIN			
WATER WELL			

FRANCHISE UTILITY WORKS

	EXISTING	PROPOSED	FUTURE
STREET LIGHTS (SINGLE / DOUBLE DAVIT)			
UNDERGROUND GAS LINE (ALL TYPES)			
GAS CROSSING SLEEVE			
SHALLOW UTILITY DUCT CROSSING			
POWER POLE			
OVERHEAD POWER LINE			
UNDERGROUND POWER LINE			
POWER TRANSFORMER			
POWER URD BOX			
OVERHEAD TELECOMMUNICATION LINE			
UNDERGROUND TELECOMMUNICATION LINE			
TELECOMMUNICATION PEDESTAL			
TELECOMMUNICATION SERVICE BOX			
GAS WELL			
OIL WELL / WELL HEAD			

HATCH PATTERNS

PLAN VIEW

CROSS SECTION/PROFILE
VIEW/DETAILS

REMOVAL OR DEMOLITION			
GRAVEL/RIPRAP			MAY USE HATCH SCALE TO DENOTE RELATIVE SIZE OF GRAVEL
CONCRETE			
ASPHALT			
ASPHALT RESURFACING			
ASPHALT RECONSTRUCTION			
UNDISTURBED SOIL			
COMPACTED BACKFILL			
PREPARED SUBGRADE			
SAND			
TOPSOIL & SEED			
TOPSOIL & SOD			
TRANSIT STOP TREATMENT			
RIGHT OF WAY REQUIRED			
LAND TRANSFER			

GENERAL NOTES:
1. ALL UNITS IN MILLIMETERS UNLESS OTHERWISE SPECIFIED

TITLE

REVISION DATE YYYY-MM-DD	
REV. X	STANDARD DETAIL #: XXXX-XX

4 ROADWAYS

4.1 General

- .1 This section covers the design of roadways, alleys, curb and gutter, sidewalks, boulevards, and associated appurtenances to be installed or rehabilitated within the Municipality.
 - .1 Pedestrian trails and bike paths are covered in **Section 10**.
 - .2 Standard Details relating to roadway design and construction are provided in **Section 13**.
- .2 These standards provide the minimum design criteria to be used in the preparation of specifications and drawings. Good engineering practices and designs must prevail on all projects and these standards may be exceeded if warranted by the Consulting Engineer.
- .3 Further to these standards, the Municipality's *Public Works Operational Standards* may apply to capital works projects or smaller scopes of work, such as asphalt patchwork and repairs, sidewalk and curb repairs, etc.
 - .1 Contact the Municipality for more information, when required.
- .4 Refer to the Municipality's *Standard Construction Specifications* for requirements for the construction of items in this section.

4.2 Traffic and Transportation Engineering

4.2.1 General

- .1 All traffic and roadway designs shall facilitate the safe and efficient movement of vehicular traffic and persons using non-vehicular modes of transportation, such as pedestrians, cyclists, and those with limited mobility.
- .2 The roadway network shall conform to the applicable Area Structure Plan, the *Transportation Master Plan*, the *Active Transportation Functional Plan*, and the *Transit Master Plan*.
- .3 The roadway design shall provide sufficient capacity for the anticipated traffic loads with consideration given for the following factors:
 - .1 **Roadway Geometrics:** right-of-way, carriageway width, lane width, turning lane storage lengths, geometry, grade and curvature, and intersection configuration.
 - .2 **Traffic Characteristics:** volume, design speed, composition, fluctuations, level of service, and saturation flow.
 - .3 **Roadway "Frictions":** traffic control measures, on-street parking, functional classification, access locations/spacing, driver sight distance, street furniture, school zones, transit zones, and Traffic Calming.

4.2.2 Traffic Impact Assessments

- .1 A Traffic Impact Assessment (TIA) shall be provided by the Consulting Engineer whenever a project is anticipated to have a significant impact on traffic operations or other components of the transportation system, or at the request of the Municipality.
 - .1 Proposed developments which are estimated to result in the following will require a TIA:

- .1 An increase of 100 vehicles/hour (two-way volumes) to and from the site during peak hour, or
- .2 An increase of more than 20% in adjacent street traffic when the two-way traffic volumes generated by the proposed development at the site are added.
- .2 Other site and adjacent roadway conditions which may require a TIA include:
 - .1 A change in traffic volumes, type of access operation, or access relocation if, in the opinion of the Municipality, the proposed change may adversely affect the operation of the access or roadway.
 - .2 The relocation of an access for a development that generates more than 100 vehicle trips in the peak hour or more than 20% of the existing volume of traffic on the adjacent roadway.
 - .3 The peak hour volumes (either total volume or any turning movement volume) at any one access or intersection in the study area change such that any one of the following occur:
 - .1 The actual or proposed traffic volumes on any access or any individual turning movement in the design hour increases by the higher of 20% or 100 vehicles/hour.
 - .2 The actual or proposed use of the access will shift the peak hour for that which the access was designed, requiring the evaluation of a new peak hour.
 - .3 The daily volume of vehicles exceeding 13,500 kg gross vehicle weight using the access increases by 10 vehicles per day or more.
 - .4 The free flow of vehicles entering the property is restricted or entering vehicles must queue on the roadway, which may cause conflicts between turning and through vehicles on the roadway.
 - .5 Significant collision history.
 - .6 Compatibility with existing, proposed, or anticipated corridor or access management plans.
- .2 The TIA methodology shall meet the Municipality's *Traffic Impact Assessment Guidelines*, available on the Municipality's website, and the requirements outlined in **Section 2.10.5.4**.
 - .1 The *Traffic Impact Assessment Guidelines* provide more clarity on when a TIA is required; the Owner shall confirm the requirement for a TIA with the Municipality prior to undertaking detailed design.
- .3 Exemption from a TIA requires written approval from the Municipality. All exemptions are to be evaluated upon receipt of written request demonstrating justifications.
- .4 The TIA shall clearly identify any required transportation improvements and the projected timelines/operational thresholds at which these improvements must be implemented.
 - .1 Examples of transportation improvements may include additional lanes, left or right turning bays, signalizations, Traffic Calming measures, etc.
- .5 A roundabout feasibility analysis shall be provided when traffic signal installation or upgrade of an existing signalized intersection experiencing undesirable levels of service are identified in the TIA.

4.2.3 Development Projects

- .1 Developments shall be designed in accordance with the requirements of NFPA 1141 *Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas*.

4.2.4 Design Vehicles

- .1 The design vehicles outlined in **Table 4-1** shall be considered, based on TAC's *Geometric Design Guide for Canadian Roads*.

Table 4-1 Design Vehicles

Design Vehicle ¹	Abbreviation	Representative of Vehicles Operating in the Municipality?
Passenger Car	P	✓
Light Single-Unit Truck	LSU	
Medium Single-Unit Truck	MSU	
Heavy Single-Unit Truck ²	HSU	✓
WB-19 Tractor Semitrailers ³	WB-19	
WB-20 Tractor Semitrailers ³	WB-20	
A-Train Double	ATD	
B-Train Double	BTD	
Standard Single-Unit Bus	B-12	✓
Articulated Bus	A-BUS	
Intercity Bus	I-BUS	

Notes:

¹ The WB-21 tractor semitrailer (WB-21) is also common on Alberta roadways and is recommended to be used to design intersections and other areas where semitrailers are anticipated to turn.

² The minimum travel way designs for the HSU design vehicle will accommodate the smaller single-unit trucks, transit buses, fire trucks, garbage trucks, and other vehicles with similar wheelbases.

The use of smaller or larger wb design vehicles may be acceptable in special circumstances, at the discretion of the municipality.

4.2.5 Intersection Spacing

- .1 Intersection spacing shall be in accordance with TAC's *Geometric Design Guide for Canadian Roads* and the requirements of the authority having jurisdiction.

4.2.6 Auxiliary Lanes

- .1 An auxiliary lane is required when access from an arterial to a proposed development is required.
- .2 Auxiliary lanes shall be designed in accordance with TAC's *Geometric Design Guide for Canadian Roads* and shall have a minimum lane width of 3.7 m and a maximum lane width of 4.0 m.
- .3 A double left turn bay may be permitted, at the discretion of the Municipality.
- .1 The intersection shall be signalized.
- .4 Triple left turn bays are not permitted.

- .1 Traffic volumes that would require a triple left turn bay shall trigger the need for a grade-separated interchange.

4.2.7 Traffic Calming

- .1 The use of Traffic Calming measures shall be considered for new residential developments.
- .2 The design of Traffic Calming measures shall be in accordance with TAC's *Canadian Guide to Traffic Calming*.
- .3 The Traffic Calming measures to be implemented will be approved by the Municipality, on a case-by-case basis, based on the drawing details and other supporting documentation submitted by the Consulting Engineer.

4.2.8 Roundabouts

- .1 Roundabouts shall be designed in accordance with TAC's *Canadian Roundabout Design Guide*.
 - .1 The National Cooperative Highway Research Program (NCHRP) *Research Report 1043: Guide for Roundabouts* may be used as a supplement to the TAC design guide.
- .2 The design life of a roundabout shall be 50 years.
- .3 Roundabout designs shall describe the functional aspects of the roundabout, including:
 - .1 Roundabout type,
 - .2 User consideration,
 - .3 Traffic analysis,
 - .4 Roundabout design software (e.g., Rodel, SIDRA, or similar design software approved by the Municipality),
 - .5 Safety requirements,
 - .6 Geometric design,
 - .7 Sight distances and visibility,
 - .8 Fastest path analysis,
 - .9 Design vehicle swept path analysis,
 - .10 Grading and drainage,
 - .11 Pavement markings,
 - .12 Signage,
 - .13 Landscaping, and
 - .14 Illumination.

4.2.9 Roadside Safety

- .1 Roadsides shall be free of fixed objects wherever possible and shall have stable, flattened slopes wherever possible, to minimize the risk to roadway users should a vehicle leave the pavement.
- .2 Design options for reducing roadside obstacles, in order of preference, are as follows:
 - .1 Remove the obstacle.

- .2 Relocate the obstacle to a point outside the Clear Zone.
- .3 Redesign the obstacle so it can safely be traversed.
- .4 Reduce impact severity by using an appropriate breakaway device.
- .5 Shield the object with a longitudinal traffic barrier designed for redirection or use a crash cushion.
- .6 Delineate the obstacle if the above alternatives are not appropriate.
- .3 A traversable and unobstructed roadside area (Clear Zone) extending beyond the edge of the traveled way, particularly on high-volume, high-speed roadways shall be provided to minimize the risk of collisions with fixed objects.
- .4 Roadside Safety features shall be designed in accordance with TAC's *Geometric Design Guide for Canadian Roads*, Alberta Transportation's *Roadside Design Guide*, and Alberta Transportation's *Highway Geometric Design Guide*, where applicable.

4.3 Roadway Classifications and Geometric Design Standards

4.3.1 General

- .1 The classification of new roadways (i.e., arterial, collector, local) shall be undertaken during preparation of the Area Structure Plan or Outline Plan, to define roadway, walkway, utility, and right-of-way requirements prior to undertaking preliminary and detailed design.
- .2 The design of roadways shall be in accordance with TAC's *Geometric Design Guide for Canadian Roads*.
 - .1 Alberta Transportation's *Highway Geometric Design Guide* may be used as a supplement to the TAC design guide.
 - .2 *Alberta Accessibility Design Guide*
- .3 Typical cross sections are provided in **Section 13**. See **Section 4.18** for **Table 4.13A** and **Table 4.13B**, which provide a summary of the design guidelines for urban and rural roads, respectively.
- .4 Alternatives to the road cross sections in **Section 13** may be acceptable, at the discretion of the Municipality, provided that the Consulting Engineer can demonstrate that all functional, safety, operational, and statutory requirements can be met for all stakeholders, including the public, Shallow Utilities, Public Infrastructure, residents and occupants, and the Municipality (maintenance and transit service).
- .5 Development and capital works projects in the downtown area of Fort McMurray shall incorporate elements outlined in the Municipality's *Downtown Area Redevelopment Plan* into the design of roadway cross sections, where appropriate.
- .6 For roadway rehabilitation in an existing neighbourhood, it may not be possible to meet the standard road cross sections due to right-of-way or other restrictions. In these situations, the Consulting Engineer shall provide detailed cross section(s) for review and approval by the Municipality.
- .7 Intersections, including alley approaches onto local and collector roadways, shall be designed to accommodate the movement of municipal operation and emergency vehicles.
 - .1 The Consulting Engineer shall contact the Municipality to confirm specific requirements and design vehicles for the application.
- .8 Consider network connectivity in new developments in accordance with the Municipality's *Transportation Master Plan*.

- .9 Road classifications and geometric guidelines are summarized in **Table 4-2A** and **Table 4-2B** for urban and rural roads, respectively. Refer to TAC's *Geometric Design Guide for Canadian Roads* to ensure roadway designs are in accordance with TAC requirements.

Table 4-2A - Road Classifications and Geometric Guidelines - Urban

Classification	Arterial		Collector			Local		
Sub-classification	Divided	Undivided	Residential		Industrial/ Commercial ⁽¹⁾	Residential	Commercial	Industrial ⁽¹⁾
			Major	Minor				
TAC Designation	UAD	UAU	UCU	UCU	UCU	ULU	ULU	ULU
Service	Through Traffic		Through Traffic & Access			Access Only		
Average Daily Volume	12000-30000	5000-12000	2500-5000	1000-2500	1000-5000	Up to 1000	Up to 1000	Up to 1000
No. of Housing Units	-	-	Over 250	100 - 250		< 100	< 100	< 100
Flow Characteristic	Uninterrupted except traffic/pedestrian signals.		Interrupted Flow			Calmed Traffic Flow		
Max. Design Speed (km/h)	80	70	60	60	60	50	50	50
Posted Speed (km/h)	50, 60 or 70	50 - 60	40 - 50	30 - 50	50	30 - 50	30 - 50	30 - 50
Carriageway (m) ⁽³⁾⁽⁴⁾	23.0	15.8	12.7	13.4	14.0	10.0	12.0	12.0
Travel Lanes (m)	4 to 6@3.7	4 to 6@3.7	2 @ 3.7	2 @ 3.7	2 @ 3.7	N/A	2 @ 3.7	2 @ 3.7
Parking Lanes (parallel)	N/A	N/A	2 @ 2.40	2 @ 2.40	2 @ 3.30	Permitted	2 @ 2.30	2 @ 2.30
Transit Service	Restricted	Restricted	Permitted	Permitted	Permitted	Prohibited	Restricted	Restricted
Curb & Gutter (mm)	700 SF or 800 Semi-mountable	700 SF or 800 Semi-mountable	450 SF	600 RF or 450 SF (lane)	450 SF with Driveway cut	600 RF or 450 SF (lane)	450 SF with Driveway cut	
Gutter Width (mm)	500		250	250	250	250	250	250
Cul-de-Sac Radius (m)	Restricted			14.5 to FOC			12.5 to FOC	
Sidewalk Type	Multi-Use Trail (MUT) or Sep. Sidewalk on both sides.		Sep. S/W or MUT	Sep. or Mono Sidewalk	Sep. S/W or MUT	Sep. or Mono Sidewalk Both Sides; Monowalk one side of short cul-de-sacs.		

Table 4-2A - Road Classifications and Geometric Guidelines - Urban

Min. Sidewalk Width (m)	3.0 Conc. or 3.0 ACP		1.8 Conc. or 3.0 ACP	1.8 Conc.	1.8 Conc. or 3.0 ACP	1.8 Mono or Separate	1.8 Mono or Separate	
Min. ROW Width (m)	37.0	30.0	25.0	22.0	26.0	18.0	22.0	22.0
Max./Min. Gradient (%)	6.0/0.5	5.0/0.5	6.0/0.5	6.0/0.5	6.0/0.5	8.0/0.5	6.0/0.5	6.0/0.5
Min. K. Crest (m)	36	23	13	13	13	7	7	7
Min. K. Sag (m) ⁶	30	23	18	18	18	13	13	13
Max. super-elevation (m/m)	0.06	0.06	0.06	0.06	0.06	crowned	crowned	crowned
Min. Crown Crossfall (m/m)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Notes: see notes, next page

Table 4-2B - Road Classifications and Geometric Guidelines - Rural

Classification	Rural Arterial / Municipal Highway	Collector		Local	
Sub-classification	Divided	Residential	Industrial / Commercial ⁽¹⁾	Residential	Industrial ⁽¹⁾
TAC Designation	RAD	RCU	RCU	RLU	RLU
Service	Through Traffic	Through & Access		Access Only	
Average Daily Volume	12000-30000	1000-5000	up to 1000		
No. of Housing Units	-	-	-	< 100	-
Flow Characteristic	Uninterrupted except traffic and pedestrian signals.	Interrupted Flow		Interrupted Flow	
Max. Design Speed (km/h)	90	80	80	60	60
Posted Speed (km/h)	70-80	70	70	50	50
Carriageway (m)	26.0	9.0	10.0	8.0	9.0
Travel Lanes (m)	4 to 6 @3.7	3.7 min. ⁴	3.7 min. ⁴	N/A	3.7 min. ⁴
Parking Lanes (parallel)	N/A	N/A	N/A	N/A	N/A
Transit Service	Restricted, unless part of BRT	Permitted	Permitted	Restricted	Restricted
Curb & Gutter (mm) (Median)	700 SF	N/A	N/A	N/A	N/A
Gutter Width (mm) (Median)	500	N/A	N/A	N/A	N/A
Cul-de-Sac Radius (m)	Restricted	14.0 to EOP		14.0 to EOP	
Sidewalk Type	Regional Trail on back slope, where specified outside clear zone	Sidewalk on Back-slope, one side only. Hybrid with mono sidewalk and 450 mm SF curb and gutter may be used where specified, c/w catch basins to drain to ditch. Outside clear zone on all roads with design speed over 50 km/h			
Min. Sidewalk Width (m)	3.0 Conc. or 3.0 ACP	2.5 ACP	2.5 ACP	1.8	1.8
Min. ROW Width (m)	44.0	30.0	30.0	30.0	30.0
Max./Min. Gradient (%)	6.0/NA	6.0/NA	6.0/NA	8.0/NA	6.0/NA
Min. K. Crest (m)	55	36	36	13	13
Min. K. Sag (m) ⁶	40	30	30	18	18
Max. super-elevation(m/m)	0.08	0.08	0.08	0.02	0.02

Table 4-2B - Road Classifications and Geometric Guidelines - Rural

Min. Clear Zone Width (m)	AADT > 5000, 8.5 - 10.0 m at 4H to 5H:1V	AADT 1500 to 5000, 7.5 -9.0 m at 4H to 5H:1V	AADT 1500 to 5000, 7.5 -9.0 m at 4H to 5H:1V	AADT< 750, 2.0 to 3.0 m at 4H to 5H:1V	AADT< 750, 2.0 to 3.0 m at 4H to 5H:1V
Min. Crown Crossfall (m/m)	0.02	0.02	0.02	0.02	0.02
Notes:	1. Industrial applies to light industrial. For heavy industrial application, provide suitable design. 2. For emergency access roads use the Rural Residential Local. For Commercial Service Roads use Rural Residential Collector. 3. All the minimum widths noted above may vary with existing infrastructure. For urban rehabilitation projects minimums noted may be waived at the discretion of the Municipality. 4. Carriageway width includes roadway and gutter widths. 5. At locations where lanes line pavement markings are on the road. 6. Sag. Vertical curves shall provide sufficient sight distance for headlight control.				

4.3.2 Vertical Alignment

4.3.2.1 General

- .1 Vertical alignment consists of:
 - .1 Straight line grades (tangents or gradients); refer to [Section 4.3.2.2](#).
 - .2 Vertical curves to transition between varying grades; refer to [Section 4.3.2.3](#).

4.3.2.2 Roadway Grades

- .1 **Urban Roadways:**
 - .1 The minimum longitudinal grade for an urban roadway shall be 0.5%.
 - .1 A longitudinal grade of less than 0.5% may be acceptable for rehabilitation projects, depending on existing conditions.
 - .2 The centreline grade of curved roadways and cul-de-sac bulbs shall be increased to ensure a minimum grade of 0.5% is maintained along the gutter pan.
 - .2 Maximum roadway grades, based on roadway classification, are indicated in [Table 4-3](#).

Table 4-3 Maximum Grades for Urban Roadways

Roadway Classification	Maximum Longitudinal Grade
Arterial	
Divided	6.0%
Undivided	5.0%
Collector	
Residential	6.0%
Industrial/Commercial	6.0%
Local	
Residential	8.0%
Industrial/Commercial	6.0%

- .2 **Rural Roadways:**
 - .1 There shall be no minimum longitudinal grade for rural roadways, provided:
 - .1 The roadway shall be crowned with a crossfall of at least 2.0% toward the roadside ditches, and
 - .2 The roadside ditches comply with the minimum grade outlined in [Section 6.8.4](#).
 - .2 The maximum longitudinal grade of rural roadways shall be per [Table 4-4](#).

Table 4-4 Maximum Grades for Rural Roadways

Roadway Classification	Maximum Longitudinal Grade
Arterial	6.0%
Collector	8.0%
Local	8.0%

4.3.2.3 Curves

- .1 Vertical curves shall be designed in accordance with TAC's *Geometric Design Guide for Canadian Roads*.
- .2 Vertical curves are required for roadway profiles with an algebraic grade difference greater than that indicated in the TAC guidelines.
- .3 Successive short tangent lengths of varying grades to eliminate vertical curves are not permitted.
- .4 Refer to the TAC guidelines for the recommended longitudinal roadway grades for non-vehicular modes of transportation (e.g., cycling and walking).

4.3.3 Urban Roadways

4.3.3.1 Arterial

- .1 Arterial roadways generally serve as primary transportation corridors between regional hubs and activity centers.
- .2 The design of arterial roadways shall consider the movement of people, vehicles, and goods.
- .3 Arterial roadways shall connect to other arterial roadways, highways, and collector roadways, but shall not connect to local roadways.
- .4 There are two types of arterial roadways:
 - .1 **Undivided** - carrying up to 12,000 vehicles per day.
 - .2 **Divided** - carrying more than 12,000 vehicles per day.
 - .1 A divided arterial may be required where roadway geometry, grades, curvature, or other safety concerns warrant the inclusion of a median for separation, at the direction of the Municipality.
- .5 Refer to **Section 13** for urban arterial roadway cross sections.
- .6 On-street parking is not permitted on arterial roadways.
- .7 Refer to **Section 10** for boulevard and median treatment.

4.3.3.2 Collector

- .1 Collector roadways generally serve as an interface between the arterial roadway system and local roadways, collecting and distributing traffic through the transportation network.
- .2 The design of collector roadways shall consider transit service and access to commercial and industrial developments and other neighbourhood-level origin/destination hubs.

- .3 Collector roadways shall connect with local roadways, arterial roadways, and/or other collector roadways.
- .4 The alignment, layout, and configuration of collector roadways shall minimize their potential use as a short-cut between arterial roadways.
- .5 Refer to **Section 13** for urban collector roadway cross sections.
- .6 Parallel parking may be allowed on collector roadways.
- .7 Single family residential driveways are not permitted on collector roadways.
- .8 Refer to **Section 10** for boulevard and median treatment.

4.3.3.3 Local

- .1 Local roadways serve to provide access to individual properties and shall be designed to accommodate a low volume of traffic.
- .2 Traffic Calming measures shall be implemented on local roadways to reduce volumes and speeds.
- .3 The intersection spacing along local roadways shall be in accordance with TAC's *Geometric Design Guide for Canadian Roads*; however, shall not exceed 600 m.
- .4 Local roadways shall connect with other local roadways, collector roadways, and alleys.
- .5 Local roadways shall not serve as municipal transit or industry bus routes; however, school buses may be permitted.
- .6 Refer to **Section 13** for urban local roadway cross sections.
- .7 Parallel parking on local roadways will be permitted, both as a Traffic Calming measure and to supplement the on-site parking options for local users.
 - .1 All sites along local roadways shall meet the on-site parking requirements as described in Municipality's Land Use Bylaw.

4.3.4 Rural Roadways

4.3.4.1 Arterial

- .1 Refer to **Section 4.3.3.1** for general requirements for arterial roadways.
- .2 Refer to **Section 13** for rural arterial roadway cross sections.

4.3.4.2 Collector

- .1 Refer to **Section 4.3.3.2** for general requirements for collector roadways.
- .2 Refer to **Section 13** for rural collector roadway cross sections.

4.3.4.3 Local

- .1 Refer to **Section 4.3.3.3** for general requirements for local roadways.
- .2 Refer to **Section 13** for rural local roadway cross sections.

4.3.4.4 Service Roads

- .1 Service roads may be acceptable for highway commercial access, at the discretion of the Municipality.
- .2 Service roads shall conform to the rural collector roadway cross section, with the additional requirement of providing on-street parking on at least one side.
- .3 The design of the service road and access intersections shall be in accordance with Alberta Transportation's *Highway Geometric Design Guide*.
 - .1 The Owner is responsible for coordination with Alberta Transportation and for obtaining all required approvals prior to commencing construction.

4.3.5 Curb Returns

- .1 A swept path analysis of the design vehicle shall be conducted to confirm the required curb radii; however, at a minimum, the curb return radii, measured at the face of curb, shall be:
 - .1 6 m for residential collector and local roadways,
 - .2 9 m for commercial and industrial collector and local roadways, and
 - .3 15 m for arterial roadways.
- .2 Where roadways with different minimum curb return radii requirements intersect, the larger radius shall take precedence.

4.4 On-Street Parking

- .1 All parking and parking stall dimensions shall meet the requirements of the Municipality's Land Use Bylaw.
- .2 Parking stalls should be graded such that no continuous slope in any direction is less than 0.5% nor more than 4.0%.
- .3 To accommodate parallel parking on urban local roadways, driveways shall be spaced in accordance with TAC's *Geometric Design Guide for Canadian Roads*.
- .4 No Parking signs shall be installed at the throat of cul-de-sacs to restrict on-street parking on the cul-de-sac bulb.
- .5 The installation of new angled on-street parking is prohibited.
 - .1 The restoration of existing angled on-street parking in rural areas may be acceptable, at the discretion of the Municipality.

4.5 Transit and Bus Stops

4.5.1 Transit

- .1 New developments may be required to incorporate transit service, at the discretion of the Municipality.
- .2 The transit system shall incorporate service and bus stop locations with appropriate land uses.
- .3 The Developer shall coordinate with the Municipality to develop an acceptable transit extension that provides a level of service appropriate for the benefitting population.
 - .1 The transit system shall conform to the Municipality's *Transit Master Plan*.

- .2 A Deviation to the Level of Service (LOS) for vehicular traffic may be acceptable, provided that the Developer can demonstrate that the implementation of the transit system will provide a net positive benefit for the movement of people, at the discretion of the Municipality.
- .3 All right-of-way and infrastructure requirements shall be the responsibility of the Developer.

4.5.2 Planning

- .1 Refer to the Municipality's *Transit Master Plan* for bus route and transit planning and proposed locations of supporting infrastructure including stop locations, bus pull-outs, and/or dedicated bus lane requirements.
- .2 Walkways shall be provided such that walking distances from residences to existing and/or future transit routes are minimized.

4.5.3 Bus Stops

4.5.3.1 General

- .1 Refer to **Section 13** for bus stop details, including required furniture.
- .2 Refer to the Municipality's *Transit Master Plan* for additional information.
- .3 New bus stops and the rehabilitation of existing bus stops shall be designed to be accessible to all users.
 - .1 Bus stops shall include a hard, unobstructed, accessible surface at both the front and rear doors of the vehicle.
- .4 Transit bus stops on arterial roadways require a bus bay pullout.
- .5 The use of bus bay pullouts on collector roadways is discouraged, the exceptions being:
 - .1 In circumstances where lengthy bus idle times would significantly interfere with overall traffic movement, and
 - .2 On high speed (> 60 km/h) roadways.
- .6 Transit bus stops shall be designed to accommodate industrial plant site buses, where applicable.

4.5.3.2 Location

- .1 Bus stops shall be situated strategically to service origin/destination hubs, with consideration for connectivity between transportation modes and connection to sidewalks and active transportation networks. Refer to the Municipality's *Transit Master Plan* for additional information.

4.5.4 School Buses

- .1 Bus bay pullouts are required along collector and local roadways adjacent to schools.
 - .1 The design and location of bus bay pullouts shall be in accordance with TAC's *Geometric Design Guide for Canadian Roads* and based on a bus swept path analysis.

4.6 Pavement Structures

- .1 A geotechnical investigation and independent pavement design is required for all development and capital works projects.
- .2 Pavement designs shall be based on a 20-year design life for in-situ conditions and projected traffic volume.
- .3 The pavement structure for roadways and alleys shall be as recommended in the geotechnical report or as per **Table 4-5**, whichever is more stringent.
 - .1 Additional pavement structure may be required in areas with poor subgrade materials, pending the results of the geotechnical investigation, for areas with trucked water and sanitary service, and/or for heavy industrial applications.
 - .2 Gravel surfaces may be acceptable in rural residential and/or industrial subdivisions, at the discretion of the Municipality. The gravel road structure shall be designed by a geotechnical Consulting Engineer.
- .4 The pavement structure shall meet the higher load criteria where the road use is mixed (e.g., commercial and residential).

Table 4-5 Minimum Pavement Structure Requirements for Roadways and Alleys

Roadway Classification Layer	Urban		Industrial/ Commercial	Rural	
	Residential			Residential	Industrial/ Commercial
Arterial	Divided	Undivided			
Hot-Mix ACP ¹	120 mm	120 mm	120 mm	120 mm	120 mm
GBC ²	300 mm	300 mm	300 mm	300 mm	300 mm
GSBC ³	400 mm	400 mm	400 mm	400 mm	400 mm
Subgrade Prep. ⁴	300 mm	300 mm	300 mm	300 mm	300 mm
Collector	Major	Minor			
Hot-Mix ACP ¹	100 mm	100 mm	120 mm	100 mm	120 mm
GBC ²	500 mm	400 mm	300 mm	400 mm	300 mm
GSBC ³	N/A	N/A	300 mm	N/A	300 mm
Subgrade Prep. ⁴	300 mm	300 mm	300 mm	300 mm	300 mm
Local					
Hot-Mix ACP ¹	100 mm		100 mm	100 mm	100 mm
GBC ²	250 mm		250 mm	250 mm	250 mm
GSBC ³	N/A		300 mm	N/A	300 mm
Subgrade Prep. ⁴	300 mm		300 mm	300 mm	300 mm
Alley					
Hot-Mix ACP ¹	75 mm		90 mm	N/A	N/A
GBC ²	250 mm		300 mm	N/A	N/A
GSBC ³	N/A		N/A	N/A	N/A
Subgrade Prep. ⁴	250 mm		300 mm	N/A	N/A

Notes:

¹ ACP = asphaltic concrete pavement.

² GBC = granular base course.

³ GSBC = granular subbase course.

⁴ Subgrade Preparation - geogrid or cement stabilization may be required, depending on the recommendations in the geotechnical report.

- .5 The structure for trails shall be as recommended in the geotechnical report or as per **Table 4-6**, whichever is more stringent.

Table 4-6 Minimum Pavement Structure Requirements for Trails

Layer	Asphalt	Concrete	Paving Stones	Gravel
Surface	75 mm Hot-Mix ACP ¹	120 mm Concrete	Paving Stones	N/A
Levelling Sand	N/A	N/A	25 mm	N/A
GBC ²	150 mm	150 mm	150 mm	150 mm
Subgrade Prep. ³	150 mm	150 mm	150 mm	150 mm

Notes:

¹ ACP = asphaltic concrete pavement.

² GBC = granular base course.

³ Subgrade Preparation - geogrid or cement stabilization may be required, depending on the recommendations in the geotechnical report.

4.7 Roadway Construction

- .1 Roadway construction shall be in accordance with the approved engineering and landscape design drawings and the Municipality's *Standard Construction Specifications*.

4.8 Materials

4.8.1 General

- .1 Manufactured good shall meet the manufacturer's specifications.
- .2 Materials to be used in roadway construction shall be in accordance with the approved contract specifications and the Municipality's *Standard Construction Specifications*.

4.8.2 Subgrade Preparation

- .1 The subgrade under a roadway pavement structure shall be constructed as per the Municipality's *Standard Construction Specifications*.
- .2 Subgrade preparation shall typically include scarification to a depth of 300 mm, unless required otherwise by the recommendations in the geotechnical report or per **Table 4-5**.
- .1 Depending on the insitu conditions, the prepared subgrade may need to be stabilized with reinforcement (i.e. cement, geogrid, etc.). In areas requiring cement stabilization, the application of cement shall be as per the recommendations in the geotechnical report.
- .3 Subgrade preparation shall extend to a minimum of 300 mm beyond the back of curb, or the back of monolithic sidewalk, as appropriate.

4.8.3 Granular Subbase

- .1 Granular subbase material shall be supplied and installed in accordance with the Municipality's *Standard Construction Specifications*.

4.8.4 Granular Base

- .1 Granular base course material shall be supplied and installed in accordance with the Municipality's *Standard Construction Specifications*.

4.8.5 Asphalt

- .1 Asphalt shall be supplied and installed in accordance with the Municipality's *Standard Construction Specifications*.
- .2 Asphalt shall achieve the minimum Marshall density identified in **Table 4-7**, based on the application.

Table 4-7 Minimum Pavement Densities

Minimum Density	Application
98%	Arterials, and collectors, and locals (industrial and commercial)
97%	Local residential roadways
97%	Alleys
97%	Overlay mats (min. 40 mm thick) and asphalt walkways/trails

.3 For development projects:

- .1 The final lift of asphaltic concrete pavement shall be deferred for a period of 20 months following issuance of the Construction Completion Certificate.
- .2 The interim pavement structure shall be adequate to handle the traffic loading (e.g., construction activity, municipal operations, buses, etc.) during the interim (20 month) period.

.4 For capital works projects:

- .1 The final lift of asphalt shall be placed following inspection and acceptance of the base course.

.5 Staged paving:

- .1 Where a vertical edge remains between existing and interim asphalt surfaces as a result of staged paving, a taper shall be installed over a minimum length of 1 m.
- .2 Where a vertical edge remains between the lip of gutter and the interim asphalt surface as a result of staged paving, a wedge shall be installed over a minimum width of 1 m.
- .3 The taper and wedge shall be removed via cold milling prior to placing the final lift of asphalt.

4.8.6 Concrete

- .1 Concrete shall be supplied and installed in accordance with the Municipality's *Standard Construction Specifications*.

4.8.7 Recycled/Reclaimed Materials

- .1 The Municipality acknowledges that there are environmental, economical, and resource management reasons for considering the use of recycled and reclaimed materials. Recycled/reclaimed materials shall be supplied and installed in accordance with the Municipality's *Standard Construction Specifications*.
- .2 Given the variability in the raw materials, it is critical that there is consistency of the material properties, including strength, gradation, and purity, in order to use recycled/reclaimed materials in Municipal Improvements.
 - .1 Contamination from impurities (e.g., reinforcing steel and other metals, soil and clay, chlorides, glass, gypsum board (drywall), sealants, plastics, paper, plaster, wood, roofing materials, etc.) will impact quality.
 - .2 Quality control measures shall be adapted to the specific material being used and for the particular application.
 - .3 The specific quality control tests and acceptability criteria for a particular project shall be recommended by the Consulting Engineer and accepted by the Municipality prior to commencing construction.
 - .4 The supplier of recycled/reclaimed materials shall certify the material before the Municipality will accept it. The certification documentation shall be provided to the Municipality prior to ordering materials.
- .3 **Reclaimed Asphalt Pavement (RAP):**
 - .1 May be used in the base lift of hot-mix asphaltic concrete paving, up to a maximum of 25% by mass.
 - .2 Is not permitted to be used in the final lift of hot-mix asphaltic paving.
 - .3 May be used in cold-mix for asphalt patching and pothole repairs.
- .4 **Crushed recycled concrete aggregates (RCA):**
 - .1 RCA meeting the gradation and requirements described in the Municipality's *Standard Construction Specifications* may be used for trench backfill and/or road subbase material.
 - .2 RCA is not permitted to be used for pipe bedding, road base, or levelling course material.
- .5 Additional applications of recycled/reclaimed materials may be acceptable, if a geotechnical report which describes the specific application and the specific quality control measures to be applied is provided for the Municipality's review and approval as part of the detailed design submission.

4.9 Traffic Control

4.9.1 General

- .1 Traffic control devices, street signs, and pavement markings shall be installed in accordance with TAC's *Manual of Uniform Traffic Control Devices for Canada*.
- .2 Refer to **Section 13** for Standard Details.

4.9.2 Signage

4.9.2.1 General

- .1 **Section 4.9.2** covers the requirements for street name signage; for the requirements for traffic control signage, refer to TAC's *Manual of Uniform Traffic Control Devices for Canada*.
- .2 High-Intensity grade reflective, flat, aluminum sheeting with a minimum thickness of 0.2 cm shall be used.
- .3 The length of street name signs shall be based on the length of the message to be incorporated onto the sign.
- .4 Supplementary descriptions, such as Street, Road, and Avenue shall be abbreviated in accordance with the Canada Post *Addressing Guidelines*, available on Canada Post's website.
- .5 The location of street name signs shall prioritize the near right hand corner of the intersection for the street with the higher traffic volume.
- .6 Lettering shall be Clearview Font, as per TAC's *Manual of Uniform Traffic Control Devices for Canada*; size of lettering shall be based on the design speed of the roadway.

4.9.2.2 Advanced Street Name Signs

- .1 **Colours:**
 - .1 White lettering on a green background.
- .2 **Borders:**
 - .1 Single line signs shall have a 1 cm wide white border.
 - .2 Two-line signs shall have a 1.5 cm wide white boarder.
- .3 Signs with a surface area exceeding 10,000 cm² shall be provided with a 1.9 cm thick pressure treated wood substrate, painted green on all sides.
- .4 Signs exceeding 100 cm in width require a pressure treated wood or metal cross brace to provide rigidity.
 - .1 Wood cross braces shall be the same size and shape as the sign and shall be painted green on all sides.
- .5 Where two street names are to be displayed on the same sign:
 - .1 The street to the left shall be listed on top with a left arrow preceding name; and
 - .2 The street to the right shall be listed below with a right arrow following the name.
- .6 **Dimensions:**
 - .1 Single line signs shall be 30 cm high.
 - .2 Two-line signs shall be 60 cm high.
 - .3 Signs shall be a maximum of two lines. A second sign is required when more than two lines are required.
- .7 **Lettering:**
 - .1 Lettering shall be as per **Section 4.9.2.3**.

4.9.2.3 Arterial Street Name Signs

.1 **Colours:**

- .1 White lettering on a blue background.

.2 **Dimensions:**

- .1 Dimensions shall be as per **Section 4.9.2.2**.

.3 **Lettering:**

- .1 Lettering shall be ClearviewHwy 4-W mixed-case letters and/or numerals.
- .2 Supplementary descriptions, such as Street, Road, and Avenue shall be bottom justified.
- .3 Where "c" or "ac" are used in such names as McLeod or MacLean, the "c" or "ac" will be ClearviewHwy 1-W upper case and shall be bottom justified.

4.9.2.4 Collector and Local Street Name Signs

.1 **Colours:**

- .1 White lettering on a blue background.

.2 **Dimensions:**

- .1 Height: 15 cm.
- .2 The maximum length shall be 100 cm. A second sign is required when the length of a sign would exceed 100 cm.

- .3 Street name blades shall be extruded aluminium with an "I" cross section.

.4 **Lettering:**

- .1 Lettering shall be ClearviewHwy 1-W upper case letters and/or numerals.
- .2 Supplementary descriptions, such as Street, Road, and Avenue shall be ClearviewHwy 1-W upper case letters and shall be vertically center justified.
- .3 Where "c" or "ac" are used in such names as McLeod or MacLean, the "c" or "ac" shall be ClearviewHwy 1-W lower case.

4.9.2.5 Mounting Posts and Fasteners

- .1 Mounting heights and setbacks shall be in accordance with the TAC's *Manual of Uniform Traffic Control Devices for Canada* or these standards, whichever is more stringent.
- .2 Signs shall be attached to wooden posts or steel breakaway posts as per **Table 4-8**.

Table 4-8 Posts for Street Name Signs

Type of Sign	Post Requirements ¹
Street Name Blades	4.5 cm x 4.5 cm pre-punched galvanized metal telescoping tube
Advanced Street Names	
Surface Area $\leq 3,600 \text{ cm}^2$	4.5 cm x 4.5 cm pre-punched galvanized metal telescoping tube , or 9 cm x 9 cm pressure treated wood (c/w lag bolts)
Surface Area of $> 3,600 \text{ cm}^2$ and $\leq 5,625 \text{ cm}^2$	9 cm x 14 cm pressure treated wood (c/w lag bolts)
Surface Area $> 5,625 \text{ cm}^2$	As per Alberta Transportation requirements

Notes:

¹ The mounting of signs on wooden power/utility poles is not permitted.

- .3 Street name signs (with the exception of two-line arterial street name signs) may also be mounted on streetlight poles or traffic signal poles or arms.
- .1 Strapping and buckles or side mount brackets shall be used, as appropriate.
- .4 Signs mounted on square metal tube posts shall use top-of-post mounting hardware.
- .5 One or two street name blades may be mounted on the same post, above a traffic control sign (e.g., stop, yield, one-way), for the following types of intersections:
 - .1 Local/local,
 - .2 Local/collector, and
 - .3 Collector/collector.
- .6 Parking restriction signs shall be mounted with galvanized metal brackets at a 45° angle to the curb.
- .7 All signage shall be mounted in accordance with manufacturer's specifications for the mounting hardware and the Municipality's *Standard Construction Specifications*.

4.9.2.6 Number of Signs

- .1 The number of street name signs at intersections shall be as per **Table 4-9**.

Table 4-9 Number of Street Name Signs at Intersections

	Arterial ¹	Collector ¹	Local
Arterial	1 sign for each approach	1 sign for each approach	N/A ²
Collector	1 sign for each approach	1 sign for each street (tee) 2 signs for each street (cross) ³	1 sign for each street
Local	N/A ²	1 sign for each street	1 sign for each street

Notes:

¹ Arterial/arterial and arterial/collector intersections where the name of the side street is different on each side require advanced street name signs.

² Intersections of arterial and local roadways are not permitted.

³ Street name signs shall be posted on opposite corners of the intersection.

4.9.3 Pavement Markings

- .1 Pavement markings shall be indicated on the detailed engineering design drawings and shall be in accordance with TAC's *Manual of Uniform Traffic Control Devices for Canada*.
- .2 **Table 4-10** indicates which type of pavement markings are required for different applications.
- .3 Stop lines shall be perpendicular to the curb line or edge of asphalt, as applicable.

Table 4-10 Types of Pavement Markings Based on Application

Application	Type of Pavement Markings
Urban Arterial Roadways	Hot Poured Thermoplastic, inlaid in final lift of asphalt
Urban Collector Roadways	Hot Poured Thermoplastic, inlaid in final lift of asphalt
Urban Local Roadways ¹	Hot Poured Thermoplastic, inlaid in final lift of asphalt
Crosswalks on Urban Roadways	Hot Poured Thermoplastic, inlaid in final lift of asphalt
Stop Bars on Urban Roadways	Hot Poured Thermoplastic, inlaid in final lift of asphalt
Rural Arterial Roadways ²	Cold Plastic or Painted
Rural Collector Roadways ²	Cold Plastic or Painted
Rural Local Roadways ²	Cold Plastic or Painted
Asphalt Trails	Painted
Parking Lots	Painted

Notes:

¹ Line markings are generally not required on urban local roadways, with the exception of the 30 m approaching an intersection.

² The type of pavement markings for rural roadways shall be at the discretion of the Municipality.

4.9.4 Traffic Signals

- .1 Traffic control signals and pedestrian crossing signals shall be provided at all traffic and pedestrian points on arterial roadways and as otherwise warranted by a TIA.
- .2 Traffic signal cabinets and related street furniture shall have an anti-graffiti coating or a decorative vinyl wrap.
- .3 For development projects:
 - .1 The conduits for future signals shall be installed as part of the current phase of development, regardless of whether they are warranted for the current phase of development.

4.9.5 Crosswalks

- .1 The requirement for mid-block crossings with pedestrian-controlled traffic signals shall be based on:
 - .1 TAC's *Manual of Uniform Traffic Control Devices for Canada*,
 - .2 A Crosswalk Warrant Analysis, and
 - .3 An Illumination Warrant Analysis.

- .2 In general, mid-block crossings with pedestrian-controlled traffic signals shall be installed on arterial and collector roadways for the following conditions:
 - .1 Where the crossings provide continuity within the regional pedestrian corridor network, or
 - .2 At locations where a high volume of pedestrian traffic is expected, or
 - .3 As otherwise required by TAC's *Pedestrian Crossing Control Guide*.
- .3 Crosswalk Illumination shall be in accordance with TAC's *Guide for the Design of Roadway Lighting*.
- .4 Pedestrian crossing signs shall consist of a black legend on a white background (RA-4).
 - .1 Two signs shall be mounted back-to-back at the crossing location.
 - .2 Advanced warning signs for pedestrian crossings shall be placed based on sightline conditions and traffic characteristics.
- .5 Mid-block crosswalk pavement markings shall be as per the Standard Details in **Section 13**.

4.9.6 Pedestrian Actuated Signals

- .1 Pedestrian actuated push-buttons shall be capable of easy activation and conveniently located at each end of the crosswalk, such that:
 - .1 They are unobstructed,
 - .2 They are accessible to all users,
 - .1 There shall be a level, all-weather surface adjacent to the pushbutton which shall be connected to the sidewalk/curb ramp via an all-weather accessible route.
 - .3 The face of the pushbutton is mounted along the pathway of, and parallel to, the pedestrian's path from the sidewalk to the crosswalk, and
 - .4 They are mounted at a height of approximately 1.0 m, but no more than 1.2 m, above the sidewalk.

4.10 Illumination

4.10.1 General

- .1 The design of roadway illumination shall be in accordance with the requirements of the utility owner.
- .2 The Owner shall maintain safe levels of illumination during the construction and Warranty Periods.
- .3 Roadway illumination shall use LED bulbs.
- .4 The location of streetlights shall be in accordance with TAC's *Guide for the Design of Roadway Lighting*.
 - .1 A streetlight is required at both ends of crosswalks within school zones and at both ends of crosswalks crossing arterial roadways.

4.10.2 Urban

- .1 Streetlights and cables shall not conflict with other utilities, street furniture, or driveways.
- .2 Streetlights shall be located on the projected common property line between two lots.
- .3 Streetlight cables shall be installed underground.
- .4 Streetlight posts shall be galvanized steel complete with fixtures.

- .5 The use of non-light polluting fixtures is preferred.
 - .1 Consideration shall be made to select fixtures which minimize obtrusive lighting (e.g., spill light, glare, sky glow). However, the reduction or elimination of obtrusive light shall not take precedence over proper illumination.
- .6 To minimize the footprint of street furniture at intersections, streetlight davits may be mounted on traffic light poles.
 - .1 In these cases, the power for the streetlights shall be metered separately from the power for the traffic signals.
 - .2 Following issuance of CCC, the Municipality will take ownership of the traffic signal infrastructure; however, ownership of the streetlights shall remain with the utility company.
- .7 The streetlight layout and location of buried streetlight cables shall be as shown on the typical cross sections in **Section 13**.
- .8 Streetlights shall be provided for each Maintained Park that does not abut onto a lit street.
 - .1 A streetlight shall be located at the point where each walkway opens out onto the park area.
 - .2 Alternatively, solar-powered LED lights shall be provided at all benches and along pathways.
- .9 In certain urban development settings, such as downtown redevelopment, consideration shall be given to providing pedestrian level lighting adjacent to sidewalks. Refer to the City of Edmonton's *Winter City Design Guidelines*, available on the City of Edmonton's website.

4.10.3 Rural

- .1 Streetlighting shall be installed in all new subdivisions.
- .2 The minimum requirements for the location of new streetlights are as follows:
 - .1 At the intersections of roadways and approaches to community recreation areas,
 - .2 At corners and intersections of internal roadways (i.e., within the subdivision),
 - .3 At intersections with main roadways, secondary highways, and primary highways,
 - .4 At a maximum spacing of 100 m within school zones,
 - .5 At a maximum spacing of 300 m within residential areas,
 - .6 One streetlight in each playground,
 - .7 One streetlight within 5 m of transit shelters,
 - .8 At designated trail crossings,
 - .9 At mailbox pull-outs,
 - .10 At each end of bridges, and
 - .11 At potentially dangerous areas such as steep banks.
- .3 Lighting for commercial and industrial areas shall be in accordance with the Illuminating Engineering Society's *Recommended Practice: Lighting Industrial Facilities An American National Standard*.
 - .1 At minimum, streetlights shall be placed at or near all intersections, driveways, and lot entrances.

4.11 Sound Abatement

- .1 A Noise and Vibration Control Study may be required, at the discretion of the Municipality; refer to **Section 2.17.17** for more information.
- .2 Sound abatement measures may include berms or sound barrier fences.
- .3 When a berm is used for sound abatement:
 - .1 The side slopes shall have a maximum gradient of 4H:1V.
 - .2 Pedestrian connectivity shall be maintained within a PUL.
 - .1 The slope shall be reduced and retaining walls shall be implemented where required along the adjacent property line on the subdivision side.
 - .2 A walkway cutting diagonally along the embankment at a maximum slope of 8% shall be installed on the roadway side.
 - .3 The right-of-way may require widening to suit; confirm right-of-way requirements with the Municipality during subdivision planning.

4.12 Alleys

4.12.1 General

- .1 An alley shall be provided for access to residential lots fronting directly onto a collector roadway.
- .2 The length of an alley connecting two roadways shall not exceed 200 m.
- .3 The alley layout shall not encourage possible short-cutting between roadways.
- .4 Internal alley intersections in residential areas require minimum 3 m corner cuts.
- .5 Internal alley intersections are not permitted in non-residential areas.
- .6 Dead-end alleys require a means to turn around.
 - .1 Hammer-head turnarounds are not permitted.
 - .2 Dead-end alleys shall terminate in a standard size cul-de-sac bulb for a local roadway.
- .7 Dead-end alleys shall have:
 - .1 No Exit signage installed at the entrance to the alley, and
 - .2 No Parking signage installed prior to the cul-de-sac bulb.

4.12.2 Right-of-Way

- .1 Alleys shall have a minimum width of 6 m.
 - .1 Residential alleys shall have a minimum 5.7 m driving surface.
 - .2 Non-residential alleys shall be paved for the full width.
- .2 Where alley traffic is expected to be high, such as for certain commercial developments, a wider driving surface and right-of-way may be required, at the discretion of the Municipality.

4.12.3 Structure

- .1 The pavement structure shall be as recommended in the geotechnical report or as per **Table 4-5**, whichever is more stringent.
- .2 Residential alleys shall be paved for a minimum width of 5.7 m.
- .3 Non-residential alleys shall be paved for the entire width of the right-of-way.
- .4 Where alley traffic is expected to be high, such as for certain commercial developments, a wider surfaced width and right-of-way may be required, at the discretion of the Municipality.

4.12.4 Grading and Drainage

- .1 Alleys shall have an inverted crown, with 2% crossfall.
 - .1 Depending on the local topography, alleys may have a consistent crossfall of 2% for the full width of the pavement.
- .2 To minimize stormwater infrastructure within alleys, Trap Lows in alleys shall be avoided, wherever possible.
- .3 The maximum longitudinal grade of an alley shall be 8.0%.
- .4 The minimum longitudinal grade of an alley shall be consistent with the parallel roadway.
- .5 Alley grades shall tie to the back of walk/curb elevation of the intersecting street.

4.13 Community Mailboxes

- .1 Refer to **Section 2.10.6** for additional information.
- .2 In general, community mailboxes shall be located as follows:
 - .1 Along the side yard of corner lots, between the front and rear property lines,
 - .2 Within a 0.5 m x 5.0 m Easement if encroaching onto private property,
 - .3 Next to an Open Space or playground,
 - .4 On the predominantly homecoming side of the street,
 - .5 Adjacent to the sidewalk and accessible by the sidewalk,
 - .6 Along collector or local roadways (community mailboxes along arterial roadways are not permitted),
 - .7 Not closer than 10 m to a fire hydrant or bus stop,
 - .8 Not within a PUL, nor above a utility, and
 - .9 Such that the community mailbox does not impede pedestrian and vehicle sight distances.
- .3 Additional requirements for rural applications include:
 - .1 Road widening (i.e., a mailbox pullout), and
 - .2 Installation of a culvert beneath the mailbox pullout, or
 - .3 Right-of-way widening to accommodate rerouting the roadside ditch, where necessary.
 - .1 Right-of-way widening to reroute the roadside ditch shall be avoided, wherever possible.
 - .4 Refer to the Standard Details in **Section 13**.

4.14 Dead-End Roadways

- .1 Temporary dead-end roadways (i.e., in staged development) in industrial subdivisions may be acceptable, at the discretion of the Municipality.
- .2 Dead-end roadways in residential subdivisions require a cul-de-sac bulb to provide a means to turn around.
 - .1 "Hammerhead" turnarounds are not permitted.
- .3 Residential cul-de-sacs shall be as per the Standard Details in **Section 13** and shall be in accordance with TAC's *Geometric Design Guide for Canadian Roads*.
- .4 The maximum length of residential dead-end roadways shall be 300 m.
 - .1 Cul-de-sacs exceeding 120 m in length may require an additional access for emergency vehicles, at the discretion of the Municipality.

4.15 Approaches and Driveways

4.15.1 General

- .1 Approaches and driveways, including required spacing, shall be in accordance with TAC's *Geometric Design Guide for Canadian Roads* and the *National Building Code - Alberta Edition*.
- .2 More than one driveway to a single family residential lot is not permitted.
- .3 Location and design for access routes in regard to emergency services shall be in accordance with the *National Building Code - Alberta Edition*.

4.15.2 Urban

- .1 Maximum driveway widths shall be as per **Table 4-11**.

Table 4-11 Maximum Driveway Widths - Urban

Type of Driveway	Maximum Width
Residential (excluding multi-family)	6.7 m
Multi-family (e.g., apartment building)	10.6 m
Commercial	10.6 m
Industrial	10.6 m
Institutional	10.6 m

- .2 Minimum driveway widths shall be 3.0 m per drive aisle, or as required to accommodate the movements of the design vehicle.
- .3 All driveways shall be constructed to provide a minimum horizontal clearance of 1.0 m from hydrants, streetlight posts, pedestals, transformers, manholes, catch basins, and other aboveground infrastructure/ street furniture.

- .4 Driveways for residential single detached lots shall be offset a minimum of 1 m from the side yard property line; the area between the driveway and side yard property line shall be soft landscaped.
- .5 Driveways on corner lots shall be located to provide a minimum clearance of 6 m from the property line adjacent to the intersection and access shall be from the street with lesser traffic.
- .6 The nearest edge of a non-residential driveway shall be a minimum of 12 m from the end of the curb return of the nearest intersection, at the discretion of the Municipality.
- .7 Non-residential driveways shall be designed to accommodate the types of vehicles the business/industry are anticipated to generate.
- .8 When the locations of driveways for a new development are known, the driveways shall be clearly shown on the design drawings and the driveway aprons shall be installed at the time of sidewalk construction.
- .9 Driveways shall be constructed to the same structure as the adjoining roadway, with the same surface extending to the property line.
- .10 Where alleys are provided to provide access to residential lots, the fronting roadway shall have straight face curb and gutter with either monolithic sidewalk or separate sidewalk.
- .11 Where residential lots are accessed from the fronting roadway, one of the following shall be provided:
 - .1 Straight face curb and gutter with dropped curb sections at pre-determined driveway locations, and separate walk, or
 - .2 Rolled face curb and gutter with either monolithic sidewalk or separate sidewalk.

4.15.3 Rural

- .1 Driveway widths shall be as per [Table 4-12](#).

Table 4-12 Maximum Driveway Widths - Rural

Type of Driveway	Minimum Width	Maximum Width
Residential	6 m	8 m
Commercial	9 m	11 m
Industrial	9 m	11 m
Institutional	9 m	11 m

- .2 Approaches and driveways shall be constructed with the same pavement or gravel structure as the adjoining roadway, from the edge of asphalt/gravel to the property line.
- .3 Approaches and driveways in areas with trucked water and/or sanitary service shall be designed to accommodate the expected wheel loads.
 - .1 The driveway shall be constructed to the location of the water cistern and/or sanitary tank.
- .4 For new developments:
 - .1 The Developer shall provide one driveway to each residential lot (from the edge of asphalt/gravel to the property line).

- .2 Approaches to industrial/commercial lots are not required to be constructed by the Developer unless the locations are known. The lot owner shall be responsible for constructing such approaches in accordance with the Standard Details in **Section 13**.

4.16 Pedestrian Walkways

4.16.1 Sidewalks

- .1 Concrete sidewalks shall be 1.8 m wide.
 - .1 The rehabilitation of sidewalks in existing neighbourhoods may not permit the construction of a 1.8 m wide sidewalk, due to right-of-way or other limitations.
 - .1 In these situations, the sidewalk shall be constructed as close to 1.8 m as possible.
- .2 Sidewalks are required on both sides of urban roadways.
 - .1 Short cul-de-sacs (fewer than 18 lots and less than 120 m in length) only require sidewalk on one side of the roadway.
 - .2 In some instances, a MUT(s) may be substituted for the sidewalk(s); refer to the typical cross sections in **Section 13** and **Section 10.7** for more information.
- .3 Sidewalks will also be required to maintain continuity of the pedestrian network for future or existing development.
- .4 Sidewalks shall have a cross-slope of 2%.
- .5 Sidewalks shall be accessible, in accordance with the *National Building Code - Alberta Edition* and Alberta Safety Codes Council's *Barrier-Free Design Guide*.
- .6 Construction joints, contraction joints, and expansion joints shall be installed as per the Standard Details in **Section 13**.
- .7 At the time of sidewalk construction, the letters "CC" shall be stamped into the plastic concrete, in line with each service box (curb stop).

4.16.2 Pedestrian/Curb Ramps

- .1 Curb ramps (sometimes referred to as pedestrian ramps or sidewalk ramps) shall be provided on sidewalks at all pedestrian crossings (e.g., roadway intersections, mid-block crossings) in accordance with the Standard Details in **Section 13**.
- .2 Curb ramps at intersections shall be installed in line with the crosswalk and each other, with the width, orientation, and location to suit the corner conditions.
 - .1 Curb ramps at intersections shall not direct the user diagonally into the intersection.
- .3 At the corner of monolithic sidewalks, a 1.5 m wide landing shall be provided between 1.75 m long ramps, with the ramps constructed along the length of the sidewalk on either side of the landing.
 - .1 For rehabilitation projects in older neighbourhoods, it may not be possible to meet these dimensions due to right-of-way or other limitations.
 - .1 In these situations, the curb ramps shall be constructed as close to the required dimension as possible.

- .2 Landscaping behind the back of walk may need to be locally depressed to suit the back of walk profile.
- .3 The crossfall on landings shall match the crossfall of the sidewalk.
- .4 The maximum longitudinal slope of curb ramps shall be 8.0%.
- .5 Catch basins shall be located upstream of pedestrian crossings and shall not conflict with curb ramps.

4.16.3 Trails

- .1 Refer to **Section 10.7** for the requirements for trails.

4.17 Acceptance Criteria

4.17.1 Asphalt

- .1 Asphalt adjacent to curb and gutter shall be less than 10 mm above the lip of gutter, except in the case of structural overlay or rehabilitation of roads where no new curb and gutter have been placed.
- .2 Localized areas of settlement which cause water ponding shall be repaired, at the discretion of the Municipality.
- .3 A repair is required if the asphalt surface has a coarse and open texture resulting (e.g., from clay tracking, segregations, or petroleum spillage).
- .4 Asphalt repairs shall be rectangular or square.
 - .1 Grind asphalt adjacent to gutter lines and at butt joints to allow for a minimum of 50 mm of asphalt overlay.
 - .2 Grinding shall extend to the full width of the lane from lip of gutter or lane line. Grind seams within the wheel path are not permitted.
- .5 A levelling course shall be placed on all settlements greater than 50 mm.
- .6 Edges of existing asphalt shall be ground or cut vertically (minimum 50 mm); feathering of patches is not permitted.
- .7 Cracks and joints between 2 mm and 15 mm wide shall be routed and sealed.

4.17.2 Concrete

4.17.2.1 New Development

- .1 The following deficiencies shall be rectified prior to the issuance of the CCC:
 - .1 Identified tripping hazards,
 - .2 Cracks measuring greater than 5 mm in width,
 - .3 Four or more cracks in a single sidewalk panel,
 - .4 Longitudinal cracks that extend through three or more sidewalk panels, and
 - .5 Sidewalk panels with surface spalling exceeding 25% of the panel area.
- .2 During the Warranty Period, cracks and deformations that pose a tripping hazard shall be immediately repaired by the Developer.

- .3 The following deficiencies shall be rectified prior to the issuance of the FAC:
 - .1 Identified tripping hazards,
 - .2 Cracks measuring greater than 2 mm in width,
 - .3 Three or more cracks in a single sidewalk panel,
 - .4 Longitudinal cracks that extend through two or more sidewalk panels, and
 - .5 Sidewalk panels with surface spalling exceeding 10% of the panel area.
- .4 If more than 50 m² of continuous sidewalk is replaced as a result of deficiency repair work prior to issuance of the FAC, the Securities for the affected assets shall only be released in exchange for the Developer providing an extra one-year Warranty Period covering workmanship and materials, specific to the affected assets.
 - .1 The final acceptance criteria (**clause 4.17.2.1.3**) shall be reassessed at the end of the extended one-year Warranty Period.

4.17.2.2 Rehabilitation

- .1 Concrete infrastructure exhibiting the following deficiencies shall be replaced as part of a rehabilitation project:
 - .1 Identified tripping hazards,
 - .2 Cracks measuring greater than 5 mm in width,
 - .3 Four or more cracks in a single sidewalk panel,
 - .4 Longitudinal cracks that extend through three or more sidewalk panels, and
 - .5 Sidewalk panels with surface spalling exceeding 25% of the panel area.
- .2 The deficiencies identified in **Section 4.17.2.1.1** shall be rectified prior to issuance of the CCC.
- .3 The deficiencies identified in **Section 4.17.2.1.3** shall be rectified prior to the issuance of the FAC.

5 SANITARY SEWER SYSTEMS

5.1 General

- .1 This section covers the design of sanitary sewer mains and associated appurtenances to be installed or rehabilitated within the Municipality.
 - .1 Standard Details relating to sanitary sewer design and construction are provided in [Section 13](#).
- .2 These standards provide the minimum design criteria to be used in the preparation of specifications and drawings. Good engineering practices and designs must prevail on all projects and these standards may be exceeded if warranted by the Consulting Engineer.
- .3 The design of sanitary sewer systems shall meet the requirements of Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* and other provincial regulations and shall conform to the Municipality's *Wastewater Master Plan*.
- .4 Refer to the Municipality's *Standard Construction Specifications* for requirements for the construction of items in this section.
- .5 The installation of a low pressure sewer system may be an acceptable alternative to a gravity sewer system under the following conditions and at the discretion of the Municipality.
 - .1 The topography is such that servicing the lots by gravity is not feasible.
 - .2 Excessive open cuts would be required to service the lots by gravity.
 - .3 Lots are too large or spread out to make sanitary service via gravity feasible (e.g., in rural areas).

5.2 Design Flow

5.2.1 Gravity Systems

5.2.1.1 General

- .1 The design of gravity systems shall be based on the peak wet weather flow, comprised of:
 - .1 **Residential Contribution** – based on the population calculated from the population density(ies) of the associated land use(s), and an associated peaking factor.
 - .1 In the assessment of existing systems, or the rehabilitation of existing infrastructure, the design population shall be based on the existing land uses and the population densities in [Table 5-1](#).
 - .2 For new developments, the design population shall be the ultimate subdivision design population from the applicable Area Structure Plan or shall be based on the population densities provided in the Municipality's *Wastewater Master Plan*.
 - .3 In the absence of suitable population density information, the densities in [Table 5-1](#) shall be used.
 - .4 Refer to [Section 5.2.1.2](#) for more information.
 - .2 **Non-Residential Contribution** – based on the type of non-residential development (where the anticipated end uses are known) or an equivalent population (where the anticipated end uses are unknown), and an associated peaking factor.
 - .1 Refer to [Section 5.2.1.3](#) for more information.

- .3 **Wet Weather Contribution** – based on allowances for inflow of surface runoff, infiltration of groundwater, sag manholes, and foundation drain connections (when assessing older neighbourhoods only).

.1 Refer to **Section 5.2.1.3** for more information.

5.2.1.2 Residential Contribution

- .1 The peak dry weather flow from the residential contribution shall be calculated as follows:

$$Q_{PDW} = G * P * PF / 86,400, \text{ where:}$$

Q_{PDW} = peak dry weather flow (L/s)

G = average per capita wastewater generation flow rate (L/c/d)

P = population

PF = Harmon's peaking factor, where;

Harmon's peaking factor shall be calculated as follows:

$$PF = 1 + [14 / (4 + P_{pf}^{0.5})], \text{ where:}$$

P_{pf} = population, in thousands (i.e., P / 1,000)

- .2 The average per capita wastewater generation flow rate shall be 360 L/c/d.
- .3 The population shall be determined as described in **Section 5.2.1.1** or as per the population densities identified in **Table 5-1**.

Table 5-1 Population Densities Based on Land Use

Land Use	Design Population Density ¹		
Single Family Residential	3.5 people/unit	18 units/ha	63 people/ha
Low Density Residential	3.5 people/unit	44 units/ha	154 people/ha
Medium Density Residential	2.5 people/unit	148 units/ha	370 people/ha
High Density Residential	2.5 people/unit	296 units/ha	740 people/ha
Country Residential	3.5 people/unit	1 unit/ha	3.5 people/ha

Note:

¹ The area in hectares in **Table 5-1** represents the Net Developable Area.

5.2.1.3 Non-Residential Contribution

- .1 Commercial, institutional, and light industrial wastewater flows are calculated as follows:
- .1 When the anticipated end use(s) (e.g., retail store, church, warehouse) is/are known, **Table 5-2** shall be used.

Table 5-2 Average Wastewater Generation Rates for Commercial, Institutional, and Light Industrial Land Uses

Type of Establishment (i.e., End Use)	Average Wastewater Generation (L/d/m ² of floor area)
Office Building	8
Restaurant	20
Bar or Lounge	12
Hotel or Motel	14
Neighbourhood Store	8
Department Store	8
Shopping Centre	4
Laundromat or Dry Cleaner	41
Bank or Financial Building	12
Medical Building or Clinic	12
Warehouse	4
Meat and/or Food Processing Plant	115
Car Wash	77
Service Station	8
Auto Dealership and/or Auto Repair/Service	6
Supermarket	8
Trade Business (e.g., plumber, carpenter, etc.)	8
Mobile Home Dealer	7
Lumber Company	7
Drive-In Movie Theatre	7
Flea Market	7
Place of Assembly (e.g., Church, School, Library, Theatre)	24
Factory ¹	33
Hospital	1,700 ²

Notes:

¹ A factory shall be considered an establishment where raw products are manufactured into finished products.

² The average wastewater generation rate for hospitals is measured in L/day/bed (rather than L/day/m² of floor area).

- .2 When the land use is known, but the anticipated end use(s) is/are unknown, an equivalent population shall be calculated based on the density(ies) in **Table 5-3**.

Table 5-3 Equivalent Population Densities for Non-Residential Land Uses

Non-Residential Land Use	Equivalent Population Density
Commercial	40 ep/ha
Institutional	40 ep/ha
Light Industrial	40 ep/ha

Note:

ep/ha = equivalent population per hectare

- .2 The wastewater generation for heavy industrial land uses can vary widely. For new heavy industrial developments, the Consulting Engineer shall propose an average wastewater generation rate, for review and approval by the Municipality.
- .3 The average dry weather flow from the non-residential contribution when the end uses are known shall be calculated as follows:

$$Q_{ADW} = \sum(G * A) / 86,400, \text{ where:}$$

Q_{ADW} = average dry weather flow (L/s)

G = average wastewater generation rate from **Table 5-2** (L/d/m² of floor area)

A = floor area (m²)

The product of G and A for each end use shall be summed to calculate the total average dry weather flow.

Note: When the end use is a hospital, G is measured in L/d/bed, and A represents the number of beds.

- .4 The average dry weather flow from the non-residential contribution when the end uses are unknown shall be calculated as described in **Section 5.2.1.2** using the population densities in **Table 5-3**.
- .5 The peak dry weather flow from the non-residential contribution shall be calculated as follows:

$$Q_{PDW} = Q_{ADW} * PF, \text{ where:}$$

Q_{PDW} = peak dry weather flow (L/s)

Q_{ADW} = average dry weather flow (L/s)

PF = Harmon's peaking factor, where;

Harmon's peaking factor shall be calculated as follows:

$$PF = 1 + [14 / (4 + P_{pf}^{0.5})], \text{ where:}$$

P_{pf} = equivalent population, in thousands (i.e., ep / 1,000)

Note: When **Table 5-2** is used to generate Q_{ADW} , the flow rate in L/s will need to be converted to L/d and divided by the average per capita wastewater generation rate (refer to **Section 5.2.1.2**) to calculate the equivalent population associated with the calculated Q_{ADW} . Once the equivalent population has been calculated, Harmon's peaking factor can be calculated.

5.2.1.4 Wet Weather Contributions

- .1 A general inflow/infiltration allowance of 0.28 L/s/ha shall be added to Q_{PDW} to account for surface runoff inflow through manhole covers and groundwater infiltration through leaky pipe and/or manhole joints.
- .2 The installation of manholes in sag locations shall be avoided, wherever possible.
 - .1 For new developments where it is unavoidable to install a manhole in a sag location, or where there are existing sag manholes, an allowance of 0.4 L/s/sag manhole shall be added to Q_{PDW} .
- .3 Roof leaders and foundation drains/weeping tiles shall not be connected to the sanitary sewer system.
 - .1 When assessing older neighbourhoods with existing roof leader and/or foundation drain/weeping tile connections to the sanitary sewer system, an allowance of 0.6 L/s/ha shall be added to Q_{PDW} .

5.2.1.5 Peak Wet Weather Flow Rate

- .1 The peak wet weather flow rate shall be calculated as the sum of:
 - .1 The peak dry weather flow rate from the residential contribution,
 - .2 The peak dry weather flow rate from the non-residential contribution, and
 - .3 The total flow rate from the wet weather contributions.

5.2.2 Low Pressure Systems

- .1 The design of low pressure systems shall be based on the probable maximum number of pumps operating simultaneously, which is a function of the total number of pumps connected to the system per [Table 5-4](#).

Table 5-4 Probable Maximum Number of Pumps Operating Simultaneously

Total Number of Pumps Connected to the System	Maximum Number of Pumps in Operation Simultaneously	Total Number of Pumps Connected to the System	Maximum Number of Pumps in Operation Simultaneously
1	1	114 - 146	9
2 - 3	2	147 - 179	10
4 - 9	3	180 - 212	11
10 - 18	4	213 - 245	12
19 - 30	5	246 - 278	13
31 - 50	6	279 - 311	14
51 - 80	7	312 - 344	15
81 - 113	8		

- .2 The design flow shall be calculated as the product of the maximum number of pumps in operation simultaneously and the average capacity of the pumps within the system.
- .3 As low pressure systems are closed, assume zero inflow and infiltration.

5.3 Pipe Design

5.3.1 Gravity Systems

- .1 Manning's formula shall be used to calculate pipe capacity for gravity systems.

$$Q_{cap} = (1/n) * A * R_h^{2/3} * s^{1/2}, \text{ where:}$$

Q_{cap} = pipe capacity (m³/s)

n = Manning's roughness coefficient

= 0.013 for smooth-walled pipe

= 0.015 for the assessment of older pipe (with the exception of PVC)

A = pipe cross sectional area (m²)

R_h = hydraulic radius (m)

s = pipe slope (m/m)

The pipe cross sectional area is calculated as:

$$A = (\pi/4) * D^2, \text{ where:}$$

D = internal pipe diameter (m)

The hydraulic radius is calculated as:

$$R_h = A / P_w, \text{ where:}$$

P_w = wetted perimeter (m)

The wetted perimeter is calculated as:

$$P_w = \pi * D$$

- .2 Sanitary sewer mains shall be sized such that the utilization does not exceed 86%.

5.3.2 Low Pressure Systems and Forcemains

- .1 The Hazen-Williams formula shall be used to calculate pipe capacity for low pressure sewer systems and forcemains.

$$Q_{cap} = C * D^{2.63} * s^{0.54} * 278.5, \text{ where:}$$

Q_{cap} = pipe capacity (L/s)

C = Hazen-Williams roughness coefficient (120 for mains conveying sewage)

D = internal pipe diameter (m)

s = slope of hydraulic grade line (m/m)

- .2 Forcemain designs shall account for pump operation, sudden changes in velocity, pressure surges, and the method of pipe restraint.

5.4 Velocity

5.4.1 Gravity Systems

- .1 Gravity systems shall be designed to achieve a minimum scour velocity of 0.6 m/s.
- .2 The maximum velocity in a gravity system shall not exceed 2.5 m/s.
- .3 Velocity shall be calculated based on the design (i.e., part-full) flow.

5.4.2 Low Pressure Systems and Forcemains

- .1 Low pressure systems and forcemains shall be designed to achieve a minimum scour velocity of 0.9 m/s.
- .2 The maximum velocity in a low pressure system shall not exceed 1.5 m/s.
- .3 The maximum velocity in a forcemain shall not exceed 2.5 m/s.

5.5 Pipe Diameter

5.5.1 Gravity Systems

- .1 Gravity systems shall be sized according to the design flow; however, in no case shall gravity sewers be smaller than the minimum pipe sizes identified in [Table 5-5](#).

Table 5-5 Minimum Pipe Sizes for Gravity Systems

Land Use	Minimum Pipe Diameter
Mains	
Residential	200 mm
Commercial	250 mm
Institutional	250 mm
Industrial	250 mm
Services	
Residential	
<i>Single Family</i>	150 mm
<i>Multi-family</i>	150 mm*
Commercial	150 mm*
Institutional	150 mm*
Industrial	150 mm*

Note:

* Multi-family and non-residential services shall be sized based on the anticipated peak wet weather flow for the development; however, in no case shall the services for these types of developments be less than 150 mm in diameter.

5.5.2 Low Pressure Systems and Force mains

- .1 Low pressure systems and force mains shall be sized according to the design flow; however, in no case shall low pressure sewers or force mains be smaller than the minimum pipe sizes identified in [Table 5-6](#).

Table 5-6 Minimum Pipe Sizes for Low Pressure Sewer and Force main Systems

Land Use	Minimum Pipe Diameter
Mains ¹	
Force mains	100 mm
Low Pressure Mains	75 mm
Services	
Residential ²	38 mm
Commercial	See Note 3
Institutional	See Note 3
Industrial	See Note 3

Notes:

¹ Mains may be as small as 50 mm at the upstream ends of systems, as required, to meet the minimum velocity.

² Single family residential.

³ As required to maintain the minimum velocity.

5.6 Pipe Slope

- .1 The minimum pipe slopes for gravity systems along straight alignments shall be as per [Table 5-7](#).

Table 5-7 Minimum Pipe Slopes

Nominal Pipe Diameter	Minimum Slope ¹
200 mm	0.40%
250 mm	0.28%
300 mm	0.22%
375 mm	0.15%
450 mm	0.12%
525 mm	0.10%
600 mm and larger	0.08%

Notes:

¹ The minimum pipe slope for sewer along a curved alignment shall be 50% greater than the value indicated in [Table 5-7](#) for the corresponding pipe diameter.

² The pipe slope shall be increased to 1.0% at the most upstream end of the system in residential areas.

5.7 Depth of Cover

- .1 The minimum depth of cover over sanitary sewers shall be 3 m, measured from finished grade to pipe crown.
- .2 The sanitary sewer shall be designed at a sufficient depth to satisfy the following:
 - .1 To permit service connections to basements,
 - .2 To prevent freezing,
 - .3 To clear other underground utilities, and
 - .4 To prevent damage from surface loading.
- .3 In cases where the minimum cover is unable to be met, or in areas of predominantly rock, the sanitary sewer shall be insulated.

5.8 Horizontal Alignment

- .1 New sanitary sewer mains shall be located within a municipal road right-of-way.
 - .1 Sanitary sewer mains in older neighbourhoods may be located in alleys. For rehabilitation projects in these areas, the sanitary sewer main can remain within the alley.
- .2 Sanitary sewers shall not be located in sags (e.g., the centreline of an alley with an inverse crown). Refer to the typical cross sections in **Section 13**.
 - .1 In general, sanitary sewers shall be aligned with the center of the roadway (i.e., the roadway crown) to minimize infiltration through manhole covers (in gravity systems).
 - .2 On divided arterial roadways, the sanitary sewer shall align with the center of one of the lanes, such that the manhole covers are not located within the wheel path.
- .3 The maximum joint deflection for gravity sewers along a curved alignment shall be as recommended by the pipe manufacturer.
- .4 Sanitary sewer mains shall maintain a minimum horizontal separation of 3 m from watermain, storm sewers, and Shallow Utilities, unless the sewer depth requires an increased spacing.
 - .1 Where circumstances prevent a minimum horizontal separation of 3 m, a lesser separation distance may be acceptable, at the discretion of the Municipality, provided that the crown of the sewer pipe is at least 0.5 m below the bottom of the watermain.
 - .2 Where extreme conditions prevent the 3.0 m horizontal separation and the vertical separation outlined in **clause 5.8.4.1** cannot be obtained, the sewer shall be constructed of pipe and joint materials which are equivalent to watermain standards.
- .5 Easements shall be provided for all deep utilities not located within roadway rights-of-way or PULs.
 - .1 A minimum width of 6 m is required for one or two deep utilities.
 - .2 A minimum width of 8 m is required for three deep utilities.

5.9 Vertical Alignment

- .1 Sanitary sewer mains shall maintain a minimum vertical separation of 0.5 m (above or below) at pipe crossings.
- .1 Sanitary sewer mains shall cross under watermains wherever possible.

5.10 Manholes

5.10.1 General

- .1 This section covers the requirements for manholes in gravity systems. Refer to [Section 5.13.3](#) for the requirements for discharge manholes in low pressure systems.
- .2 Sanitary manholes shall not be located in Trap Lows.
 - .1 If locating a sanitary manhole in a Trap Low is unavoidable, a watertight manhole cover shall be used to reduce inflow into the sanitary sewer.
- .3 Manhole frames and covers shall not be located within sidewalks.
- .4 Manhole frames and covers shall be finished to surface grade when located within landscaped areas.
- .5 Manhole runs shall be in a straight line from top to bottom and, wherever possible, shall not be located over inlet or outlet pipes.

5.10.2 Spacing

- .1 Manholes shall be provided:
 - .1 At the end of each line,
 - .2 At all changes in pipe size, grade, and alignment, and
 - .3 At the beginning and end of curved sections.
- .2 The maximum allowable distance between manholes along a **straight alignment** shall be 120 m.
- .3 The maximum allowable distance between manholes along a **curved alignment** shall be 90 m.

5.10.3 Hydraulic Losses

- .1 Generally, at changes in pipe size, the crown of the upstream pipe shall match the crown of the downstream pipe; however, the upstream 80% flow depth level shall not be below the downstream 80% flow depth level.
- .2 The minimum drop in invert elevations across manholes shall be as per [Table 5-8](#).

Table 5-8 Minimum Drops Across Manholes

Pipe Deflection Across Manhole	Minimum Drop in Invert Elevation
Straight runs (i.e., no deflection)	30 mm
Deflections $\leq 45^\circ$	30 mm
Deflections $> 45^\circ$ and $\leq 90^\circ$	60 mm
Deflections $> 90^\circ$	Use 2 or more manholes

- .3 A drop manhole is required when the difference between inverts exceeds 0.6 m.
 - .1 Internal drop manholes are preferred by the Municipality; external drop manholes may be acceptable, at the discretion of the Municipality.
- .4 Internal drop manholes shall be designed to facilitate flushing and maintenance from the surface by installing a full cap over the end of the tee and coring a 100 mm diameter hole through the top of the tee.
- .5 Benching shall incorporate the following items, in addition to the minimum drop requirements in **Table 5-8**.
 - .1 Benching shall be provided in all manholes to provide a smooth transition from the inlet(s) to the outlet(s) to minimize hydraulic losses and to prevent the accumulation of debris.
 - .2 A change in grade between incoming and outgoing pipes may be accomplished by the following:
 - 1. Condition of steep graded inlet with flat graded outlet: benching shall be parallel with the flat graded outlet pipe.
 - 2. Condition of flat graded inlet with steep graded outlet: benching slope shall be between the two slopes of the inlet and outlet pipes.
 - .3 Benching shall extend straight through from the outgoing pipe, in all cases including dead end manholes.
 - .4 Standard side sloping of 10H:1V from top of half pipe.
 - .5 Generally, all channels are to be sized to match the pipe size, although channels one pipe size larger will be accepted.
 - .6 All unused channels on pre-benched manholes that are not intended for future expansions are to be filled with concrete.

5.10.4 Abandonment

- .1 Manholes to be abandoned shall be fully removed and disposed off-site, whenever possible.
- .2 When a manhole is to be abandoned in place, plug all pipes with non-shrink grout, remove and dispose the manhole to a minimum of 1.0 m below the ground surface, and fill the remainder of the manhole with fillcrete.

5.11 Services

5.11.1 New Connections

5.11.1.1 General Requirements

- .1 Refer to the Standard Details in **Section 13**.
- .2 Services shall connect to the sanitary sewer main in the roadway (or the alley, for rehabilitation projects in older neighbourhoods).
 - .1 Service connections to sewer mains located within a side yard PUL or MR are not permitted.
- .3 Service connections shall be designed as a single connection from the main to the property line and shall be located in a common trench with the water service.
 - .1 Multi-family residential and non-residential sanitary and water services require 3 m horizontal separation.

- .4 Sanitary sewer services shall not be located within driveways.
 - .1 This requirement may be relaxed in congested cul-de-sacs, at the discretion of the Municipality.
- .5 Sanitary sewer service connections shall be located between the water and storm services.
- .6 Service connections shall generally terminate 1 m beyond the property line (into private property).
 - .1 If the Shallow Utilities are located within a four-party Easement along the fronts of lots, the service connections shall terminate 1 m beyond the limits of the Shallow Utility Easement.
- .6 The end of service connections shall be adequately capped to prevent the entry of earth, water, or other deleterious materials into the pipe.
- .7 The end of the pipe shall be indicated by a marker stake with the following properties:
 - .1 38 mm x 89 mm wooden post,
 - .2 Post set at the service invert and extending 1 m above the ground surface, and
 - .3 Top 300 mm of the exposed portion of the post painted red.
- .8 Service connections shall have a minimum cover of 3.0 m at the property line, measured from the finished grade to the pipe crown.
- .9 Residential lots shall be provided with only one sanitary service connection.
 - .1 This includes duplexes and townhomes, provided each unit has a separate Certificate of Title.
 - .2 This does not include high density residential lots, such as apartment or condo buildings.
- .10 The Owner shall coordinate with the Municipality to determine servicing requirements for park spaces.

5.11.1.2 Requirements in Cul-de-Sacs

- .1 Submit a detailed drawing for review and approval if 4 or more service connections are proposed to a manhole. Service wyes are permitted at cul-de-sacs when 4 or more service connections are proposed.
- .2 Lateral benching shall be a minimum diameter of 100 mm for 1 service and a minimum diameter of 200 mm for 2 services. Benching of lateral services is required to be half pipe benching.
- .3 The maximum height of the inlet is 300 mm above the invert of the outgoing pipe.
- .4 Service connections into barrel to be machine cored.

5.11.1.3 Gravity Service Considerations

- .1 Service connections shall have a minimum slope of 2.0%.
- .2 Residential service connections at the main shall be made with an in-line tee.
 - .1 Residential service connections shall not be connected to manholes, except in the case of cul-de-sacs.
 - .2 Multi-family and non-residential development requiring larger services shall be connected to a manhole on the sanitary main.
 - .1 A manhole on the sanitary main is required for all services larger than 150 mm.
- .3 Pipe saddles or service tees shall be used to connect sanitary sewer services to mains in instances where retrofit work is undertaken.

- .4 Risers are required on sanitary services when the main is at a depth of 4 m or greater.
- .5 **Inspection Manholes:**
 - .1 Commercial, industrial, and multi-family residential developments with more than 40 residential units, require an inspection manhole on the sanitary service, located 0.6 m inside the municipal roadway right-of-way.
 - .1 The inspection manhole shall be accessible to municipal staff.
 - .2 Inspection manholes shall not be located within sidewalks, walkways, or trails.
 - .3 Inspection manholes shall not be located within driveways, wherever possible.
- .6 **Non-Residential Considerations:**
 - .1 Hydrocarbon, grease, and sediment traps shall be provided at all food processing establishments, shopping centres, service stations, car washes, hotels, motels, factories, equipment servicing and cleaning facilities, institutions (churches, schools, etc.), business industrial developments, and any other facility that is expected to discharge sediment and/or grease.

5.11.1.4 Low Pressure Service Considerations

- .1 Low pressure sanitary services shall be located 1 m offset from the driveway/approach.
- .2 Low pressure sewer service connections shall be made with a fused in-line service tee or service saddle.
- .3 Stainless steel pipe saddles shall be used to connect low pressure sewer services to mains in instances where retrofit work is undertaken.
- .4 A curb stop, labelled "SEWER", and a service box located 0.3 m inside the municipal roadway right-of-way is required on all low pressure sanitary sewer service connections.
- .5 A check valve, located at the septic tank, is required.

5.11.2 Abandonment

- .1 If a gravity service connection is to be abandoned, a compression type plug shall be installed in the sanitary service at the connection to the main.
- .2 If a low pressure service connection is to be abandoned, the main stop shall be closed and the service pipe cut and removed.
- .3 The service pipe shall be completely removed within the municipal roadway right-of-way.

5.11.3 Service Records

- .1 For new developments, the Developer's Consultant shall provide detailed service reports for all installed services.
- .2 Service reports shall provide information related to pipe diameter, invert elevations at the property line, location of services (relative to property line(s), manholes, or water valves), and lot number.
- .3 A blank service report is provided at the end of **Section 2**.

5.12 Additional Considerations

5.12.1 Soil Conditions

- .1 Special design requirements such as pipe foundations, special bedding, anchors, etc. may be required for extreme soil conditions. All special designs are subject to approval from the Municipality.

5.12.2 Cold Weather

- .1 Some communities in the northern portion of the Municipality (such as Fort Chipewyan) may encounter shallow bedrock and achieving the minimum depth of cover as per **Section 5.7** may not be feasible.
- .1 All sanitary mains and manholes in northern communities shall be insulated. The Consulting Engineer shall determine the insulation requirements on a case-by-case basis. Pre-insulated pipe is preferred.

5.13 Low Pressure Systems

5.13.1 Isolation Valves

- .1 Isolation valves, at a maximum spacing of 300 m, are required along the main line as a means to isolate a section for servicing, repair, or regular maintenance.
- .2 Isolation valves shall be installed at intersections to allow each branch to be isolated.
 - .1 3 valves are required at cross intersections, and
 - .2 2 valves are required at tee intersections.
- .3 Isolation valves shall be plug valves or ball valves, equipped with a gear actuator and non-rising stem capable of being operable from ground level.
- .4 Refer to the Standard Details in **Section 13**.

5.13.2 Flush Points

- .1 Flush points are required at the end of every branch, at intermediate points (maximum spacing of 300 m) on long stretches of pipe, and at low points.
- .2 Refer to the Standard Details in **Section 13**.

5.13.3 Discharge Manholes

- .1 Refer to the Standard Details in **Section 13**.
- .2 Manhole frames and covers shall be exposed when located in landscaped areas.
- .3 To abandon a manhole, plug all pipes with non-shrink grout, remove and dispose the manhole to 1.0 m below the ground surface, and fill the remainder of the manhole with fillcrete.

5.13.4 Combination Air Release/Vacuum Valves

- .1 Combination air release/vacuum valves are required at high points along the main line, or wherever needed to release entrapped air during normal operation when pumps stop or the sewer is drained.
- .2 Refer to the Standard Details in **Section 13**.

5.13.5 STEP Systems

- .1 Refer to the Municipality's *Rural Water and Sewer (RWSS) Service Connection Guidelines*, available on the Municipality's website, for service connection details for STEP systems.
- .2 The information in the *Rural Water and Sewer (RWSS) Service Connection Guidelines* are guidelines to assist property owners and Contractors in completing the on-property installation of a STEP system.
- .3 Any work completed on private property by the owner is the sole responsibility of the property owner.

5.14 Private Sewage Systems

- .1 All installations of private sewage systems shall be in accordance with the Safety Codes Council's *Alberta Private Sewage Systems – Standard of Practice*.
- .2 In general, private sewage systems are required for rural residential and industrial/commercial developments without reasonable access to a common sewage collection and disposal system.
- .3 The owner of a private sewage system shall ensure the system:
 - .1 Is maintained.
 - .2 Is operated within the design parameters of the system, and
 - .3 Effectively treats and disposes of the sewage and effluent.
- .4 The Consulting Engineer is responsible for selecting a septic tank of the appropriate size for the development.
- .5 An access road to the tank is required and shall be designed to accommodate sewage collection truck wheel loads. Refer to [Section 4](#).
- .6 The on-site sanitary collection system shall utilize a septic tank.
 - .1 The use of septic fields is prohibited in any hamlets or urban service areas within the Regional Municipality of Wood Buffalo.

5.15 Approved Materials

5.15.1 Pipe

5.15.1.1 General

- .1 Pipe materials shall be selected using the information in [Tables 5-9](#) through [5-11](#) as a guide.
- .2 The Consulting Engineer is responsible to confirm that the selected pipe material and class is suitable for the proposed application (e.g., site conditions, depth of installation, etc.).
- .3 Alternative pipe materials will be evaluated through a Deviation request submitted by the Consulting Engineer. The Consulting Engineer shall provide justification for the request for Deviation.
- .4 Alternative pipe materials shall not be installed without receiving written authorization from the Municipality.

5.15.1.2 Gravity Sewers

- .1 Approved pipe materials for gravity sanitary sewers are identified in [Table 5-9](#).

Table 5-9 Approved Pipe Materials for Gravity Sanitary Sewers

Material	Specification
PVC DR35	ASTM D3034, CSA B182.2
Steel (for casing pipes)	ASTM A252/A252M, CSA Z245.1, Grade as required by design
Reinforced Concrete	ASTM C76M, CSA A257.2, Class as required by design

5.15.1.3 Low Pressure Sewers

- .1 Approved pipe materials for low pressure sanitary sewers and forcemains are identified in [Table 5-10](#).

Table 5-10 Approved Pipe Materials for Low Pressure Sanitary Sewers and Forcemains

Material	Specification
HDPE DR11*	AWWA C906, DR11 or as required by design
Steel (for casing pipes)	ASTM A252/A252M, CSA Z245.1, Grade as required by design

*or as required by design

5.15.1.4 Services

- .1 Approved pipe materials for sanitary services are identified in [Table 5-11](#).

Table 5-11 Approved Pipe Materials for Sanitary Services

Application	Material	Specification
Gravity services larger than 150 mm	PVC DR35	ASTM D3034, CSA B182.2
150 mm gravity services	PVC DR28	ASTM D3034, CSA B182.2
Low pressure services	HDPE DR11*	AWWA C906

*or as required by design

5.15.2 Manholes

- .1 Refer to the Standard Details in [Section 13](#).
- .2 Precast manhole sections and grade rings shall conform to CSA A257.4 and shall be manufactured using sulphate-resistant Type HS cement.
- .3 Manhole sections shall be precast reinforced concrete sections conforming to ASTM C478/C478M and CSA A257.4.
- .1 All precast units shall be marked with manufacturer's identification, date of casting, type of cement, and CSA standard.
- .4 Manhole steps shall be standard safety type, aluminium forged of 6061-T6 alloy having a minimum tensile strength of 260 MPa.
- .5 All manhole sections shall have flexible watertight joints sealed with rubber gaskets conforming to ASTM C443M.

- .6 In areas where the water table is above the bottom of the manhole:
 - .1 A waterproofing admixture shall be added to the concrete mix design. In addition, the outer surface of the manhole, including under the base, shall be covered by a fully sealed exterior waterproofing membrane.
 - .2 Consideration shall be made to fastening the barrels of the manhole together to reduce lift from frost action and minimize the risk of infiltration.
 - .3 Buoyancy proofing may also be required, at the discretion of the Consulting Engineer.
- .7 Manholes shall be fitted with the appropriate cast iron frame and cover conforming to Class 35B ASTM A48/A48M; refer to the Standard Details in **Section 13**.
 - .1 All castings shall be true to form and dimension, and shall be free from faults, sponginess, cracks, blowholes, and other defects affecting their strength.
 - .2 Sanitary manhole covers shall be labelled "SANITARY".
 - .3 All manholes in unpaved or landscaped areas shall include a provision to secure the frame to the manhole cover.
- .8 Pre-benched manhole bases shall be used wherever possible, with pre-formed connection holes and watertight Duraseal or A-Lok joints or approved equivalent.
- .9 Perched manholes are required when adding a manhole along an existing sanitary sewer.
- .10 Pipe components of tee riser manholes shall conform to CSA 257.2 and ASTM C76M; manhole riser components of tee riser manholes shall conform to CSA A257.4 and ASTM C478/C478M.

5.15.3 Pipe Bedding

- .1 Granular material for bedding of pipes in sound, dry soils shall be Class B sand as per the Municipality's *Standard Construction Specifications*.
- .2 Washed rock wrapped in filter cloth shall be used in areas with high water table.
 - .1 Rock shall be washed, crushed, or screened stone or gravel consisting of hard and durable particles meeting the gradation limits specified in the Municipality's *Standard Construction Specifications* and shall be free from sand, clay, cementitious, organic, and other deleterious material.
- .3 Refer to the Standard Details in **Section 13** for bedding details.

5.15.4 Backfill

- .1 Backfill for trenching shall be supplied and installed as per the Municipality's *Standard Construction Specifications*.
- .2 Trench backfill for emergency repairs in grassed and sodded areas shall use native backfill compacted in 200 mm lifts to 95% of standard proctor density in the zone above the pipe zone bedding. Minimum 150 mm of topsoil must be placed on the top of the backfilled area.
- .3 Refer to the Standard Details in **Section 13** for all other trenching details, including emergency repairs in paved areas.

5.15.5 Corrosion Protection

- .1 All concrete used in the sanitary sewer system shall be made with sulphate-resistant cement.
- .2 A digital (PDF) copy of a specialist's evaluation of cathodic protection requirements shall be supplied to the Municipality for all steel applications.

6 STORMWATER MANAGEMENT

6.1 General

- .1 This section covers the design of stormwater management systems and associated appurtenances to be installed or rehabilitated within the Municipality.
 - .1 Standard Details relating to stormwater management system design and construction are provided in **Section 13**.
- .2 These standards provide the minimum design criteria to be used in the preparation of specifications and drawings. Good engineering practices and designs must prevail on all projects and these standards may be exceeded if warranted by the Consulting Engineer.
- .3 The design of stormwater management systems shall meet the requirements of Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems* and shall confirm to the Municipality's *Stormwater Master Plan*.
- .4 Refer to the Municipality's *Standard Construction Specifications* for requirements for the construction of items in this section.

6.2 Stormwater Management Plan

- .1 Stormwater management shall be implemented to achieve the following objectives:
 - .1 Development does not negatively impact downstream stormwater infrastructure or watercourses.
 - .2 Reduce the risk of property damage from flooding during a major (1:100-year) storm event.
 - .3 Reduce surface ponding for minor (1:5-year) storm events.
- .2 Stormwater runoff generated from within a new development shall be routed through a stormwater management facility as required to regulate the rate of outflow prior to discharge, unless otherwise approved by the Municipality.
- .3 Stormwater management facilities shall be designed in accordance with Alberta Environment's *Stormwater Management Guidelines*.
 - .1 Evaporation ponds are not permitted and will not be accepted by the Municipality.
- .4 A phased construction approach to match the expected development sequence may be acceptable, at the discretion of the Municipality, provided the requirements of these standards are met.
 - .1 Temporary stormwater management facilities without the required design components per these standards will not be accepted.
- .5 Prior to submission of any detailed design, a Stormwater Management Report shall be prepared by the Owner and submitted to the Municipality for approval. Refer to **Section 2.10.5.10** for the requirements for Stormwater Management Reports.

6.3 Design Flow

6.3.1 Rational Method

6.3.1.1 General

- .1 The Rational Method is applicable for the design of Minor System components for watersheds smaller than 50 ha.
- .2 The Rational Method formula is:

$$Q_n = C * I * A / 360, \text{ where:}$$

Q_n = design flow for a storm with a return period of "n" years (m^3/s)

C = runoff coefficient (refer to [Section 6.3.1.2](#))

I = rainfall intensity for a storm with a return period of "n" years (mm/hr) (refer to [Section 6.3.1.3](#))

A = drainage area (ha)

6.3.1.2 Runoff Coefficients

- .1 The runoff coefficients for a storm event with a return period of 5 years, summarized in [Tables 6-1](#) and [6-2](#), shall be used in the design of Minor System components.

Table 6-1 1:5 Year Runoff Coefficients Based on Surface

Surface	Runoff Coefficient		
	Flat (0% to 2%)	Average (2% to 7%)	Steep (> 7%)
Hard			
Asphalt		0.95	
Concrete		0.95	
Gravel		0.80	
Roofs		0.95	
Soft			
Sparse Vegetation (grass cover on < 50% of area)	0.34	0.40	0.43
Lawn (grass cover on > 75% of area)	0.23	0.32	0.37
Weeds and Bushes	0.28	0.36	0.40
Dense Wood	0.25	0.34	0.39

Table 6-2 1:5 Year Runoff Coefficients Based on Land Use

Land Use	Runoff Coefficient
Agricultural	0.10
Low Density Residential	0.45
Medium Density Residential	0.60
High Density Residential	0.70
Country Residential	0.15
Commercial	0.75
Industrial	0.75
Institutional	0.75
Park	0.15

- .2 The runoff coefficients for storm events with return periods exceeding 5 years shall be increased from those identified in **Tables 6-1** and **6-2** according to the factors identified in **Table 6-3**, up to a maximum of 0.95.

Table 6-3 1:5 Year Runoff Coefficients Based on Land Use

Design Storm Event	Runoff Coefficient Modification
Greater than 1:5 year, up to 1:25 year	Multiply C by 1.10
Greater than 1:25 year, up to 1:50 year	Multiply C by 1.20
Greater than 1:50 year	Multiply C by 1.25

6.3.1.3 Rate of Precipitation

- .1 The coefficients for the most up-to-date intensity-duration-frequency (IDF) curves, obtained from Environment and Climate Change Canada for the appropriate regional station, for the appropriate storm event, shall be used.
- .1 A storm event with a return period of 5 years shall be used for the design of Minor System components.
- .2 A storm event with a return period of 100 years shall be used for the design of Major System components and critical infrastructure.
- .2 Climate change shall be taken into consideration in the design of stormwater drainage systems. Refer to the Environment and Climate Change Canada website for additional information and resources.
- .3 The time of concentration is the sum of the inlet time and travel time.
- .1 The inlet time is the time required for runoff to become established and drain to the inlet of the storm sewer system. The inlet time shall be as per **Table 6-4** and shall not exceed 10 min.

- .2 The travel time is the time required for the flow to travel within the storm sewer system to the design location. Travel time shall be determined based on the part-full velocity in each pipe upstream of the design location.

Table 6-4 Design Inlet Time

Catchment Area	Imperviousness		
	30%	50%	> 70%
8 ha or less	8 min	8 min	5 min
Between 8 ha and 40 ha	9 min	9 min	6 min
40 ha or more	10 min	10 min	7 min

- .4 When selecting the appropriate regional climate station, the "Six Lakes" site shall be considered the boundary between the Fort McMurray and Fort Chipewyan areas. The regional climate stations are identified in **Table 6 5**.

Table 6-5 Regional Climate Stations

Area	Description	Regional Climate Station ID
Fort McMurray	Areas south of and including "Six Lakes"	3062696
Fort Chipewyan	Areas north of "Six Lakes"	3072659

6.3.2 Computer Modelling

- .1 Computer modelling shall be used for the design of stormwater drainage components for the following:
 - .1 Minor System components for watersheds of 50 ha or larger, and
 - .2 All Major System components.
- .2 Computer modelling is also acceptable for the design of Minor System components for watersheds smaller than 50 ha.
- .3 The selection of an appropriate computer model shall be based on an understanding of the software's principles, assumptions, and limitations in relation to the system being designed.
 - .1 The Consulting Engineer shall confirm the modelling software currently used by the Municipality and shall provide data in a compatible format.
- .4 Chicago design storms ($R = 0.30$) shall be used for modelling conveyance systems and for the evaluation of short duration storage facilities (e.g., Trap Lows located within roadways or parking lots).
- .5 The storm duration used for modelling simulations depends on the type of system being analysed, the drainage basin characteristics, and outlet rates.
 - .1 Shorter duration storms (1 to 4 h) generally govern the design of storm sewer systems
 - .2 Longer duration storms (24 hours) generally govern the design of stormwater management facilities.
 - .3 Several design storm durations shall be evaluated to determine the worst-case scenario for the system being designed.
- .6 The Huff design storm for a storm event with a return period of 100 years and a 24 h duration shall be used for the design of long duration storage facilities (i.e., stormwater management facilities).

6.3.3 Controlled Release Rate

- .1 New development and redevelopment (i.e., infill) shall provide stormwater management to control the release rate from the site.
- .2 The maximum allowable release rate shall be as per the Municipality's *Stormwater Master Plan*.
 - .1 Should downstream infrastructure or waterbodies be unable to accommodate the restricted release rate, the release rate shall be further restricted based on the available downstream capacity.

6.4 Pipe Design

6.4.1 Capacity

- .1 Manning's formula shall be used to calculate the capacity of pipes (e.g., mains, services, catch basin leads) for storm drainage systems.

$$Q_{cap} = (1/n) * A * R_h^{2/3} * s^{1/2}, \text{ where:}$$

Q_{cap} = pipe capacity (m³/s)

n = Manning's roughness coefficient (as per [Table 6-6](#))

A = pipe cross sectional area (m²)

R_h = hydraulic radius (m)

s = pipe slope (m/m)

The pipe cross sectional area is calculated as:

$$A = (\pi/4) * D^2, \text{ where:}$$

D = internal pipe diameter (m)

The hydraulic radius is calculated as:

$$R_h = A / P_w, \text{ where:}$$

P_w = wetted perimeter (m)

The wetted perimeter is calculated as:

$$P_w = \pi * D$$

- .2 [Table 6-6](#) identifies Manning's roughness coefficients for pipes.

Table 6-6 Manning's Roughness Coefficients for Pipes

Pipe Material	Roughness Coefficient, n
Smooth walled (e.g., PVC, concrete)	0.013
Corrugated steel (unpaved)	0.024
Corrugated steel (invert paved)	0.020

6.4.2 Velocity

- .1 Storm sewer systems shall be designed with velocities ranging from 0.9 m/s to 1.0 m/s where feasible.
- .2 Velocities below 0.6 m/s are not permitted.
- .3 The maximum velocity in a storm sewer system shall not exceed 3.0 m/s.
 - .1 Energy dissipation is required in instances where this is not feasible.
- .4 Velocity shall be calculated based on the design (i.e., part-full) flow.

6.4.3 Diameter

- .1 Storm sewer systems shall be sized according to the design flow; however, in no case shall storm sewers be smaller than the minimum pipe sizes identified in [Table 6-7](#).

Table 6-7 Minimum Pipe Sizes for Storm Sewer Systems

Land Use	Minimum Pipe Diameter
Mains & Leads	
Foundation Drain	200 mm
Storm Sewer	300 mm
Catch Basin Lead	250 mm
Services	
Residential	
<i>Single Family</i>	100 mm
<i>Multi-family</i>	150 mm*
Commercial	150 mm*
Institutional	150 mm*
Industrial	150 mm*

Note:

- * Multi-family and non-residential services shall be sized based on the anticipated design flow/release rate; however, in no case shall the services for these types of developments be less than 150 mm in diameter.

6.4.4 Slope

- .1 The minimum pipe slopes for storm drainage systems along straight alignments shall be as per [Table 6-8](#).

Table 6-8 Minimum Pipe Slopes

Nominal Pipe Diameter	Minimum Slope ¹
200 mm	0.60% ²
250 mm	0.60% ²
250 mm	2.0% ³
300 mm	0.23%
375 mm	0.17%
450 mm	0.13%
525 mm	0.11%
600 mm and larger	0.10%

Notes:

¹ The minimum pipe slope for a sewer along a curved alignment shall be 50% greater than the value indicated in [Table 6-8](#) for the corresponding pipe diameter.

² Foundation drain sewers only.

³ Catch basin leads only.

6.4.5 Depth of Cover

- .1 The minimum depth of cover over storm drainage pipes, measured from finished grade to pipe crown, shall be as per [Table 6-9](#).

Table 6-9 Minimum Cover Requirements for Storm Drainage Pipes

Storm Drainage Pipe	Minimum Depth of Cover
Storm sewer mains ¹ in roadways	2.5 m
Storm sewer mains ¹ in landscaped areas	2.5 m
Catch basin leads (at the catch basin)	2.0 m

Note:

¹ Including foundation drain sewer mains.

- .2 The storm sewer shall be designed at a sufficient depth to satisfy the following:
- .1 To permit service connections to basements,
 - .2 To prevent freezing,
 - .3 To clear other underground utilities, and
 - .4 To prevent damage from surface loading.

6.4.6 Horizontal Alignment

- .1 Storm sewer mains shall be located within a municipal road right-of-way, parallel to the roadway centreline; refer to the typical roadway cross sections in **Section 13**.
- .2 The maximum joint deflection for storm sewers along a curved alignment shall be as recommended by the pipe manufacturer.
- .3 Storm sewer mains shall maintain a minimum horizontal separation of 3 m from watermains, sanitary sewers, and Shallow Utilities, unless the sewer depth requires an increased spacing.
- .4 Easements shall be provided for all deep utilities not located within roadway rights-of-way or PULs.
 - .1 A minimum width of 6 m is required for one or two deep utilities.
 - .2 A minimum width of 8 m is required for three deep utilities.

6.4.7 Vertical Alignment

- .1 Storm sewer mains shall maintain a minimum vertical separation of 0.5 m (above or below) at pipe crossings.

6.5 Manholes

6.5.1 General

- .1 Manhole frames and covers shall not be located within sidewalks.
- .2 Manhole frames and covers shall be exposed when located within landscaped areas.

6.5.2 Spacing

- .1 Manholes shall be provided:
 - .1 At the end of each line,
 - .2 At all changes in pipe size, grade, and alignment, and
 - .3 At the beginning and end of curved sections.
- .2 The maximum allowable distance between manholes along a **straight alignment** shall be 120 m.
- .3 The maximum allowable distance between manholes along a **curved alignment** shall be 90 m.

6.5.3 Hydraulic Losses

- .1 Generally, at changes in pipe size, the crown of the upstream pipe shall match the crown of the downstream pipe; however, the upstream 80% flow depth shall not be below the downstream 80% flow depth.
- .2 The minimum drop in invert elevations across manholes shall be as per **Table 6-10**.

Table 6-10 Minimum Drops Across Manholes

Pipe Deflection Across Manhole	Minimum Drop in Invert Elevation
Straight runs (i.e., no deflection)	30 mm
Deflections $\leq 45^\circ$	30 mm
Deflections $> 45^\circ$ and $\leq 90^\circ$	60 mm
Deflections $> 90^\circ$	Use 2 or more manholes

- .3 Extreme changes in invert elevations at manholes shall be avoided wherever possible. A drop manhole is required when the difference between inverts exceeds 1.0 m.
 - .1 Internal drop manholes (rather than external drop manholes) are preferred by the Municipality.
- .4 The following shall be considered when designing drop manholes:
 - .1 Upstream flow shall be sub-critical.
 - .2 The outlet pipe shall be sized such that it does not flow full.
 - .3 A smooth vertical curve shall be formed between the inlet pipe and the drop shaft with no breaks in grade, projections, or edges.
 - .4 The drop shaft diameter shall be equal to or greater than the diameter of the largest inlet pipe.
 - .1 A larger drop shaft is required for multiple connections.
 - .5 Air vents shall be provided.
 - .6 The manhole cover shall be capable of withstanding pressures from air release and surcharging.
 - .7 The outlet shall provide a hydraulic jump basin to dissipate energy, convert the flow to sub-critical, and to allow for the release of air.
- .5 Vortex type drop shafts are preferred; baffled vertical drop shafts are not permitted.
- .6 Internal drop manholes shall be designed to facilitate flushing and maintenance from the surface by:
 - .1 Installing a cross in lieu of a tee, or
 - .2 Coring a 100 mm diameter hole in the top of a tee.
- .7 Benching shall be provided in all manholes to provide a smooth transition from the inlet(s) to the outlet(s), to minimize hydraulic losses, and to prevent the accumulation of debris as per the standards described in **Section 5.10.3.5** except for:
 - .1 Benching on storm pipe diameters greater than 600 mm, the benching half pipe shall be replaced with a 10H:1V side sloped benching channel, minimum 100 mm thick using very low slump, sulfate resistant concrete. Provide super-elevation on large diameter bends.
 - .2 The designer is responsible for addressing design considerations of major junctions, large diameter bends and high velocity sewers.

6.5.4 Abandonment

- .1 Manholes to be abandoned shall be fully removed and disposed off-site, whenever possible.
- .2 When a manhole is to be abandoned in place, plug all pipes with non-shrink grout, remove and dispose the manhole to a minimum of 1.0 m below the ground surface, and fill the remainder of the manhole with fillcrete.

6.6 Catch Basins

- .1 Catch basins shall be of sufficient number and shall have sufficient inlet capacities and catch basin leads to receive and convey the 1:5 year design flow.
- .2 The maximum spacing between catch basins shall be 120 m.
- .3 The maximum flow distance to the first catch basin shall be 150 m.
- .4 Catch basins shall be located:
 - .1 Upstream of crosswalks.
 - .2 To not conflict with curb returns.
 - .3 To not conflict with driveways or alley/commercial crossings.
- .5 Catch basin leads shall have a minimum slope of 2%.
- .6 Catch basin leads shall discharge directly into a storm sewer manhole or catch basin manhole.
 - .1 Catch basins may be connected in series, provided that the downstream catch basin is a catch basin manhole which discharges into a storm sewer manhole.
- .7 The maximum length of a catch basin lead shall be 18 m.
 - .1 Where catch basin leads exceeding 18 m in length are required, a catch basin manhole shall be installed.
- .8 To abandon a catch basin, follow the procedure for the abandonment of manholes as outlined in **Section 6.5.4**.

6.7 Services

6.7.1 New Connections

6.7.1.1 General Requirements

- .1 Refer to the Standard Details in **Section 13**.
- .2 Services shall connect to the storm sewer main (or foundation drain sewer, as appropriate) in the roadway (or the alley, for rehabilitation projects in older neighbourhoods).
 - .1 Service connections to sewer mains located within a side yard PUL or MR are not permitted.
- .3 Service connections shall be designed as a single connection from the main to the property line and shall be located in a common trench with the water and sanitary services.
 - .1 Multi-family residential and non-residential storm and water services require 3 m horizontal separation.

- .4 Storm sewer services for residential lots shall not be located within driveways.
 - .1 This requirement may be relaxed in congested cul-de-sacs, at the discretion of the Municipality.
 - .2 This requirement does not apply to multi-family (e.g., apartment) sites.
- .5 Service connections shall generally terminate 1 m beyond the property line (into private property).
 - .1 If the Shallow Utilities are located within a four-party Easement along the fronts of lots, the service connections shall terminate 1 m beyond the limits of the Shallow Utility Easement.
- .6 The end of service connections shall be adequately capped to prevent the entry of earth, water, or other deleterious materials into the pipe.
- .7 The end of the pipe shall be indicated by a marker stake with the following properties:
 - .1 38 mm x 89 mm wooden post,
 - .2 Post set at the service invert and extending 1 m above the ground surface, and
 - .3 Top 300 mm of the exposed portion of the post painted green.
- .8 Service connections shall have a minimum cover of 2.5 m at the property line, measured from the finished grade to the pipe crown.
- .9 Residential lots shall be provided with only one storm service connection.
 - .1 This includes duplexes and townhomes, provided each unit has a separate Certificate of Title.
 - .2 This does not include high density residential lots, such as apartment or condo buildings.

6.7.1.2 Foundation Drains

- .1 **General:**
 - .1 Foundation drain sewers are required in all urban areas without a storm sewer, drainage PUL, or dedicated drainage swale and shall discharge to the nearest downstream storm sewer.
 - .2 The system shall be dedicated to the collection of foundation drain (also referred to as weeping tile) flows produced from basement sump pump discharge only.
 - .1 The foundation drain sump pump discharge collection system shall be sized to provide the capacity in free flow based on all connected sump pumps operating simultaneously.
 - .3 Roof drains shall not be connected to the foundation drain sewer; refer to **Section 6.7.1.3**.
 - .4 Under no circumstances shall a foundation drain sewer (or service) be discharged to the sanitary system.
 - .5 The Consulting Engineer shall estimate foundation drain/weeping tile flows as part of the detailed geotechnical investigation.
 - .1 The geotechnical investigation shall include an assessment of the pre-development subsurface soil and groundwater conditions and shall describe the anticipated post-development conditions.
 - .2 The geotechnical investigation shall define any special design and construction measures to be taken for foundations or other infrastructure that may be impacted by foundation drain/weeping tile flows.
 - .3 When significant foundation drain flows are anticipated, these flows shall be added to the design flows used to size the storm sewers.

- .4 When high flows are expected (such that sump pumps will pump continuously or run excessively), the Consulting Engineer shall present alternative solution(s) to the Municipality.

.2 Main Lines:

- .1 The depth of the foundation drain sewer shall be adequate to receive the flows from the foundation drain services such that the services can be connected to the sewer above its spring line, within 45° of the pipe crown.
 - .1 The minimum cover, measured from the finished grade to the crown of the sewer, shall be 2.5 m.
 - .2 In areas where it is not feasible to provide minimum cover, alternative solutions shall be discussed with the Municipality.
- .2 The maximum spacing of manholes along a foundation drain sewer shall be 120 m.

.3 Services:

- .1 The on-lot portion of a foundation drainage service shall consist of the following. Refer to the Standard Details in **Section 13**.
 - .1 A sump pump in the basement, with a pressure discharge connection to a foundation drain service riser pipe on the outside of the building foundation, and
 - .2 A foundation drain service connection pipe from the riser connection at the house to the property line.
- .2 The pressure discharge connection to the gravity foundation drain service riser pipe shall be provided with a cleanout and an overflow discharge to a concrete splash pad.
- .3 Installation and maintenance of on-lot components are the responsibility of the homeowner.
- .4 The remainder of the foundation drain service components shall be located within a municipal roadway right-of-way or a PUL and shall consist of:
 - .1 A foundation drain service from the property line to the storm sewer, or
 - .2 A foundation drain service from the property line to a foundation drain sewer (in areas where there is no storm sewer in the street).
- .5 The minimum cover, measured from the finished grade to the crown of the service, at the property line shall be 2.5 m.
 - .1 In areas where it is not feasible to provide minimum cover, alternative solutions shall be discussed with the Municipality.
- .6 Foundation drain services shall have a minimum diameter of 100 mm.
- .7 Foundation drain services shall have a minimum slope of 1.0%.

6.7.1.3 Roof Drainage

- .1 Roof drainage from single family and duplex dwellings shall be discharged to the ground and dispersed via splash pads at the downspouts.
 - .1 The point of discharge shall be a minimum of 1.5 m away from the building (including downspout extensions) to achieve positive drainage.

- .2 Roof drainage from MICI (**m**ulti-family, **i**ndustrial, **c**ommercial, and **i**nstitutional) areas may discharge to the storm sewer, where the new and existing systems are designed to accommodate the direct discharge, and at the discretion of the Municipality.

- .1 MICI sites shall incorporate principles of low impact development (LID) as described in **Section 6.15.2**.

6.7.2 Abandonment

- .1 If a service connection is to be abandoned, a compression type plug shall be installed in the storm service at the connection to the main.
- .2 The service pipe shall be completely removed within the municipal roadway right-of-way.

6.7.3 Service Records

- .1 For new developments, the Developer's Consultant shall provide detailed service reports for all installed services.
- .2 Service reports shall provide information related to pipe diameter, invert elevations at the property line, location of services (relative to property line(s), manholes, or water valves), and lot number.
- .3 A blank service report is provided at the end of **Section 2**.

6.8 Open Channel Design

6.8.1 General

6.8.1.1 Types of Open Channels

- .1 Open channels include:
 - .1 Side and rear yard swales,
 - .2 Roadside ditches, and
 - .3 Drainage Parkways.

6.8.1.2 Swales

- .1 Swales are required to intercept runoff between adjacent private properties where the overall gradient of the land directs surface runoff toward property lines.
- .2 Swales servicing three or more lots shall be within a drainage Easement which shall be registered with the Plan of Subdivision.
 - .1 Drainage Easements shall have a minimum width of the greater of:
 - .1 2 m, or
 - .2 As required to accommodate the anticipated flows.
- .3 Restrictive covenants are required to be registered on the titles of private properties which have drainage Easements (and related infrastructure).
- .4 Swales shall generally be grassed. Concrete swales are required when:
 - .1 The length of a grassed swale would exceed 100 m,

- .2 The swale is designed to accommodate flows from three or more lots, and/or
- .3 The longitudinal slope of the swale is less than 2% (refer to [Section 6.8.4](#)).
- .5 Refer to the Standard Details in [Section 13](#).

6.8.1.3 Roadside Ditches

- .1 Roadside ditches shall collect and convey the runoff from rural roadways.
- .2 The minimum floor elevation for buildings on lots adjacent to a ditch shall be 0.3 m above the 1:100 year water elevation.
- .3 Refer to the Standard Details in [Section 13](#).

6.8.1.4 Drainage Parkways

- .1 Drainage Parkways may be used, at the discretion of the Municipality.
- .2 Drainage Parkways shall be designed in accordance with good engineering practice and shall function similarly to a linear dry pond.

6.8.2 Capacity

- .1 Roadside ditches shall be designed to convey the 1:100 year design flow.
- .1 The 1:100 year design flow shall be contained within the ditch with no flooding of the road surface or adjacent properties.
- .2 Manning's formula shall be used to calculate the capacity of open channels (e.g., swales, ditches) for storm drainage systems.

$$Q_{cap} = (1/n) * A * R_h^{2/3} * s^{1/2}, \text{ where:}$$

Q_{cap} = channel capacity (m³/s)

n = Manning's roughness coefficient (as per [Table 6-11](#))

A = channel cross sectional area (m²)

R_h = hydraulic radius (m)

s = channel longitudinal slope (m/m)

The hydraulic radius is calculated as:

$$R_h = A / P_w, \text{ where:}$$

P_w = wetted perimeter (m)

.3 **Table 6-11** identifies Manning's roughness coefficients for open channels.

Table 6-11 Manning's Roughness Coefficients for Open Channels

Channel Material	Roughness Coefficient, n
Gravel lined channels	0.033
Concrete or asphalt lined channels	0.020
Natural streams	0.050
Grassed channels	0.050

6.8.3 Geometry

- .1 Side yard and rear yard swales shall be designed with the following geometry:
 - .1 Minimum depth of 150 mm,
 - .2 "Vee" cross section, and
 - .3 Maximum side slopes of 4H:1V.
- .2 Ditches shall be designed with the following geometry:
 - .1 Minimum depth of 0.75 m, measured from the toe of the backslope to the bottom of the granular base course, or granular subbase course, as applicable,
 - .1 A deeper ditch may be required, depending on the 1:100 year design flow.
 - .2 Maximum side slope of 4H:1V,
 - .3 Maximum back slope of 3H:1V, and
 - .4 Minimum ditch bottom width of 1.5 m, sloping away from the roadway at a minimum of 5%.
- .3 Drainage Parkways shall be designed with the following geometry:
 - .1 Minimum ditch bottom width of 3 m, sloping inward to a low flow channel installed along the centreline of the ditch bottom, and
 - .2 Maximum side slopes of 5H:1V.
- .4 Terraced side slopes are required when the depth of a Drainage Parkway exceeds 3 m.
 - .1 Terraces shall have a minimum width of 3 m.

6.8.4 Longitudinal Slope

- .1 Grassed swales may be used for longitudinal slopes of at least 2%, with provision for erosion protection.
 - .1 Concrete swales shall be used where the longitudinal slope of the swale is less than 2%.
- .2 The minimum allowable roadside ditch grade shall be 0.5%.
- .3 Ditches with grades exceeding 2% shall be protected against erosion. Steep ditches may require drop structures.

6.8.5 Horizontal Alignment

- .1 Side yard (and rear yard, where applicable) swales shall be aligned with the centreline of the swale coinciding with the shared property line between two lots.
- .2 Where a swale is required parallel to a fence, the preference is for the swale to be on the south or east side of the fence, to maximize sun exposure (e.g., for ice melt).
- .3 Roadside ditches shall follow the alignment of the roadway.
- .4 Drainage Parkways shall be aligned to provide a minimum horizontal separation of 1.5 m between the top of slope and the adjacent property line.

6.8.6 Vertical Alignment

- .1 Design consideration shall be given to the proper interception of lateral flow into the swale and the discharge of the flow across sidewalks at the ends of the swale.
- .2 The vertical alignment of roadside ditches shall be such that positive drainage is maintained along the roadway (i.e., the vertical alignment of roadside ditches may not necessarily match the vertical alignment of the roadway).

6.9 Culvert Design

6.9.1 Capacity

- .1 Culverts shall be designed to convey the 1:100 year design flow.
- .2 Culverts shall be sized using the inlet and outlet control methods referred to in the following documents, as appropriate.
 - .1 The Corrugated Steel Pipe Institute's *Handbook of Steel Drainage and Highway Construction Products*,
 - .2 The Portland Cement Association's *Handbook of Concrete Culvert Pipe Hydraulics*, or
 - .3 Alberta Transportation's *Design Guidelines for Bridge Size Culverts*.

6.9.2 Diameter

- .1 Culverts shall be sized according to the design flow; however, in no case shall culverts be smaller than the minimum pipe sizes identified in **Table 6-12**.

Table 6-12 Minimum Pipe Sizes for Culverts

Application	Minimum Pipe Diameter
Roadway	600 mm
Residential Driveway	600 mm
Non-Residential Driveway	600 mm
Trail	300 mm

6.9.3 Depth of Cover

- .1 The minimum depth of cover over culverts, measured from finished grade to pipe crown, shall be as per **Table 6-13**.

Table 6-13 Minimum Cover Requirements for Storm Drainage Pipes

Storm Drainage Pipe	Minimum Depth of Cover
Culverts across roadways	Greater of half the culvert diameter, or 1.0 m
Driveway and trail culverts	Greater of half the culvert diameter, or 0.5 m

6.9.4 End Treatment

- .1 Riprap, complete with geotextile, shall be placed around the inlet and outlet of all culverts; refer to the Standard Details in **Section 13**.
 - .1 The rip rap shall meet the gradation identified in the Municipality's *Standard Construction Specifications*.
 - .2 The rip rap and geotextile shall be installed as per the Municipality's *Standard Construction Specifications*.
- .2 When concrete headwalls are required, they shall be designed to suit the specific application.
 - .1 When bar screens are required, they shall be mounted to the concrete headwall. Bar screens shall not be installed inside the culvert barrel.

6.9.5 Length

- .1 Culverts of excessive length require an intermediate access point (e.g., a catch basin or manhole), at the discretion of the Municipality.

6.10 Roadway Base Drainage

- .1 Urban roadways shall be constructed to have continuous longitudinal subgrade drainage (wick drains).
- .2 Wick drains shall be installed adjacent to the curb line at the bottom of the granular base course, on both sides of roadways, or along the centreline of alleys.
- .3 Wick drains shall generally be installed at the same longitudinal grade as the curb and gutter; in no case shall the grade of the wick drain be less than 0.6%.
- .4 Wick drains shall be connected to catch basins.

6.11 Site and Lot Grading

6.11.1 General

- .1 Cross lot drainage is prohibited.
- .2 Lots shall be graded to protect private property and critical infrastructure by directing surface runoff and groundwater away from buildings and into the municipal drainage system.
- .3 All retaining walls and/or drainage Easements shall be registered on title.

- .4 If a retaining wall is required between adjacent lots, the swale shall be constructed above the retaining wall.

6.11.2 Rough Grading

- .1 Lots shall be rough graded to allow for earth balancing of future basement excavation and landscaping.
- .2 Rough grading shall ensure positive drainage is maintained until the lots are developed.
 - .1 The Owner shall be responsible for removing and properly disposing of standing water on lots.
 - .2 Rough grading of lots to ensure positive drainage is required prior to requesting a joint municipal CCC inspection.
- .3 Rough grading shall be carried out without damage to the root and branch systems of existing plant material to be retained.
- .4 Sites requiring topsoil shall be rough graded to within:
 - .1 150 mm of finish grade in areas to be seeded, or to within
 - .2 100 mm of finish grade in areas to be sodded.
- .5 Grades at the toes of slopes and banks shall be smoothly rounded.
 - .1 Slopes, banks, and disturbed areas shall be feathered to meet existing grades.
- .6 The slope of a berm shall not exceed 4H:1V.
 - .1 Slopes of 3H:1V may be acceptable in areas of minimum pedestrian traffic and for the side slopes of drainage swales, at the discretion of the Municipality.

6.11.3 Finish Grading

- .1 Each lot shall be graded to drain to the municipal storm drainage system.
- .2 Rear to front drainage shall be provided wherever possible.
- .3 Split drainage and front-to-back drainage is only permitted when the lot is located such that there is a roadway, alley, public right-of-way, or stormwater management facility at both the front and back of the lot.
- .4 Areas around buildings shall be graded away from the foundations; refer to the Standard Details in **Section 13** for typical grading requirements.
- .5 Lots lower than adjacent roadways shall be avoided.
- .6 Building foundations shall be above the Major System hydraulic grade line for a storm with a return period of 100 years, plus a 0.3 m minimum freeboard.
 - .1 This requirement may not apply to replacement of structures/developments within existing floodplains.
 - .1 In these areas, the Consulting Engineer shall propose suitable precautions, such as mounting electrical panels above the 1:100 year hydraulic grade line.
- .7 Reserves and public lands shall be graded to drain towards developed streets, alleys, and/or the municipal storm drainage system.

6.11.4 Grading Tolerances

- .1 The Owner shall ensure that all lots are graded in accordance with the approved lot grading plan.
 - .1 Rough grading tolerance: 100 mm below finished grade.
 - .2 Finish grading tolerance: within 25 mm of finished grade.

6.12 Stormwater Management Facilities

6.12.1 General

- .1 Stormwater management facilities shall be sized such that there will be storage for a 1:100-year storm event.
- .2 The approximate location of new stormwater management facilities shall be in accordance with the applicable Area Structure Plan or Outline Plan.
 - .1 A maximum of one or two stormwater management facilities shall manage the runoff from a single quarter section.
- .3 The footings of lots surrounding a stormwater management facility shall be a minimum of 0.3 m above the high water level (the water level associated with a 1:100-year storm event).
- .4 The lowest building opening for lots surrounding a stormwater management facility shall be a minimum of 0.5 m above the high water level.
- .5 Discharge from stormwater management facilities shall be by gravity.

6.12.2 Approval By Others

- .1 Stormwater management facilities and associated infrastructure require approval from Alberta Environment.

6.12.3 Types of Storage Facilities

- .1 The following types of storage facilities are acceptable. The type of facility to be used shall be assessed on a case-by-case basis.
 - .1 **Dry Ponds** - temporarily store stormwater runoff to promote the settlement of runoff pollutants and to restrict discharge to predetermined levels to reduce downstream flooding and erosion potentials.
 - .1 They are often designed as two-stage facilities: the upper stage (flood fringe area) is designed to store large, infrequent storms; the lower stage (extended detention storage) is designed to store and promote Sedimentation of smaller, more frequent storms.
 - .2 The lower stage is designed to empty completely between storm events.
 - .3 Dry ponds shall only be used when topographical or planning constraints exist which limit the use of wet ponds or constructed wetlands.
 - .2 **Wet Ponds** - temporarily store stormwater runoff to promote the settlement of runoff pollutants and to restrict discharge to predetermined levels to reduce downstream flooding and erosion potentials.
 - .1 They are often designed as two-stage facilities: the upper stage (flood fringe area) is designed to store large, infrequent storms; the lower stage (extended detention storage) is designed to store and promote Sedimentation of smaller, more frequent storms.

- .3 **Constructed Wetlands** – improve water quality and control peak discharge rates by retaining runoff for a prolonged period.
 - .1 Relatively deep permanent pools are maintained at the inlet and outlet and along low flow paths to minimize resuspension of settled pollutants.
 - .2 Relatively shallow extended detention storage areas with extensive plantings (submergent and emergent) make up the majority of the permanent storage.

6.12.4 Flow Control

- .1 Stormwater management facilities require an outlet control structure to limit the rate of discharge.
 - .1 Water release shall be controlled via an orifice or other accepted means and shall include provisions for increasing the release rate in an emergency.
 - .1 Outflow piping shall be sized for a flow twice that of the maximum allowable release rate.
- .2 The Consulting Engineer shall submit a design for the outlet control structure, detailing:
 - .1 Size and configuration of the concrete chamber,
 - .2 Type of lockable hatch,
 - .3 How the structure will be accessed for maintenance (all-weather access suitable for a vac truck is required),
 - .4 Locations of safety railings around the hatches,
 - .5 Provision for kickplates at the base of railings,
 - .6 Locations and models of davit bases (if required – Consulting Engineer to discuss this requirement with the Municipality),
 - .7 Locations and models of water level control gates (if required), and
 - .8 Location and size of orifice and provisions for increasing the release rate for rapid drawdown.

6.12.5 Planning

- .1 When possible, preserve existing wetlands by incorporating them into the stormwater management plan.

6.12.6 Geotechnical Considerations

- .1 A geotechnical investigation is required to support the design of all stormwater management facilities.
- .2 The geotechnical investigation shall determine:
 - .1 The suitability of the native soil for berm construction and shall provide recommendations for imported material, as required,
 - .2 The salinity of the soil, and whether other potential contaminants are present, and
 - .3 The elevation of the groundwater table.
 - .1 When a stormwater management facility is located above a shallow aquifer, the potential for groundwater contamination shall be minimized.

6.12.7 Water Quality

- .1 Stormwater management facilities shall be designed to meet provincial and federal regulations for water quality.

6.12.8 Design of Dry Ponds

- .1 Dry ponds shall be offline storage. A low flow bypass shall direct storm runoff around the dry pond during minor (up to 1:5-year) rain events.
- .2 Dry ponds shall be located within a PUL which covers up to the 5-year water level.
- .3 Side slopes shall not be steeper than 5H:1V within public property and shall not be steeper than 7H:1V within private property.
- .4 The pond bottom shall be graded to provide positive drainage to the outlet, within a minimum longitudinal slope of 2% and minimum lateral slope of 1.5%.
 - .1 A French drain may be required below the invert of the longitudinal slope, depending on the intended recreational use of the dry pond.
- .5 All surfaces, including the bottom, shall be topsoiled and seeded or sodded (refer to [Section 10](#)), except for the low flow channel which shall be a rip rapped channel or planted with aquatic plant material.
- .6 The maximum storage depth shall be 1.5 m, as measured from the invert of the outlet pipe.
- .7 Dry ponds shall be designed as an amenity to the development with Open Space for passive play and links to pedestrian walkways for use by the public.

6.12.9 Design of Wet Ponds

- .1 Wet ponds shall have a minimum surface area at normal water level (NWL) of 2 ha.
 - .1 If a wet pond is not to become a publicly owned and maintained facility, a surface area of less than 2 ha may be permitted, upon approval from the Municipality and Alberta Environment.
- .2 The active storage depth shall be as required to provide storage for a 1:100-year storm event.
- .3 An impervious pond bottom shall be constructed of material with a permeability coefficient in the order of 1×10^{-6} cm/s.
- .4 A minimum pond depth of 2 m, from pond bottom to NWL is required; however, a 3 m depth is preferred.
- .5 Dead bay areas are not permitted.
- .6 Inlets and outlets shall be located to maximize the detention time and circulation within the wet pond.
- .7 All inlet and outlet pipes shall be submerged a minimum of 1.2 m below NWL and shall be marked by a post at the surface.
 - .1 Inlet and outlet pipe inverts shall be a minimum of 150 mm above the pond bottom.
- .8 The side slopes of the pond shall:
 - .1 Not be steeper than 7H:1V from freeboard elevation to 1 m below NWL.
 - .1 When space limitations exist, side slopes of 5H:1V may be permitted, at the discretion of the Municipality.

- .2 Not be steeper than 3H:1V from the pond bottom to 1 m below NWL.
- .9 The NWL elevation shall be such that the collection system shall not surcharge to an elevation greater than the lowest catch basin invert in the collection system during a 1:5-year storm.
- .10 The shoreline treatment of the pond shall consist of a band of granular material, from 0.3 m above to 0.3 m below NWL, on top of woven polypropylene geotextile fabric.
 - .1 The granular material shall be:
 - .1 Chemically sterilized,
 - .2 75 mm minimum size,
 - .3 Installed in a 250 mm thick layer.
 - .2 An evaluation of wave action shall be made and, if necessary, additional bank protection shall be provided.
- .11 A buffer strip shall be provided between NWL and the 1:25-year flood level.
 - .1 The difference between the NWL and the 1:25-year flood level shall be limited to 1 m of vertical rise.
- .12 The wet pond design shall incorporate a pedestrian pathway, above the 1:25-year water level, connected to the regional trail network; refer to **Section 10**.
- .13 Wet ponds shall be designed to minimize the risk of water stagnation and the propagation of algal blooms.
 - .1 The Consulting Engineer shall provide calculations demonstrating that the combination of annual turnover-rate, aerators, and fountains is sufficient to prevent issues arising from stagnation.
 - .2 The following requirements apply to **powered aerators**:
 - .1 A 100-amp 120/240 VAC single phase service shall be provided to a double-sided free standing rodent-proof cabinet.
 - .1 The cabinet shall be a CSA rated enclosure, Type 4X on the controls side and 3R on the power side. Colour shall be at the discretion of the Municipality.
 - .2 A 24 circuit panel board shall be provided on the power side of the cabinet.
 - .3 The cabinet shall be located on a precast concrete base, with underground conduits.
 - .1 The bottom of concrete base shall be installed at freeboard elevation, within the PUL and away from any membranes.
 - .4 The controls side of the cabinet shall have a thermostat-controlled heater with desiccant packets inside the cabinet for vapour control.
 - .2 Controls for powered aerators shall include real-time based timers to control the spray pump at set times.
 - .3 Any exterior lighting shall be photocell-controlled.
 - .4 All cabinet penetrations shall be sealed with polywater foam duct seal.

6.12.10 Design of Constructed Wetlands

- .1 This section applies to constructed wetlands for the purposes of stormwater management and do not pertain to wetlands that are constructed as a replacement to offset the loss of Provincial wetland area.
- .2 The size of a constructed wetland should be approximately 5% of the watershed area that it will be servicing.
- .3 Approximately 25% of the surface area at NWL should consist of deep pools (at inlet(s) and the outlet) which are 2.4 m to 3.0 m deep to allow for settlement of suspended solids.
- .4 The average permanent wetland water depth shall be 0.3 m with 1 m deep zones for flow redistribution and for fish and submerged or floating aquatic vegetation habitat.
- .5 Active storage shall be 0.3 m to 0.6 m deep. Fluctuation in excess of 1 m above NWL should be infrequent to avoid killing vegetation.
- .6 The NWL elevation shall be such that the collection system shall not surcharge to an elevation greater than the lowest catch basin invert in the collection system during a 1:5-year storm event.
- .7 The side slopes shall generally be no steeper than 7H:1V; however, where space limitations exist, the side slopes may be as steep as 5H:1V.
- .8 A length to width ratio of 3:1 is preferred; however, if space limitations exist, the length to width ratio may be as low as 1:1, provided that additional considerations are made to maximize the travel time through the wetland for treatment and to avoid short-circuiting.
- .9 The deep zones shall be sloped at 1.0% from inlet to outlet.
- .10 The shallow marshy areas shall have a smooth bottom to promote sheet flow through the system.
- .11 An impervious wetland bottom shall be constructed of material with a permeability coefficient in the order of 1×10^{-6} cm/s.
- .12 Dead bay areas are not permitted.
- .13 All inlet and outlet pipes shall be submerged a minimum of 1.2 m below NWL and shall be marked by a post at the surface.
 - .1 Inlet and outlet pipe inverts shall be a minimum of 150 mm above the wetland bottom.
- .14 Design with the landscape, not against it; take advantage of natural topography and drainage patterns.
- .15 Incorporate as much "edge" as possible and design in conjunction with a buffer and the surrounding land and aquatic systems.
- .16 Design to protect the wetland from any potential high flows and sediment loads.
- .17 Design for self-sustainability and to minimize maintenance; however, an all-weather maintenance access is required to all deep pool areas for sediment removal.
- .18 The constructed wetland design shall incorporate a pedestrian pathway, above the 1:25-year water level, connected to the regional trail network; refer to **Section 10**.

6.12.11 Emergency Overflow

- .1 An emergency overland drainage swale shall be provided from the downstream end of the stormwater management facility to the receiving stream.
 - .1 The emergency overland drainage swale shall have the capacity to transport storm runoff should a malfunction in the downstream piped system occur.
- .2 If an emergency overland flow path to the receiving channel is not feasible, the stormwater management facility shall be sized to be able to accommodate two back-to-back 1:100-year storm events.
 - .1 This may be achieved by proving that the combined available storage in the active zone and freeboard zone are sufficient to store the second 1:100-year storm event after 96 h.
 - .2 If the drawdown time from the first 1:100-year storm event is longer than 96 h, the Consulting Engineer shall take into consideration that the full active storage zone is not available for the second storm event, which may result in additional freeboard being required.

6.12.12 Landscaping

- .1 The landscaping requirements for stormwater management facilities are outlined in **Section 10**.

6.12.13 Signage

- .1 Wet ponds and constructed wetlands require warning signs, posted along the perimeter of the PUL, to prohibit activities which may present a danger to public health and/or safety or which may interfere with the operation of the facility.
- .2 Refer to the Standard Details in **Section 13**.

6.12.14 Vehicle Access

- .1 Where walkways to and/or around a stormwater management facility have a secondary function as a maintenance access, the walkway shall be designed to accommodate a vac truck.
 - .1 Turf reinforcement matting shall be placed underneath the walkway, extending beyond the width of the walkway to a minimum width as per **clause 6.12.14.4.3**.
- .2 The alignment of the vehicle access shall follow the most direct route between the municipal roadway and the stormwater management facility.
- .3 The design of the vehicle access and working area shall be site-specific and the geotechnical investigation shall provide recommendations for the vehicle access structure.
- .4 The Consulting Engineer shall take into consideration the following
 - .1 The vehicle access, including the granular road structure and turning radii, shall be designed to accommodate a vac truck.
 - .2 The granular road structure shall be as per the recommendations of the geotechnical report, or as per the requirements for alleys (refer to **Section 4**), whichever is more stringent.
 - .3 The vehicle access shall have a minimum width of 4.5 m.
 - .4 A working area of 500 m² shall be provided at structures.
 - .5 The side slopes of the stormwater management facility shall be reduced at boat launches.

- .6 Boat launches shall be provided with turf reinforcement matting, capable of supporting turf establishment and vehicle loading.

6.12.15 Recreation

- .1 Recreational use of wet and dry ponds shall be regulated by the Municipality.
- .2 Recreational uses are not permitted for constructed wetlands.
- .3 Suitable Recreation Facilities such as bicycle trails, benches, trees, etc. shall be provided for stormwater management facilities; refer to **Section 10**.
- .4 Primary recreational activities will not be allowed on or in wet ponds.
 - .1 Signage shall be posted indicating that recreational activities (i.e., all water-based activities, such as boating, swimming, wading, and winter activities, including ice skating) are prohibited.

6.12.16 Boundary Control and Use

- .1 All stormwater management facility and shoreline areas, up to the HWL, shall be within a PUL.
- .2 Land above the 1:100-year design storm event flood level within lots that back onto a stormwater management facility, when no overflow is provided, shall be protected by a restrictive covenant registered against the title of the property.
 - .1 The restrictive covenant shall indicate that the land is subject to flooding and that the landowner shall not construct any permanent structures susceptible to flood damage within the area covered by the restrictive covenant.
- .3 If the provision of public access to the shoreline is being considered, fencing of a uniform type shall be constructed along the HWL elevation, to separate public from private lands.
- .4 Noxious industrial land uses are considered unacceptable adjacent to or upstream of stormwater management facilities.
- .5 Minimum lot dimensions and rear yard depths, as measured from the property line, shall conform to the requirements of the Municipality's Land Use Bylaw and relevant Area Structure Plan/Outline Plan.

6.12.17 Legal Liability and Safety

- .1 Given that primary water contact (i.e., swimming and wading) are prohibited, supervision will not be provided.
- .2 Proper and adequate signage to alert people to the potential hazards ("No Swimming - Deep Water", "Danger - Thin Ice - Keep Off", "Subject to Flooding", etc.) shall be provided; refer to the Standard Details in **Section 13**.
- .3 Fencing requirements shall be determined during detailed design, through discussions with the Municipality.
- .4 Lighting, in accordance with the service provider's requirements, shall be provided at the interface between the stormwater management facility and the adjacent land.
 - .1 Additional lighting requirements shall be determined during detailed design, through discussions with the Municipality.

- .2 Full cut-off light fixtures shall be considered in areas where light pollution is undesirable.

6.13 Outfalls

- .1 A hydraulic analysis is required for outfalls, to ensure that exit velocities will not negatively impact natural watercourses.
- .2 Outfalls shall be designed by the Consulting Engineer to suit the particular application and site conditions.
- .3 Appropriate erosion control measures, including drop structures and/or energy dissipators, shall be provided downstream of the outfall; refer to **Section 12** for more information.
- .4 Outfalls shall be constructed with lockable grates to allow maintenance but prevent the entry of unauthorized personnel.
 - .1 There shall be a maximum clear distance of 150 mm between bars on grates.
 - .2 The grate shall be anchored to the outfall structure.
 - .3 Grated outfalls shall be designed to accommodate twice the required hydraulic capacity.
- .5 Where required, guardrails, and/or fences shall be installed to provide fall protection.
- .6 Outfall structures shall be designed with consideration of aesthetics as they are generally located within parks, ravines, and on riverbanks.
- .7 Concrete end treatment is recommended.
- .8 Where possible, outfalls shall be located above the 1:100-year water level in the receiving watercourse, to minimize the risk of damage from ice and/or backwater effects.
- .9 An all-weather vehicle access shall be provided to the outfall for maintenance purposes.
 - .1 Space shall be provided such that a maintenance vehicle can park within 2 m of the gate for removal.
 - .2 Access gates through the railings are required, to allow pedestrian access to the headwall for maintenance and inspection, as required.
- .10 Outfalls require flap gates to prevent sediment from entering the storm sewer system during high water events.

6.14 Trap Lows

- .1 Trap Lows may be implemented on roadways and within parking lots to temporarily detain runoff during major storm events.
- .2 The maximum depth of ponding shall be as per **Table 6-14**.

Table 6-14 Maximum Depth of Ponding in Trap Lows

Application	Maximum Depth of Ponding
Arterial Roadway	150 mm
Collector Roadway	350 mm
Local Roadway	350 mm
Parking Lot	350 mm

- .3 A minimum freeboard of 300 mm shall be provided between the HWL of the Trap Low and the nearest building entrance(s).
- .4 When trapped low areas are included in the design of the overland stormwater drainage system, and where the HWL of the trapped low area will result in water ponding on private property, the land within each affected lot shall be protected by a restrictive covenant registered against the title of the property.
 - .1 The restrictive covenant shall indicate that the land is subject to flooding and that the landowner shall not construct any permanent structures susceptible to flood damage within the area covered by the restrictive covenant.
- .5 All Trap Low areas shall be indicated on the Stormwater Management Plan and Lot Grading Plan.

6.15 Additional Considerations

6.15.1 Best Management Practices

- .1 Erosion and Sedimentation controls shall adhere to best management practices as directed by the RMWB ECO Plan Framework.
- .2 The selection and design of stormwater BMPs shall consider both water quality and quantity.
 - .1 Current stormwater quality criteria within the Municipality requires the removal of 85% TSS for particle sizes of 75 µm or greater.
- .3 The use of BMPs is recommended for all sites; however, BMPs are required for the following sites, at a minimum:
 - .1 Commercial or light industrial sites greater than 2 ha,
 - .2 Gas stations, auto repair/maintenance facilities, car washes, and sites with on-site fuel storage, and
 - .3 Heavy industrial and manufacturing sites.
- .4 In conjunction with BMPs, an oil and grit separator (OGS) is required for the sites listed in [clause 6.15.1.3](#).
 - .1 The OGS shall be installed upstream of an inspection manhole located on the site's storm service.
 - .2 The inspection manhole shall be located 0.6 m from the property line, within the municipal roadway right-of-way.
 - .3 The OGS shall be located on private property and the property owner is responsible for operation and maintenance of the OGS.

6.15.2 Low Impact Development

6.15.2.1 General

- .1 The implementation of low impact development (LID) measures, to promote infiltration and reduce runoff from minor storm events, is encouraged for new developments.
- .2 LID measures are site-specific and shall be developed based on industry best practices and input from the geotechnical Consulting Engineer, Consultant, and the Municipality.
- .3 Examples of LID measures include:
 - .1 Deep, absorbent soil under soft landscaped areas,
 - .1 When this method is used adjacent to roadways, subgrade protection is required.
 - .2 Sandy engineered soils under landscaping to promote bio-filtration,
 - .3 Rainwater harvesting for on-site irrigation or re-use,
 - .4 Subsurface stormwater management systems for groundwater recharge (where appropriate soil and groundwater conditions exist),
 - .5 Natural vegetation which requires less maintenance and/or irrigation,
 - .6 Retaining existing vegetation (e.g., trees with canopies and deep roots),
 - .7 Engineered bioswales and/or naturalized channels for the conveyance of stormwater (refer to [Section 6.15.2.2](#)), and
 - .8 Green roofs on buildings.

6.15.2.2 Bioswales

- .1 Bioswales shall be designed to:
 - .1 Convey stormwater,
 - .2 Promote infiltration to reduce runoff, and
 - .3 Capture sediment and absorb nutrients.
- .2 Bioswales shall be designed such that maintenance over time is minimal.
- .3 Bioswales may be used:
 - .1 Within drainage Easements/PULs,
 - .2 Along the rear or side yards of industrial or commercial lots, and
 - .3 Within passive recreational and Maintained Parks sites.
- .4 Bioswales adjacent to roadways are not permitted, due to the anticipated impact of road salt and sand from winter operations.
- .5 Refer to [Section 10](#) for more information.

6.15.3 Erosion and Sedimentation Control

- .1 Erosion and Sedimentation controls shall adhere to best management practices as directed by the RMWB ECO Plan Framework

6.15.4 Development Within Floodplain

- .1 Development within a floodplain shall be coordinated with the Municipality to confirm additional requirements.
- .2 Additional analyses to support development within the floodplain may be required, at the discretion of the Municipality.
- .3 Manholes (whether storm or sanitary) installed within a floodplain require watertight covers.

6.16 Approved Materials

6.16.1 Pipe

6.16.1.1 General

- .1 Pipe materials shall be selected using the information in **Tables 6-15** through **6-17** as a guide.
- .2 The Consulting Engineer is responsible to confirm that the selected pipe material and class is suitable for the proposed application (e.g., site conditions, depth of installation, etc.).
- .3 Alternative pipe materials will be evaluated through a Deviation request submitted by the Consulting Engineer. The Consulting Engineer shall provide justification for the request for Deviation.
- .4 Alternative pipe materials shall not be installed without receiving written authorization from the Municipality.

6.16.1.2 Mains and Catch Basin Leads

- .1 Approved pipe materials for storm sewers and catch basin leads are identified in **Table 6-15**.

Table 6-15 Approved Pipe Materials for Storm Sewers and Catch Basin Leads

Material	Specification
PVC DR35	ASTM D3034, CSA B182.2
PVC Open Profile, 320 kPa pipe stiffness	CSA B182.4
HDPE Open Profile, 320 kPa pipe stiffness	CSA B182.8
Reinforced Concrete	ASTM C76M, CSA A257.2, Class as required by design

6.16.1.3 Culverts

- .1 Approved pipe materials for culverts are identified in **Table 6-16**.

Table 6-16 Approved Pipe Materials for Culverts

Material	Specification
Corrugated Steel Pipe (CSP)	CSA G401, stiffness as per AASHTO M306
Reinforced Concrete	ASTM C76M, CSA A257.2, Class as required by design

- .2 CSP culverts shall be galvanized, with a minimum wall thickness of 1.6 mm, or as required by design.

6.16.1.4 Services

- .1 Approved pipe materials for storm services are identified in [Table 6-17](#).

Table 6-17 Approved Pipe Materials for Storm Services

Application	Material	Specification
Services larger than 150 mm	PVC DR35	ASTM D3034, CSA B182.2
100 mm and 150 mm services	PVC DR28	ASTM D3034, CSA B182.2

6.16.2 Manholes

- .1 Refer to the Standard Details in [Section 13](#).
- .2 Storm manholes shall meet the requirements outlined in [Section 5.15.2](#), with the following exceptions:
 - .1 Storm manhole covers shall be labelled "STORM".

6.16.3 Catch Basins

- .1 Refer to the Standard Details in [Section 13](#).
- .2 Catch basins shall have a minimum diameter of 900 mm.
- .3 Catch basins shall have a 600 mm sump.
- .4 Precast catch basin sections and grade rings shall conform to CSA A257.4 and shall be manufactured using sulphate-resistant Type HS cement.
- .5 Catch basin sections shall be precast reinforced concrete sections conforming to ASTM C478/C478M and CSA A257.4.
 - .1 All precast units shall be marked with manufacturer's identification, date of casting, type of cement, and CSA standard.
 - .2 Precast catch basins shall have pre-formed connection holes and watertight Duraseal or A-Lok joints or approved equivalent.
- .6 All catch basin sections shall have flexible watertight joints sealed with rubber gaskets conforming to ASTM C443M.
- .7 Catch basins shall be fitted with the appropriate cast iron frame and grate conforming to Class 35B ASTM A48/A48M; refer to the Standard Details in [Section 13](#).
 - .1 All castings shall be true to form and dimension, and shall be free from faults, sponginess, cracks, blowholes, or other defects affecting their strength.
- .8 Catch basin manholes shall meet the requirements for manholes, outlined in [Section 5.15.2](#), with the following exceptions:
 - .1 Exterior waterproofing is not required on catch basin manholes.
 - .2 Catch basin manholes shall be fitted with the appropriate cast iron frame and grate, as per [clause 6.16.3.7](#).
 - .3 Catch basin manholes shall have a 600 mm sump (i.e., catch basin manhole bases shall not be benched).

6.16.4 Pipe Bedding

- .1 Granular material for bedding of pipes in sound, dry soils shall be Class B sand as per the Municipality's *Standard Construction Specifications*.
- .2 Washed rock wrapped in filter cloth shall be used in areas with high water table.
 - .1 Rock shall be washed, crushed, or screened stone or gravel consisting of hard and durable particles meeting the gradation limits specified in the Municipality's *Standard Construction Specifications* and shall be free from sand, clay, cementitious, organic, and other deleterious material.
- .3 Refer to the Standard Details in **Section 13** for bedding details.

6.16.5 Backfill

- .1 Backfill for trenching shall be supplied and installed as per the Municipality's *Standard Construction Specifications*.
- .2 Refer to the Standard Details in **Section 13** for trenching details.

7 WATER DISTRIBUTION SYSTEMS

7.1 General

- .1 This section covers the design of water distribution mains and associated appurtenances to be installed or rehabilitated within the Municipality.
 - .1 Standard Details relating to watermain design and construction are provided in **Section 13**.
- .2 These standards provide the minimum design criteria to be used in the preparation of specifications and drawings. Good engineering practices and designs must prevail on all projects and these standards may be exceeded if warranted by the Consulting Engineer.
- .3 The design of water distribution systems shall meet the requirements of Alberta Environment's *Standards and Guidelines for Municipal Works, Waterworks, Wastewater and Storm Drainage Systems* and shall confirm to the Municipality's *Water Master Plan*.
- .4 All substances, materials, and compounds (e.g., pipes, coatings, valves, gaskets, etc.) that may come in contact with water that is, or will be treated to be, potable shall conform to ANSI/NSF Standard 61 for health effects and the product certified for potable use by an agency accredited by the Standards Council of Canada (e.g., NSF, CSA, UL, etc.).
- .5 Refer to the Municipality's *Standard Construction Specifications* for requirements for the construction of items in this section.

7.2 Design Flow

7.2.1 Domestic Demand

7.2.1.1 General

- .1 The domestic demand shall be based on the population, calculated from the population density(ies) of the associated land uses(s).
 - .1 In the assessment of existing systems, or the rehabilitation of existing infrastructure, the design population shall be based on the existing land uses and the population densities in **Table 5-1**.
 - .2 For new developments, the design population shall be the ultimate subdivision design population from the applicable Area Structure Plan or shall be based on the population densities provided in the Municipality's *Water Master Plan*.
 - .3 In the absence of suitable population density information, the densities in **Table 5-1** shall be used.
- .2 Non-residential demands shall be based on an equivalent population, calculated from the population density(ies) of the associated land uses(s) outlined in **Table 5-3**.
- .3 The water demands for heavy industrial land uses can vary widely. For new heavy industrial developments, the Consulting Engineer shall propose an average day demand, peak day peaking factor, and peak hour peaking factor, for review and approval by the Municipality.

7.2.1.2 Demand Scenarios

- .1 The demand scenarios to be assessed include:
 - .1 Average Day Demand (ADD),
 - .2 Peak Day Demand (PDD),
 - .3 Peak Day Demand plus Fire Flow (PDD+FF), and
 - .4 Peak Hour Demand (PHD).
 - .1 PHD is not assessed in the design of truck fill and trickle fill water distribution systems.
- .2 The per capita water demand shall be based on the values in [Table 7-1](#).

Table 7-1 Per Capita Water Demands

Demand Scenario	Per Capita Water Demand	Peaking Factor
Full Pressure Distribution Systems		
ADD	360 L/c/d	N/A
PDD	720 L/c/d	2 x ADD
PHD – Urban Areas	1,080 L/c/d	3 x ADD
PHD – Rural Areas	1,440 L/c/d	4 x ADD
Trickle Fill Distribution Systems		
ADD	360 L/c/d	N/A
PDD	900 L/c/d	2.5 x ADD
Truck Fill Systems		
ADD	180 L/c/d	N/A
PDD	450 L/c/d	2.5 x ADD

7.2.2 Fire Flow

7.2.2.1 Urban Areas

- .1 Fire flow requirements shall be in accordance with *Water Supply for Public Fire Protection, A Guide to Recommended Practice in Canada* as published by the Fire Underwriters Survey and the fire flows indicated in [Table 7-2](#).
- .2 Fire flows exceeding the values in [Table 7-2](#) may be required, based upon an assessment by the Consulting Engineer.
- .3 In instances where automatic sprinkler systems are to be installed in residences, the distribution and/or storage systems shall consider the demand resulting from these fixtures.

Table 7-2 Recommended Fire Flows Based on Type of Structure in Urban Areas

Type of Structure	Size	Recommended Fire Flow	
SFR wood frame construction, max. 2 storeys	Up to 275 m ²	83 L/s	5,000 L/min
MFR wood frame construction, with fire separation	4 units, up to 100 m ² each (20% exposure)	133 L/s	8,000 L/min
Walk-up apartment, ordinary construction	Up to 3,200 m ² (15% exposure)	200 L/s	12,000 L/min
School, non-combustible construction	Up to 3,300 m ²	167 L/s	10,000 L/min
	Up to 4,000 m ²	183 L/s	11,000 L/min
	Up to 12,000 m ²	317 L/s	19,000 L/min
Institutional (e.g., church), ordinary construction	Up to 850 m ² (15% exposure)	100 L/s	6,000 L/min
Commercial, non-combustible construction	Up to 2,900 m ² (25% exposure)	183 L/s	11,000 L/min
	Up to 4,200 m ² (25% exposure)	233 L/s	14,000 L/min
Light industrial, non-combustible construction	Up to 2,900 m ² (0% exposure)	150 L/s	9,000 L/min
	Up to 2,900 m ² (25% exposure)	183 L/s	11,000 L/min
	Up to 4,200 m ² (25% exposure)	233 L/s	14,000 L/min

7.2.2.2 Rural Areas

- .1 Residential developments in rural communities shall meet the requirements of the *National Building Code - Alberta Edition* and *National Fire Code - Alberta Edition*.
- .2 Fire protection for rural developments shall be in accordance with the more stringent of these standards:
 - .1 FUS: *Water Supply for Public Fire Protection, A Guide to Recommended Practice in Canada*,
 - .2 NFPA 1142: *Standard on Water Supplies for Suburban and Rural Firefighting*, or
 - .3 *National Fire Code - Alberta Edition*.
- .3 The minimum fire flow requirements for single family residential developments, with a maximum of 2 storeys, in rural areas shall be as per **Table 7-3**.

Table 7-3 Recommended Fire Flows Based on Land Use in Rural Areas

Land Use	Separation	Recommended Fire Flow	
LDR ¹	Greater than 30 m	33 L/s	2,000 L/min
MDR ¹	10 m to 30 m	50 L/s	3,000 L/min
HDR ¹	3 m to 10 m	67 L/s	4,000 L/min
Industrial		To be determined on a case-by-case basis	
Commercial		To be determined on a case-by-case basis	
Institutional		To be determined on a case-by-case basis	

Note:

¹ Single family residential with a maximum of 2 storeys.

- .4 The water supply source for rural firefighting shall be accessible on a year-round basis.
 - .1 The Consulting Engineer shall contact the Municipality to confirm the specifications for the design vehicle for use in designing the all-weather access. Refer to **Section 4** for more information.
- .5 Water supply for firefighting shall be available at the target firefighting location within 5 min of the arrival of the first firefighting response unit at the scene.
- .6 All non-pressurized water supply sources shall be accessible using dry hydrants as per the Standard Details in **Section 13**.
 - .1 Dry hydrants shall be capable of providing a minimum flow of 3,800 L/min at draft.
 - .2 Dry hydrants require reflective markings and signage such that the hydrant locations are visible from the nearest municipal roadway.
 - .3 Consideration shall be given for aboveground water storage tanks to improve the hydraulic performance according to the standards listed in Section 7.2.2.2.3, at the discretion of the Municipality.
- .7 Surface waterbodies may be acceptable as the source of water for firefighting in areas with non-pressurized systems, at the discretion of the Municipality.
 - .1 The surface waterbody(ies) must be capable of meeting the minimum capacity and delivery requirements on a year-round basis, considering the 50-year drought for the water source and winter ice thickness.
- .8 Cross-connections between potable water supply/distribution systems and non-potable fire suppression systems are prohibited.
- .9 The Owner shall be responsible for coordinating and obtaining Water Usage Agreements or environmental approvals, as required.
 - .1 Refer to NFPA 1142: *Standard on Water Supplies for Suburban and Rural Firefighting* for additional requirements.
- .10 Where a full pressure water distribution system is in use in a rural area, the desired objective is to implement the urban fire flow requirements; refer to **Section 7.2.2.1**. This, however, may need be adapted due to insufficient flow rates and prohibitive operational and maintenance requirements. The Consulting Engineer may optimize the fire-fighting requirements according to the applicable standards listed above, which may result in designs which optimize fire-fighting volume and quantity requirements with site specific designs (ie. sprinkler systems, clearance from surrounding structures or fire threats, and low-combustible landscaping).
- .11 Where a rural Area Structure Plan outlines the re-development or densification of a rural area, consideration shall be given to applying the urban standard for fire protection.

7.3 Pipe Design

- .1 Water distribution systems shall be in accordance with the Municipality's *Water Master Plan*.
- .2 A Water Network Analysis is required to support the design of water distribution systems; refer to **Section 2.10.5.3** for more information.

- .3 The Hazen-Williams formula shall be used for the design and assessment of water distribution systems.

$$Q_{cap} = C * D^{2.63} * s^{0.54} * 278.5, \text{ where:}$$

Q_{cap} = pipe capacity (L/s)

C = Hazen-Williams roughness coefficient (see [Table 7-4](#))

D = internal pipe diameter (m)

s = slope of hydraulic grade line (m/m)

- .4 The Hazen-Williams roughness coefficient shall be as per [Table 7-4](#).

Table 7-4 Hazen-Williams Roughness Coefficients for Watermains

Pipe Material	Roughness Coefficient, C
PVC	130
Asbestos Cement ¹	120
Cast Iron ¹	100
Steel	120
Ductile Iron	120
Concrete Pressure Pipe ¹	110
HDPE	130

Note:

¹ These materials are not approved pipe materials for new installations.

Roughness coefficients have been provided for assessment of the existing system only.

- .5 Network analysis shall be by a suitable computer program.

7.4 Pressure

7.4.1 Full Pressure Distribution Systems

- .1 Pressures within the water distribution system shall be in accordance with [Table 7-5](#).

Table 7-5 Pressure Requirements for Full Pressure Distribution Systems

Scenario	Required Pressure	
Minimum pressure at peak demand	280 kPa	40 psi
Minimum pressure with automatic fire sprinklers	350 kPa	50 psi
Maximum allowable pressure - existing system	620 kPa	90 psi
Maximum allowable pressure - new development	550 kPa	80 psi
Minimum pressure at main during a fire (at demand hydrant)	150 kPa	22 psi
Minimum zone pressure during a fire event	280 kPa	40 psi

7.4.2 Trickle Fill Systems

- .1 Pressures within a trickle fill water distribution system shall be in accordance with **Table 7-6**.

Table 7-6 Pressure Requirements for Trickle Fill Systems

Scenario	Required Pressure	
Minimum pressure at peak demand (at property line)	140 kPa	20 psi
Maximum allowable pressure	620 kPa	90 psi

7.5 Velocity

7.5.1 Full Pressure Distribution Systems

- .1 Velocities in a full pressure distribution system shall not exceed 1.5 m/s during normal operation or 3.0 m/s during a fire event.

7.5.2 Trickle Fill Systems

- .1 The velocity in a trickle fill water distribution system shall not exceed 1.5 m/s during normal operation.

7.6 Pipe Diameter

7.6.1 Full Pressure Distribution Systems

- .1 Watermain size requirements shall be confirmed by a WNA and may be increased, at the discretion of the Municipality, to accommodate future development.
- .2 The minimum watermain sizes, based on land use, shall be as per **Table 7-7**.

Table 7-7 Minimum Pipe Sizes for Full Pressure Distribution Systems

Land Use	Minimum Pipe Diameter
Mains	
Low Density Residential	200 mm
Medium Density Residential	250 mm
High Density Residential	300 mm
Commercial	300 mm
Institutional	300 mm
Industrial	300 mm
Services	
Residential	
Single Family (urban; no automatic fire sprinklers)	19 mm
Single Family (rural; no automatic fire sprinklers)	25 mm
Single Family (automatic fire sprinklers)	38 mm
Multi-family	See Note 1
Commercial	See Note 1
Institutional	See Note 1
Industrial	See Note 1

Note:

1. Water services for multi-family and non-residential uses shall be sized by the Consulting Engineer based on the calculated water demand.

7.6.2 Trickle Fill Systems

- .1 Watermain size requirements shall be confirmed by a WNA and may be increased, at the discretion of the Municipality, to accommodate future development.
- .2 In no case shall the diameter of a trickle fill water distribution main be less than 50 mm.
- .3 A report from the Consulting Engineer is required, to ensure that pipe sizing has been determined with consideration for the topography and population projections of the service area.

7.7 Looping and Dead-Ends

- .1 Every effort is to be made to minimize the occurrence of dead-end watermains.
 - .1 Except in cul-de-sacs of less than 120 m in length, all watermains shall be looped.
 - .2 When looping to adjacent streets is not practical, consideration shall be given to installing twin watermains, interconnected at the dead-end, along the dead-end roadway, provided that the WNA supports that this method will increase water turnover.

- .3 Watermains shall be looped such that no more than 30 single family residential lots shall be isolated in the event of a watermain break, or a watermain shutoff for maintenance purposes.
- .2 Multi-family and non-residential sites may be permitted to have multiple service connections to support on-site looping, at the discretion of the Municipality, provided:
 - .1 There is more than one self-contained building,
 - .2 Each building is individually metered, and
 - .3 Each service connection has a check valve to prevent on-site water from flowing into the public water distribution system.
 - .1 The check valve shall be located on private property, in a location accessible to the Municipality for inspection purposes.
- .3 All dead-end watermains shall have a hydrant installed, within 10 m of the dead-end, to facilitate regular flushing.
 - .1 This applies to temporary dead-ends which may be installed during staged development and to un-looped watermains which are intended to be permanent.
- .2 The use of standpipes or blow-offs is not permitted.
- .3 The installation of bleeders on the water distribution system requires prior approval from the Municipality.

7.8 Depth of Cover

- .1 The minimum depth of cover over watermains shall be 3.5 m, measured from finished grade to pipe crown.
- .2 The watermain shall be designed at a sufficient depth to satisfy the following:
 - .1 To prevent freezing,
 - .2 To clear other underground utilities, and
 - .3 To prevent damage from surface loading.
- .3 In cases where the minimum cover is unable to be met, or in areas of predominantly rock, the watermain shall be insulated.

7.9 Horizontal Alignment

- .1 New watermains shall be located within a municipal road right-of-way.
 - .1 Watermains in older neighbourhoods may be located in alleys. For rehabilitation projects in these areas, the watermain can remain within the alley.
- .2 The maximum joint deflection for watermains along a curved alignment shall be as recommended by the pipe manufacturer.
- .3 Watermains shall maintain the minimum horizontal separations identified in [Table 7-8](#).

Table 7-8 Minimum Horizontal Separation Between Watermains and Other Infrastructure

Infrastructure	Minimum Horizontal Separation
sanitary sewer main ¹	3.0 m
storm sewer main ¹	3.0 m
telecommunications ² infrastructure	2.0 m
streetlight	2.0 m
utility pole	2.0 m
tree	As per Section 10.6.5
catch basin	1.5 m

Notes:

¹ Unless the sewer depth requires an increased spacing.

² Term used to collectively refer to telephone, internet, fibre optic, and cable TV.

- .4 Water services require a minimum horizontal separation of 3.0 m from catch basins.
- .5 Easements shall be provided for all deep utilities not located within roadway rights-of-way or PULs.
 - .1 A minimum width of 6 m is required for one or two deep utilities.
 - .2 A minimum width of 8 m is required for three deep utilities.
- .6 **Tracer wire:**
 - .1 Shall be installed on top of all watermains that are installed via trenchless methods.
 - .2 Shall be installed on watermains that are installed within green spaces via open trench methods.
 - .3 Is not required on watermains that are installed within a municipal roadway via open trench methods.

7.10 Vertical Alignment

- .1 Watermains shall maintain a minimum vertical separation of 0.5 m (above or below) at pipe crossings.

7.11 Valves

7.11.1 General

- .1 Gate valves are the Municipality's preferred valve type for watermain applications.
- .2 Butterfly valves or other types of valves may be acceptable, at the discretion of the Municipality.
- .3 Valves shall be cathodically protected.

7.11.2 Locations

- .1 In general, valves shall be located as follows:
 - .1 Outside of intersections, in line with the corner cuts of the roadway (collectors and locals):
 - .1 3 valves at cross intersections, and
 - .2 2 valves at tee intersections.
 - .2 Valves shall be located a minimum of 30 m from arterial intersections.
 - .3 Valves shall be provided at both ends of PULs, walkways, and Easements, located 0.5 m from the property line, inside municipal right-of-way.
 - .4 Not more than 2 hydrants shall be isolated during a watermain break or shutdown for maintenance purposes.
 - .5 A maximum of 4 valves shall be closed to isolate any one section of watermain.
- .2 Hot-tapped connections shall follow the valving notes outlined in **clause 7.11.2.1**.
 - .1 In addition, hot-tap valves shall be located a minimum of 1.5 m from joints.

7.12 Hydrants

7.12.1 General

- .1 Fire hydrants shall be in accordance with Fire Underwriters Survey's *Water Supply for Public Fire Protection, A Guide to Recommended Practice in Canada*.
 - .1 Should these standards contradict *Water Supply for Public Fire Protection, A Guide to Recommended Practice in Canada*, the more stringent requirements shall apply.
- .2 Hydrants shall be cathodically protected.

7.12.2 Locations

- .1 Fire hydrants shall generally be located at street intersections and shall be spaced as follows:
 - .1 Not more than 150 m apart, nor more than 100 m from any dwelling, within urban single family residential areas,
 - .2 Not more than 90 m apart in all other urban areas,
 - .3 For cul-de-sacs less than 90 m in length, hydrants shall be spaced along the intersecting street, at the intersection with the cul-de-sac, and
 - .4 In accordance with Fire Underwriters Survey's *Water Supply for Public Fire Protection, A Guide to Recommended Practice in Canada*.
- .2 Refer to the typical roadway cross sections in **Section 13** for the location of hydrants within the roadway cross sections.
- .3 Hydrant valves shall be located a minimum of 1 m and a maximum of 2 m from the hydrant, preferably within a landscaped area. In no case shall a hydrant valve be located within a sidewalk.
- .4 Hydrants require a minimum horizontal separation of 3 m from Shallow Utilities.
- .5 Hydrants require a minimum clear distance of 1.5 m on all sides.

7.12.3 Markings

- .1 Hydrants installed within the Municipality shall undergo flow testing to determine the rate of flow available for firefighting and to determine the bonnet and cap paint colour. Refer to the Municipality's *Standard Construction Specifications* for testing requirements.
- .2 Bonnets and caps for municipal hydrants shall be painted as per NFPA standards, summarized in **Table 7-9**.

Table 7-9 NFPA Hydrant Bonnet and Cap Colour Coding

Colour Name	Code	Colour	Available Flow
Red	C		Less than 31.5 L/s
Orange	B		31.5 to 63.0 L/s
Green	A		63.1 to 94.5 L/s
Light Blue	AA		94.6 L/s and greater

7.12.4 Private Hydrants

- .1 Private hydrants shall be designed and installed in accordance with these standards.
- .2 Private hydrants shall be painted yellow.
- .3 The owner of a private hydrant is responsible for:
 - .1 Ensuring the on-site hydrant(s) is/are accessible and operational and that there is sufficient firefighting capacity in the event of an emergency.

7.13 Services

7.13.1 New Connections

7.13.1.1 General Requirements

- .1 Refer to the Standard Details in **Section 13**.
- .2 Services shall connect to the watermain in the roadway (or the alley, for rehabilitation projects in older neighbourhoods).
 - .1 Service connections to watermains located within a side yard PUL or MR are not permitted.
- .3 Service connections shall be designed as a single connection from the main to the property line and shall be located in a common trench with the sanitary service.
 - .1 Multi-family residential and non-residential sanitary and water services require 3 m horizontal separation.
- .4 Water services shall not be located within driveways.
 - .1 This requirement may be relaxed in congested cul-de-sacs, at the discretion of the Municipality.
 - .1 If a curb stop is located within a driveway or other hard-surfaced location, the valve shall be placed within a PVC sleeve.

- .5 Water services require a corporation stop, located at the service connection to the watermain, and a curb stop, located 0.3 m from the property line (within the municipal roadway right-of-way).
 - .1 Curb stops shall be a minimum of 1.8 m from the power infrastructure located within the Shallow Utility Easement, where present.
- .6 Service connections shall generally terminate 1 m beyond the property line (into private property).
 - .1 If the Shallow Utilities are located within a four-party Easement along the fronts of lots, the service connections shall terminate 1 m beyond the limits of the Shallow Utility Easement.
- .7 The end of service connections shall be adequately capped to prevent the entry of earth, water, or other deleterious materials into the pipe.
- .8 The end of the pipe shall be indicated by a marker stake with the following properties:
 - .1 38 mm x 89 mm wooden post,
 - .2 Post set at the service invert and extending 1 m above the ground surface, and
 - .3 Top 300 mm of the exposed portion of the post painted blue.
- .9 Service connections shall have a minimum cover of 3.0 m at the property line, measured from the finished grade to the pipe crown.
- .10 Residential lots shall be provided with only one water service connection.
 - .1 This includes duplexes and townhomes, provided each unit has a separate Certificate of Title.
 - .2 This does not include high density residential lots, such as apartment or condo buildings.
- .11 The Owner shall coordinate with the Municipality to determine servicing requirements for park spaces, including park spaces with amenities such as spray parks.
- .12 The design and installation of service connections and associated equipment shall be in accordance with the Municipality's *Standard Construction Specifications*, AWWA standards, and these standards.

7.13.1.2 Full Pressure Service Considerations

- .1 The minimum distance between corporation stops shall be 600 mm.

7.13.1.3 Trickle Fill Service Considerations

- .1 A water demand of 2 L/min/unit restricted flow feeding into an on-lot cistern with proper storage capacity shall be used to confirm the service size for a single residential application.
- .2 A water service for a country residential residence shall have a minimum diameter of 25 mm or 38 mm, as determined by the Consulting Engineer.
- .3 Trickle fill water services shall be located 1.3 m offset from the driveway/approach.
- .4 Pack joint curb stops shall be used.
- .5 Trickle fill water service connections shall be made by means of a fused saddle or a fused in-line tee.
- .6 Services shall be one piece; no mechanical connections are permitted between the main stop and curb stop.

- .7 Refer to the Municipality's *Rural Water and Sewer (RWSS) Service Connection Guidelines*, available on the Municipality's website, for service connection details for the on-lot portion of trickle fill water services.
- .8 The information in the *Rural Water and Sewer (RWSS) Service Connection Guidelines* are guidelines to assist property owners and Contractors in completing the on-property installation of a trickle fill water service.
- .9 Any work completed on private property by the owner is the sole responsibility of the property owner.

7.13.2 Abandonment

7.13.2.1 Services 50 mm and Smaller

- .1 If a service connection 50 mm or smaller in diameter is to be abandoned, the corporation stop shall be closed and the service pipe shall be cut at the gooseneck and removed.
- .2 The service pipe shall be completely removed within the municipal roadway right-of-way.

7.13.2.2 Services Larger than 50 mm

- .1 If it is anticipated that a new service of the same size will be installed in the near future, a closed valve with a blind flange shall be installed immediately off the tee.
- .2 If no service is anticipated to be installed in the near future, the tee shall be removed and a spool piece shall be installed to bridge the gap in the main.

7.13.3 Service Records

- .1 For new developments, the Developer's Consultant shall provide detailed service reports for all installed services.
- .2 Service reports shall provide information related to pipe diameter, invert elevations at the property line, location of services (relative to property line(s), manholes, or water valves), and lot number.
- .3 A blank service report is provided at the end of **Section 2**.

7.14 Thrust Restraint

7.14.1 Full Pressure Distribution Systems

- .1 Thrust restraints may be provided by poured concrete thrust blocks or the combined application of mechanical pipe restraints with poured concrete thrust blocks, as warranted by the project specific requirements or as required by the Municipality.
 - .1 Restraining rods used in mechanical pipe restraints shall be stainless steel.
- .2 Thrust restraint shall be provided at bends, tees, wyes, reducers, plugs, caps, hydrants, valves, dead-ends, hydrant branch valves and transition couplings.
 - .1 Refer to the Standard Details in **Section 13**.
- .3 The Consulting Engineer is responsible to review the application of standardized thrust restraints with the soil conditions identified in the project specific geotechnical report.

- .1 Cast iron fittings shall be wrapped in polyethylene sheeting to prevent direct contact between the concrete and the cast iron.
- .4 It is recommended that mechanical restraints be used in conjunction with thrust blocks in areas where thrust blocks are being installed in fill material or in previously disturbed ground.
 - .1 When fittings are mechanically restrained, all joints within 5 m of the fitting shall also be mechanically restrained.

7.14.2 Trickle Fill Systems

- .1 Should the Consulting Engineer determine that thrust restraint is required for a trickle fill water distribution system, the thrust restraint shall meet the requirements of **Section 7.14.1**.

7.15 Pressure Reducing Stations

- .1 **Dimensions:**
 - .1 The minimum interior dimensions of a PRV chamber for watermain or services 200 mm in diameter and smaller shall be: 3.94 m length x 3.048 m width x 1.98 m height.
- .2 **Electrical:**
 - .1 A minimum of a 30-amp, 120 VAC electrical service shall be provided.
- .3 For larger pipe diameters, the Consulting Engineer shall consult with the Municipality to confirm the largest fire flow rate required.
- .4 PRV chambers located within PULs or Easements shall be protected by bollards.

7.16 Watermain Tie-Ins

- .1 The execution of the installation, testing, and commissioning of watermain and associated infrastructure shall be in accordance with AWWA standards, the Municipality's *Standard Construction Specifications*, and these standards.
- .2 Only municipal staff shall operate in-service Public Infrastructure, including valves and hydrants.
- .3 If an existing valve cannot be closed to maintain a seal, a new valve shall be installed or the valve shall be repaired to facilitate isolation of the proposed work zone.
- .4 Tie-ins shall be completed with a spool piece that has been treated with a super-chlorinated solution.
- .5 The execution requirements for isolation, pressure testing, flushing, bacteriological testing, and final tie-in shall be considered during detailed design, with consideration for temporary hydrants, temporary blow-offs, and/or isolation chambers, as required.
- .6 The Municipality shall be present when connecting a newly constructed watermain to the existing water distribution system.

7.17 Cathodic Protection

7.17.1 Non-Metallic Pipe Systems

- .1 All non-steel metallic elements within PVC and HDPE watermain distribution systems shall be cathodically protected.
 - .1 Fittings and valves shall be cathodically protected with 2.3 kg zinc anodes.
 - .2 Hydrants shall be cathodically protected with 5.5 kg zinc anodes.
- .2 Refer to the Standard Details in **Section 13**.

7.17.2 Metallic Pipe Systems

- .1 All steel pipe and fittings require cathodic protection with high-potential magnesium anodes.
- .2 A soil resistivity analysis shall be conducted along the existing pipeline (or the proposed alignment, for new watermain) to calculate the weight and spacing of anodes.
- .3 Electrical continuity shall be maintained in the system.
- .4 A cathodic protection report shall be provided to the Municipality in conjunction with the detailed design.
- .5 The cathodic protection design shall be undertaken by a corrosion specialist.

7.17.3 Services

- .1 Copper services 50 mm in diameter and smaller shall be cathodically protected with a 5.5 kg zinc anode attached to the water service.
- .2 Zinc anode wire shall be clamped to the copper service within 1 m of the curb stop (within the municipal roadway right-of-way).
- .3 An all-brass clamp shall be used.
- .4 Refer to the Standard Details in **Section 13**.

7.17.4 Anode Requirements

- .1 Zinc anodes shall be Type II in accordance with ASTM B418.
- .2 The anode container shall consist of a water permeable cardboard tube or bag.
- .3 The anode shall be centered in the tube and backfilled with material sufficient to cover all parts of the anode to a minimum thickness of 25 mm.
- .4 The backfill material shall possess a resistivity of 50 ohm-cm when wet and as measured by the soil box method in ASTM G57.
- .5 The water used for wetting the backfill shall be distilled or demineralized. No more than 15% to 20% water by weight shall be added.

7.18 Additional Considerations

7.18.1 Chamber Drainage

- .1 Chambers or manholes containing valves, blow-offs, meters, or other appurtenances shall not be connected directly to a storm or sanitary sewer by gravity, nor shall blow-offs or air release valves be connected to any sewer.
- .2 Such chambers or manholes shall be:
 - .1 Drained to absorption pits underground (when the chamber is located above the groundwater table), or
 - .2 Pumped to a sanitary sewer.
- .3 Chambers shall be insulated to prevent freezing; refer to the Standard Details in **Section 13**.
- .4 The finished grade shall be sloped away from the frame and cover, to minimize surface water infiltration.
- .5 Chambers shall be waterproofed following the standards outlined in **clause 5.15.2.6**.

7.18.2 Temporary Water Connections

- .1 Temporary water services are required on all watermain upgrade and rehabilitation projects.
- .2 The Municipality shall be notified two weeks prior to construction to arrange for the disconnection of existing water meters.
- .3 Temporary aboveground water connections shall be Series 200 Type III PE-3048 polyethylene pipe meeting the requirements of CSA B137.1.
- .4 To prevent leaking of the piping within old buildings a pressure reducer may be required to be installed on the service.
 - .1 The Owner is responsible for confirming the pressure at each house that will require a temporary water service to determine if a pressure reducer will be required, prior to installing the temporary water.
- .5 When temporary aboveground water connections cross roadways, the asphalt may be required to be cut and the pipe embedded in the road structure, at the discretion of the Municipality.
 - .1 The disturbed road structure shall be covered by a steel plate or backfilled with granular material or asphalt milling such that the disturbed area is flush with the existing roadway surface.

7.18.3 Cold Weather

- .1 Some communities in the northern portion of the Municipality (such as Fort Chipewyan) may encounter shallow bedrock and achieving the minimum depth of cover as per **Section 7.8** may not be feasible.
 - .1 All watermains in northern communities shall be insulated. The Consulting Engineer shall determine the insulation requirements on a case-by-case basis. Pre-insulated pipe is preferred.
 - .2 There shall be no dead-ends on watermains in northern communities, including hydrant leads.

7.18.4 Residential Sprinklers

- .1 This section covers the design of automatic fire sprinkler systems in single family dwellings.
- .2 The Municipality strongly encourages the installation of automatic sprinkler systems in single family dwellings within subdivisions with lot sizes greater than 0.40 ha and where a municipal water system is provided.
 - .1 Developments designed for a residential sprinkler system shall have a caveat assigned to each lot outlining the homeowner's responsibility to install an automatic sprinkler system.
- .3 The homeowner shall be responsible for the design, installation, and maintenance of an automatic sprinkler system in accordance with these standards.
- .4 Automatic sprinkler systems shall be in accordance with NFPA 13D *Standard for the Installation of Sprinkler Systems in One- and Two- Family Dwellings and Manufactured Homes* and the Government of Alberta's *Safety Codes Act*.
- .5 Only equipment and materials listed by ULC or UL may be used in the installation of automatic sprinkler systems.

7.18.5 Transmission Mains

- .1 Appurtenances to accommodate pigging/swabbing may be required for transmission mains, at the discretion of the Municipality. The Consulting Engineer shall contact the Municipality to confirm requirements for transmission mains during preliminary design.

7.19 Truck Fill Systems

- .1 Where a piped distribution system is impractical and individual landowners supply their own storage of water in the form of holding tanks or cisterns, the following general standards shall be followed:
 - .1 Clearances shall be as required by the Safety Codes Council and Alberta Environment.
 - .2 Fill points for tanks shall be easily accessible and kept clear of obstructions.
 - .3 The recommended tank size is 4,500 L or larger, as determined by the Consulting Engineer.
 - .4 The on-lot truck fill infrastructure shall be protected from freezing.
 - .5 The holding tank or cistern shall be protected from surface water inflow.
 - .6 Adequate venting shall be provided.
 - .7 The holding tank or cistern shall be complete with a lockable cover and external fill gauge.
 - .8 Water meters with remote external readers shall be provided.
 - .9 The access road to holding tank/cistern shall be designed to accommodate a loaded water truck's wheel load. Refer to **Section 4** for additional requirements for the design of accesses.
- .2 In areas where groundwater will be the source of water supply, the on-lot water system shall be in accordance with applicable Alberta Environment guidelines.

7.20 Approved Materials

7.20.1 Pipe

7.20.1.1 General

- .1 Pipe materials shall be selected using the information in **Tables 7-10** through **7-12** as a guide.
- .2 The Consulting Engineer is responsible to confirm that the selected pipe material and class is suitable for the proposed application (e.g., site conditions, depth of installation, etc.).
- .3 Alternative pipe materials will be evaluated through a Deviation request submitted by the Consulting Engineer. The Consulting Engineer shall provide justification for the request for Deviation.
- .4 Alternative pipe materials shall not be installed without receiving written authorization from the Municipality.

7.20.1.2 Full Pressure Distribution Systems

- .1 Approved pipe materials for watermains in full pressure distribution systems are identified in **Table 7-10**.

Table 7-10 Approved Pipe Materials for Watermains in Full Pressure Distribution Systems

Material	Specification
PVC DR18	AWWA C900
PVC DR25	AWWA C900
Steel (for casing pipes)	ASTM A252/A252M, CSA Z245.1, Grade as required by design

7.20.1.3 Trickle Fill Systems

- .1 Approved pipe materials for trickle fill water distribution systems are identified in **Table 7-11**.

Table 7-11 Approved Pipe Materials for Trickle Fill Systems

Material	Specification
HDPE DR11 ¹	DR11 or as required by design
Steel (for casing pipes)	ASTM A252/A252M, CSA Z245.1, Grade as required by design
Steel Pipe ²	AWWA C200

Notes:

¹ Or as required by design.

² On a project-specific basis.

7.20.1.4 Services

- .1 Approved pipe materials for water services are identified in **Table 7-12**.
- .2 Kitec service piping is prohibited.
- .3 Plastic service tubing is prohibited.

Table 7-12 Approved Pipe Materials for Water Services

Application	Material	Specification
Full pressure services 50 mm and smaller	Type K Copper ¹	AWWA C800, ASTM B88M
Full pressure services 100 mm and greater	PVC DR18 ²	AWWA C900
Trickle fill services	HDPE DR11 ³	AWWA C906

Notes:

¹ No. 2 insulated, with thaw wires.

² Or same pipe type as distribution system.

³ Or as required by design.

7.20.2 Valves

- .1 Gate valves shall be in accordance with AWWA C509 or AWWA C515.
- .2 Gate valves shall have an epoxy-coated (to AWWA C550) iron body, bronze mounted.
- .3 Valves shall be resilient seat gates with non-rising stem, to open by turning in a counterclockwise direction.
- .4 The position of the valve in line shall be vertical.
- .5 Stem seals shall be O-ring.
- .6 Valve boxes with non-rising operating stem and 50 mm square operating nut are required on all valves.
 - .1 Valve boxes shall be sliding Norwood Type A, or approved equivalent.
- .7 Valve stems shall be complete with a rock guard.
- .8 All gate valves larger than 350 mm shall have a bypass valve built into the body of the valve.

7.20.3 Hydrants

- .1 Design and installation of hydrants and associated equipment shall be in accordance with AWWA C502 (dry-barrel hydrants) or AWWA C503 (wet-barrel hydrants) and AWWA 550.
- .2 Approved materials for hydrants shall be at the discretion of the Municipality.
- .3 Hydrants shall be complete with a breakaway flange and a 600 mm spool piece; refer to the Standard Details in **Section 13**.
- .4 The minimum hydrant connection size shall be a 150 mm hub end.
- .5 The hydrant hose outlet centerline height shall be between 457 mm & 762 mm above grade, with a preferred height of 711 mm.
- .6 The minimum cover over hydrant leads shall be 3.5 m, as measured from finished grade to pipe crown.

- .7 Drain outlets shall be provided and the Consulting Engineer shall confirm the level of the groundwater table, as identified in the geotechnical report, to determine whether to plug drain ports.
- .1 All hydrants with drain ports plugged shall be identified on the Record Drawings and shall be painted in the field as per the requirements of the Municipality.
- .8 Hydrants shall have two 63.5 mm hose connections and one 114 mm pumper connection.
- .9 Threads on hose and pumper connections shall be as required by the Municipality.
- .10 Operating nuts shall be three sided operating nuts, or as required by the Municipality.
- .11 Hydrant main spindles shall turn counterclockwise to open.
- .12 A gate valve shall be provided on each connection between the hydrant and the main.
- .13 Hydrants shall be red in colour, painted with alkyd exterior gloss enamel.
- .14 Concrete for thrust blocking shall not interfere with the operation of flange bolts and nuts, nor prevent proper operation of the drain outlets.

7.20.4 Fittings and Hardware

- .1 Approved pipe materials for fittings and hardware are identified in **Table 7-13**.

Table 7-13 Approved Pipe Materials for Fittings and Hardware

Application	Material	Specification
On Full Pressure Watermains		
Cast iron fittings	Cast Iron, 1,035 kPa working pressure	AWWA C110
PVC fittings ¹	PVC, Class 150	AWWA C900; CSA B137.3 AWWA C907; CSA B137.2
Flanged Joints	Steel, Class 150, flat-faced	ASME B16.5
Bolts and Nuts	Stainless Steel, Type 304 ²	ASTM A193/A193M
On Trickle Fill Watermains		
HDPE fittings	HDPE DR11 ³	AWWA C906
On Full Pressure Water Services		
Couplings	Standard Brass, compression type	AWWA C800
Service saddles	Cast Bronze or Stainless Steel	AWWA C800
Corporation stops	Brass	AWWA C800, ASTM B62
Curb stops	Brass	AWWA C800, ASTM B584
On Trickle Fill Water Services		
HDPE fittings	HDPE DR11 ³	AWWA C906

Notes:

¹ The Municipality prefers PVC fittings.

² Wrapped with Denso paste and tape.

³ Or as required by design.

- .2 All fittings shall be able to withstand a test pressure of 1,035 kPa.
- .3 Curb stops shall be copper to copper invert and key stop and drain.
- .4 Non-draining curb stops shall be provided in areas with high water table.
- .5 Fittings and joints for trickle fill water distribution systems shall be assembled by electro-fusion or butt-fusion for all HDPE piping. No mechanical connections are permitted.

7.20.5 Pipe Bedding

- .1 Granular material for bedding of pipes in sound, dry soils shall be Class B sand as per the Municipality's *Standard Construction Specifications*.
- .2 Washed rock wrapped in filter cloth shall be used in areas with high water table.
 - .1 Rock shall be washed, crushed, or screened stone or gravel consisting of hard and durable particles meeting the gradation limits specified in the Municipality's *Standard Construction Specifications* and shall be free from sand, clay, cementitious, organic, and other deleterious material.
- .3 Refer to the Standard Details in **Section 13** for bedding details.

7.20.6 Backfill

- .1 Backfill for trenching shall be supplied and installed as per the Municipality's *Standard Construction Specifications*.
- .2 Refer to the Standard Details in **Section 13** for trenching details.

8 SHALLOW UTILITIES

8.1 General

- .1 This section provides basic procedures and requirements for the coordination of Shallow Utilities.
- .2 Throughout this section telephone, internet, fibre optic, and cable TV will collectively be referred to as **"telecommunications"**.
- .3 Should the requirements outlined in this section contradict the requirements of any other authority(ies) having jurisdiction, the more stringent requirements shall apply.
- .4 All work necessary for the coordination of the installation of gas, electrical power, streetlighting, and telecommunications shall be the responsibility of the Owner.
 - .1 In new developments, installation and commissioning of Shallow Utilities shall be a condition of the Development Permit.
- .5 In addition to the financial responsibilities, the Owner must initiate and coordinate the design, approval, and construction of the Shallow Utilities. The actual design and construction of each utility is normally handled by the respective utility company.
- .6 Standard Details relating to the installation of Shallow Utilities are provided in **Section 13**.

8.2 Shallow Utility Design Approvals Process

- .1 Prior to coordinating the design of gas, electrical power, streetlighting, and telecommunications systems, the Consulting Engineer shall confirm the cross section for each street within the project area.
 - .1 For capital works projects, the definition of the cross section(s) is typically governed by a topographic survey of the existing roadway(s).
 - .2 For development projects, the classification and designation of roadway cross sections for each street within the development area is typically governed by the relevant planning documents for the development (e.g., Area Structure Plan and/or Outline Plan).
 - .3 Refer to **Section 13** for typical roadway cross sections for various land uses and roadway hierarchies.
- .2 Upon approval of a Tentative Plan of Subdivision, the Consulting Engineer shall circulate the following to each Shallow Utility company:
 - .1 A PDF of the Tentative Plan of Subdivision,
 - .2 PDF(s) of the applicable roadway cross sections,
 - .3 Identification of utility alignments,
 - .4 Notification of intent to plant boulevard trees with preliminary planting plan, and
 - .5 Any other information the Shallow Utility companies may require.
- .3 The Shallow Utility companies shall indicate on the Tentative Plan of Subdivision the basic design of their infrastructure, complete with right-of-way, Easement, and Public Utility Lot requirements identified and shall return the marked-up plan to the Consulting Engineer.

- .1 The Shallow Utility companies shall be responsible for designing their systems to consider existing infrastructure, future development (if applicable), planned utility expansion(s), and limiting the impacts to customers in the event of a localized service outage.
- .4 After checking for and eliminating potential conflicts, the Consulting Engineer shall prepare an Overall Shallow Utility Plan showing the location of all proposed Shallow Utilities. The Overall Shallow Utility Plan shall also show any Municipal Improvements that are associated with the project, in addition to any existing infrastructure.
 - .1 Refer to **Section 3** for more information pertaining to the requirements for the Overall Shallow Utility Plan.
- .5 The Owner shall request a Utility Line Assignment Permit, as per the requirements outlined in **Section 2.16.5**.
- .6 The Overall Shallow Utility Plan shall be circulated to the respective Shallow Utility companies for review and approval.
- .7 The Overall Shallow Utility Plan shall be included in the engineering drawing package, to be submitted to the Municipality for review and approval.
 - .1 Refer to **Section 2** for more information pertaining to the detailed design submittal process and requirements.

8.3 Design of Shallow Utilities

8.3.1 Location

- .1 Unless otherwise approved by the Municipality, all gas, electrical power, and telecommunications distribution lines and service connections shall be installed in the locations shown on the typical roadway cross sections.
- .2 Electrical power shall be underground in all hamlets and urban areas within the Municipality.
 - .1 When modifying the existing distribution system in hamlets or urban areas that are currently serviced by overhead lines, the continued use of overhead power may be acceptable, at the discretion of the Municipality.
- .3 Overhead electrical power may be acceptable for rural areas where the installation of underground power may not be practical, at the discretion of the Municipality.
- .4 Four-party trenching (one common trench for distribution cables for primary and secondary power, gas, telecommunications, and streetlight feeders), located within a 3.5 m wide Easement on private property is the preferred trench configuration.
- .5 Shallow Utilities may be installed within the boulevard between the back of curb and the property line along side yards, at the discretion of the Municipality.
 - .1 The design and alignment of the Shallow Utilities and line assignments shall consider the placement of street furniture and other infrastructure (including community mailboxes) and sidewalk (whether separate or monolithic).
 - .2 Trees are not permitted within the boulevard along side yards in locations where Shallow Utilities have been, or are planned to be, installed within the same boulevard.

- .6 Streetlights shall be placed at locations not interfering with driveways (existing or proposed) and shall be in line with the extension of a common property line between two lots, or as otherwise required by the service provider.
- .7 Posts, poles, pedestals, and transformers shall be placed to provide a minimum clear distance of 1.0 m from the face of the curb and 0.3 m from the sidewalk and shall not interfere with sight distance requirements, as defined in the Transportation Association of Canada (TAC) *Geometric Design Guidelines for Canadian Roads*.

8.3.2 Depth of Cover

- .1 The minimum depth of cover over Shallow Utilities shall be as required by the respective utility companies; typically, the minimum depth of cover below finished grade is 1.2 m.
- .2 The minimum depth of cover shall be indicated on the Overall Shallow Utility Plan.
- .3 If the minimum depth of cover below finished grade exceeds 2.0 m, a request for Deviation shall be submitted to the Municipality for review and approval.

8.3.3 Street Furniture

- .1 Street furniture shall have an anti-graffiti coating or furniture wrap.
- .2 Electrical transformers require grounding loops; loop dimensions are dependant on the size and capacity of the transformer.
 - .1 Grounding loops are to be protected from other infrastructure.
 - .2 The footprints of the transformer and grounding loops shall be accommodated within the roadway cross section, whenever possible; otherwise, a pocket Easement will be required.
 - .3 The depth of grounding loop shall be indicated on the Overall Shallow Utility Plan.
- .3 Site-specific requirements shall be as per the service provider.
- .4 Where required, pocket Easements shall be identified on the Overall Shallow Utility Plan and shall be incorporated into the Legal Plan of Subdivision.

8.3.4 Separation from Valves, Hydrants and Other Utilities

- .1 Shallow Utilities shall be separated from deep utilities (i.e., watermain, sanitary sewers, and storm sewers) by not less than 3.0 m laterally. Also, a lateral separation of 1.0 m must be maintained from hydrants and valves.
- .2 Except in a common (four-party) trench installation, a horizontal separation of 0.7 m is required between gas mains and other Shallow Utilities.
- .3 Where possible, the gas service shall be located on the opposite side of the lot as the storm service, to minimize the risk of gas infiltrating into the storm sewer system in the event of a leak.

8.4 Installation of Shallow Utilities

8.4.1 Road Crossings

- .1 Ducts shall be installed under roadways prior to roadway construction, when possible, to accommodate the installation of Shallow Utilities.
- .2 When it is not possible to install the road crossings prior to roadway construction, the Shallow Utilities shall be installed via an appropriate trenchless method to minimize disturbance to the roadway.
- .3 Road crossings shall meet the requirements of the service provider.

8.4.2 Site Preparation

- .1 The Owner shall pre-grade all boulevards, alleys, and/or Easements where Shallow Utilities are to be installed in accordance with the requirements of the service provider(s).

8.4.3 Construction Layout and Survey of Record Information

- .1 The Owner is responsible for laying out all work, lines, and levels, as required to proceed with the entire installation, and for the preservation of all such stakes and marks during construction.
- .2 Record information shall be provided to the Municipality in accordance with **Section 3**.

8.4.4 Trenching and Backfilling

- .1 Conduits shall be packed with bedding sand and overlain by suitable backfill material in accordance with the Municipality's *Standard Construction Specifications*.
- .2 0.7 MPa non-shrink concrete (fillcrete) may be used as a backfill material if native materials are not acceptable.
- .3 For Shallow Utility Easements across lot frontages (e.g., four-party trenches), continuous grade and positive drainage shall be maintained across the Easement (toward the municipal right-of-way) once the trench backfill is complete.

8.4.5 Municipal Permits

- .1 Refer to **Section 2.16** for information pertaining to municipal permits that may be required prior to commencement of construction.

8.4.6 Landscaping

- .1 Tree planting and landscaping works adjacent to Shallow Utilities shall not commence until all affected Shallow Utility companies have been notified.

8.5 Rights-of-Way, Easements, and Public Utility Lots

- .1 In the case of new developments, the Developer shall provide, to the satisfaction of the Shallow Utility companies, rights-of-way, Easements, or PULs to accommodate the utility servicing and registered in the name of the Municipality.
- .2 Easements shall be registered on each lot prior to the sale of any lot in the development area.

9 FACILITIES AND MECHANICAL PLANTS

9.1 General

- .1 This section applies to the design of municipal facilities and mechanical plants within the Municipality.
 - .1 Standard Details relating to facility/mechanical plant design and construction are provided in **Section 13**.
- .2 General construction requirements, materials, and procedures are not covered in this section. It is the Consulting Engineer's responsibility to provide this information for consideration and approval by the Municipality.
- .3 Mechanical plants shall meet the requirements of Alberta Environment's *Standards for Municipal Waterworks, Wastewater and Storm Drainage Systems*, the *National Building Code - Alberta Edition*, American Water Works Association (AWWA), Occupational Health and Safety Legislation, and all other relevant industry standards and codes.
- .4 The standards in this section are considered the minimum requirements which are to be satisfied, where feasible; however, the Municipality acknowledges that each facility/mechanical plant site is unique and some requirements may need to be adjusted to suit the needs of a project.

9.2 Facilities

9.2.1 General

- .1 The following facilities are included in this section:
 - .1 Communication Towers (**Section 9.2.2**), and
 - .2 Spray Parks (**Section 9.2.3**).

9.2.2 Communication Towers

9.2.2.1 General Requirements

- .1 This section applies to new communication towers greater than 15 m in height, and within a 3 km radius of existing and/or proposed urban development and hamlets within the Municipality.
- .2 Applications for new communication towers shall comply with Industry Canada CPC-2-0-03.
- .3 The Owner shall contact the Municipality to confirm the requirements for public engagement.
- .4 Communication towers require approval from Transport Canada and NAV Canada.
- .5 In general, guy-wired towers are only permitted in rural areas; new towers that are proposed in developed or developable urban areas and hamlets shall be free-standing.
- .6 New communication towers shall consider municipal communication requirements (e.g., SCADA, emergency services, transit, etc.) and the requirements of private telecommunication companies, as appropriate.
- .7 Communication tower setbacks from highways and roadways shall meet Transportation Association of Canada (TAC) requirements.
- .8 New communication towers shall be climbable and CSA S37 rated.

9.2.2.2 Submission Requirements

- .1 Submissions shall include scaled Authenticated engineering drawings, including the following:
 - .1 **Location Plan** indicating the site location with respect to adjacent urban areas and/or hamlets and geographic features. Proposed tower location coordinates (latitude/longitude) and land ownership details shall also be included.
 - .2 **Detailed Site Plan** including all existing and proposed features, including property lines and Easements, top of bank setbacks, clearing limits, drainage courses, access roads, fences, buildings, structures, and guy wire locations, as appropriate.
 - .3 **Cross Sections** including two perpendicular sections clearly indicating tower height, antenna heights, and relative height of existing adjacent structures, trees, and geographic features.
 - .4 Refer to **Section 3** for additional drawing requirements.
- .2 Submissions require a geotechnical report; refer to **Sections 2.10.5.1** and **2.10.5.2** for more information.
- .3 Record information (refer to **Section 2**) and Record Drawings (refer to **Section 3**) shall be provided to the Municipality upon construction completion.

9.2.3 Spray Parks

- .1 Spray parks shall meet the Alberta Health *Public Health Act, Public Swimming Pools Regulation*.
- .2 The Owner shall consult with the Municipality and a feasibility assessment shall be completed, to confirm that the Municipality's existing water distribution and wastewater collection systems can accommodate the development of a spray park, prior to undertaking the design of a spray park.
- .3 Spray park servicing requirements (i.e., water, sanitary, storm, electrical) shall be determined based on the size and nature of the spray park.
- .4 Refer to **Section 10** for accessibility requirements in play areas.

9.3 Mechanical Plants - General Requirements

9.3.1 General

- .1 The following mechanical plants are included in this section:
 - .1 Water Pumphouses (**Section 9.4**),
 - .2 Truck Fill Stations (**Section 9.5**),
 - .3 Water Reservoirs (**Section 9.6**), and
 - .4 Sanitary Sewage Lift Stations (**Section 9.7**).
- .2 All equipment shall be CSA approved.
- .3 All materials are subject to review and approval by the Municipality.
- .4 Equipment and/or systems that are installed within municipal mechanical plants:
 - .1 Shall be established within the industry for a minimum of 10 years.
 - .2 Shall be supported within the region, with regards to maintenance, repairs, and materials required to properly maintain the equipment/systems.

- .5 Design of facilities and mechanical plants shall consider the intended use and any associated demands.
- .6 Rehabilitation of structures built before 1985 require a Hazardous Material Assessment be conducted to identify remediation requirements for items such as asbestos, lead, silica, and mercury.
- .7 All design work executed for buildings shall include a schedule listing all material and equipment to support a Building Life Cycle program.
 - .1 The schedule shall be broken down into the following categories:
 - .1 Architectural,
 - .2 Mechanical,
 - .3 Electrical,
 - .4 Structural, and
 - .5 Conveyance.
 - .2 Each piece of building equipment and/or materials shall include the make, model, and serial number where applicable and shall be placed under the appropriate category within the schedule.
 - .3 The schedule shall contain the recommended replacements for all equipment and materials, to coincide with the product's life cycle.
 - .4 An electronic format (spreadsheet or database) of the schedule shall be submitted to the Municipality as part of the CCC application.
- .8 The design of hazardous energy systems shall include lock-out and tag-out devices, in general accordance with CSA Z460.
- .9 Equipment and valves shall be labelled with barcode tags according to the Municipality's Asset Management System.
 - .1 Equipment tagging designation shall be provided by the Municipality.
- .10 All substances, materials, and compounds (e.g., pipes, coatings, filter media, solders, valves, gaskets, lubricants, resins, process equipment, etc.) that may come in contact with water that is, or will be treated to be, potable shall conform to ANSI/NSF Standard 61 for health effects and the product certified for potable use by an agency accredited by the Standards Council of Canada (e.g., NSF, CSA, UL, etc.).
 - .1 This applies to all piping, valves, pumps, and other wetted components in water pumphouses, truck fill stations, and reservoirs.
- .11 The Owner shall consult with all relevant stakeholders, regulators, and affected parties to determine an acceptable appearance for all structures.

9.3.2 Site Layout

- .1 When selecting a site for a new mechanical plant or facility, the adjacent land use(s), environmental and/or geotechnical constraints, flood risks, access and parking requirements, construction and laydown needs, snow removal, and the intended use of the facility shall be considered.
- .2 Conduct a thorough site survey and prepare a detailed site plan as part of the drawing submission.

- .3 Mechanical plants/facilities shall be accessible in all weather conditions.
 - .1 Mechanical plants/facilities shall not be located within areas subject to surface ponding or inundation by surface runoff during major rainfall events.
 - .1 The finished floor elevation of the building shall be a minimum of 300 mm above the flood level associated with a storm with a return period of 100 years.
 - .2 Mechanical plants/facilities shall be designed to remain in operation during a 1:25 year rainfall event.
- .4 The access road shall have a minimum width of 5.5 m.
 - .1 The minimum road and pavement structure shall be as per the recommendations in a site specific geotechnical report, based on the anticipated loading, or the urban industrial/commercial collector pavement structure, whichever is more stringent.
 - .2 Refer to **Section 4** for more information.
 - .3 Cold mix asphalt or gravel surface may be acceptable in rural locations, at the discretion of the Municipality.
- .5 The site layout shall be designed to permit vehicles to park, turn, and leave the site in a forward direction.
- .6 Parking lots shall be designed to meet the intended use of the facility.
 - .1 Parking lots intended for public access shall meet the requirements of the Municipality's Land Use Bylaw, as well as accessibility standards as prescribed by the *National Building Code - Alberta Edition (NBC-AE)*.
- .7 Parking lot geometry shall meet the following requirements:
 - .1 A HSU Tridem vehicle (8.5 m wheelbase and 13.15° degree maximum turning angle) can enter and exit the site without backing up onto a public road or performing more than a three point turn.
 - .2 A 3-tonne flatbed service truck can back up to the service doors and park perpendicular to the door.
 - .1 The truck access shall be flat.
 - .3 A minimum of two parking stalls suitable for half-tonne trucks shall be provided.
- .8 Bollards shall be installed on the maintenance door apron to minimize the risk of damage from vehicles backing into the building.
 - .1 The bollards shall not inhibit vehicle access to the maintenance doors for equipment removal.
- .9 The site shall be fenced. Refer to **Section 10** and the Municipality's *Standard Construction Specifications* for the requirements for chain link fencing.
 - .1 The fence shall have a double swing gate for the entry of service vehicles and an additional gate for staff.
 - .1 Gates shall be lockable with a Municipality-supplied lock.
 - .2 Gates shall be offset into the site to allow for a half-tonne truck to park off the street when the gate is being opened.
- .10 The site shall be graded to provide a minimum slope of 2% away from the building(s).
 - .1 There shall be no sags within the access road or parking area, to minimize the risk of ponding and icing.

- .2 Slopes and berms shall be accessible for mowing, with a maximum slope of 3H:1V.
- .11 Finished floor elevations of the building substructure shall be 200 mm above the surrounding grade.
- .12 Roof drains and downspouts shall not drain onto sidewalks or designated walkways; they shall be directed to deposit water at least 1.5 m from the building foundation.
- .13 Landscaping is required; refer to **Section 10**.
 - .1 Trees shall be planted such that roots will not compromise the foundation or foundation drains.
Provide appropriate distances between the building and any new or existing trees.
- .14 Space shall be allocated for back-up power, as required.
- .15 Storage and collection of solid waste shall be included in the site layout design, such that the refuse and recycling bins are accessible for the site occupants and can be accessed and emptied with the minimum number of collection vehicle movements as is practical.

9.3.3 Carpentry and Building Standards

- .1 **Industry Standards:**
 - .1 All mechanical plants shall meet the requirements of the *National Building Code: Alberta Edition*.
 - .2 All publicly accessed and administrative buildings shall adhere to barrier free design standards.
 - .1 Barrier free accessibility shall be in accordance with the Alberta Safety Codes Council's *Barrier-Free Design Guide*.
- .2 **Concrete:**
 - .1 Sulphate resistant concrete and mortar shall be used.
 - .2 Expansion joints shall be incorporated into the design where appropriate.
 - .3 Structural base plates shall be grouted.
 - .4 In-floor heating in concrete slabs at main building entrances shall be considered.
 - .5 Except for monolithic concrete slabs, all concrete slabs and walkways adjacent to building walls shall be separated from the building foundation with an expansion joint at the wall.
 - .6 Prior to the issuance of the Final Acceptance Certificate, all concrete slabs near the entrance(s) to the building shall be reviewed for differential settlement and any potential trip hazards or cracking shall be repaired.
- .3 **Finishes:**
 - .1 Anti-graffiti coatings shall be applied to external walls of buildings.
 - .1 Alternatively, materials which are easy to clean with no permanent damage or discoloration may be used, at the discretion of the Municipality.
 - .2 Sound-absorbing wall and ceiling finishes shall be used for spaces identified for administrative use.
 - .1 The Municipality may require acoustical testing on-site post-construction prior to acceptance.
 - .3 Sky lights and slope glazing are not permitted, without prior approval from the Municipality.
 - .4 Cloth-based ceiling tiles, and other surfaces that are difficult to clean, are not permitted.
 - .5 IT server rooms shall be equipped with anti-static flooring.

.4 Audio/Video:

- .1 The installation of audio/video equipment on a mechanical chase requires prior approval from the Municipality.

.5 Roofs:

- .1 Self-shedding roofs shall not be sloped toward the side of a building with public or staff access.
 - .1 If this is unavoidable, all entrances on the downward slope side of self-shedding roofs shall have awnings to protect staff and public accessing the facility.
- .2 Access hatches and engineered tie-off points for fall protection shall be incorporated on all roofs.
- .3 Roof penetrations are not permitted; venting penetrations shall be made through walls, as per the applicable codes and regulations.
- .4 Roofs shall meet the Alberta Roofing Contractors Association (ARCA) standards and an ARCA Warranty is required.
 - .1 The ARCA Warranty shall be a minimum of 10 years.
 - .2 Gravel ballast is not permitted.
- .5 Mechanical plants shall include ice cleats on metal roof systems and/or properly installed gutter systems.
 - .1 Eavestroughs, downspouts, and gutters shall be heat traced.
- .6 Standing seam metal roofing with a manufacturer stated minimum 25-year service life shall be used.
- .7 Wooden truss roof structures and ceilings are preferred; other roofing systems may be acceptable, at the discretion of the Municipality.

.6 Windows and Doors:

- .1 High performance windows and doors are required.
- .2 Doors shall be heavy-duty, tamper-resistant, insulated, hollow metals doors complete with high quality door seals.
 - .1 One leaf of double doors shall be pinned at the top and bottom.
- .3 Doors shall be located such that open doors do not inhibit access walkways.
- .4 Medeco locks, or an approved equivalent, shall be used on exterior doors.

.7 Washrooms:

- .1 All washrooms require plywood liners to be installed behind the drywall.
- .2 Toilet partitions in publicly accessible facilities shall be built to anti-vandalism standards.
- .3 Below countertop sink designs shall be used whenever possible.

.8 Exterior Stairs:

- .1 Exterior stairs with a width exceeding 4 m shall have a metal handrail installed in the center if 3 or more steps are provided. Handrails shall be skate-board resistant.

.9 Maintenance Doors:

- .1 Mechanical plants shall be equipped with double metal door structures complete with panic hardware for maintenance and removal of large equipment.

- .2 Door openings shall be sized to accommodate the largest piece of equipment, including installation and extraction, with consideration for minimal disassembly on-site.
- .10 **Insulation:**
 - .1 The building shall be insulated as per the following, or the requirements of the *National Energy Code of Canada for Buildings*, whichever is more stringent.
 - .1 Walls shall have an insulation equivalent to a minimum of RSI-5.3.
 - .2 Roofs shall have insulation equivalent to a minimum of RSI-7.
- .11 Roofs, flashing, soffits, downspouts, and exterior doors shall be painted "Energy Blue", unless specified otherwise by the Municipality.
- .12 Downspouts shall have splash pads installed below the outlet.
- .13 Conduit shall be run from the PLC to the gate on the site perimeter fence to accommodate power and controls for the security and swipe card systems.
- .14 **Submittals:**
 - .1 An electronic format (spreadsheet) of the key schedule, including pinning diagrams for mechanical keying, shall be submitted to the Municipality with the Construction Completion Certificate application.

9.3.4 Electrical Standards

- .1 **General:**
 - .1 The mechanical plant electrical system shall meet *Canadian Electrical Code* and shall be designed by a qualified electrical Consulting Engineer.
- .2 **Power Supply:**
 - .1 Three phase power shall be used.
 - .1 Each phase shall be monitored using a 3-phase monitor with LED visual indication.
 - .2 Each phase shall report to the telemetry system of each building.
 - .2 The Consulting Engineer shall contact the electric utility to confirm the nature of the available power supply and shall make all necessary arrangements for connection.
 - .3 Transient voltage surge suppression shall be installed on service entrances.
 - .4 The system voltage shall not exceed:
 - .1 347/600 volts for non-industrial facilities, or
 - .2 2,447/4,160 volts for industrial facilities.
 - .5 Power quality shall be in accordance with IEEE 519 and, where necessary, voltage/lightning arrestors and harmonic mitigation (active and/or passive filters) shall be incorporated into the electrical system.
 - .6 Where deemed critical by the Municipality, there shall be two independent power supply feeders to the mechanical plant, with provision for automatic switch-over to the second feeder in the event of a failure of the first.

- .1 The design, installation, operation, maintenance, and testing of back-up and emergency generators, and associated equipment for providing back-up power supply, shall conform to CSA C282.
- .7 Short circuit calculation and calibration is required for any 3-phase service of 400-amp or greater.
- .8 The final power supply system shall be modelled in ETAP.
 - .1 A short circuit analysis shall be conducted, followed by a coordination study and an arc flash study.
 - .2 The arc flash study shall be in accordance with IEEE 1584 and 1584.1.
- .3 **Standby Power:**
 - .1 Mechanical plants, and any other facility deemed by the Municipality to be of critical importance (for which continuous operation is required), require an automatic diesel-powered generator rated for continuous use, with sufficient power to operate the mechanical plant at full capacity for 24 hours.
 - .2 Natural gas supply generators, with sufficient power to operate emergency-only systems, may be acceptable for non-essential facilities, at the discretion of the Municipality.
 - .3 Standby power generators shall include on-off-auto switches and shall have the auto function tied into and alarmed to the BMS or to the PLC/HMI in all water and wastewater mechanical plants.
 - .1 Generators shall have the following points wired or networked to the DCS, PLC, or BMS as appropriate:
 - .1 Not in Auto alarm,
 - .2 Low Temperature alarm,
 - .3 Breaker Open alarm,
 - .4 Low Battery alarm,
 - .5 Charger Fault,
 - .6 Loss of Utility,
 - .7 Running Status,
 - .8 Fuel Level,
 - .9 Low Fuel Level alarm, and
 - .10 Fail to Start alarm.
 - .4 Uninterruptible Power Supply (UPS) systems shall have a network alarm alerting the BMS or the PLC/HMI in water and wastewater mechanical plants of "On Battery" status.
 - .1 UPS systems shall be capable of energizing the controls for all BMS systems, alarms, and telemetry/phone systems during power failures.
 - .2 UPS systems shall have automatic reset/power restore capabilities after a prolonged power outage.
 - .3 Portable UPS power supply units shall be connected to normal-power outlets with quick disconnect cord ends.

.4 Location of Electrical Components:

- .1 Electrical switchgear and similar equipment shall be located such that they are not subject to flooding.
- .2 Electrical services (e.g., main panels, sub panels) shall not be located in areas frequented by facility staff or the public.
- .3 The electrical breaker box and meter shall be housed in a secure locking cabinet with a transparent window to allow the meter to be read without opening the cabinet.
 - .1 To prevent theft of these components, the secure locking cabinet shall be supplied and installed at the time of the electrical connection.

.5 Lighting:

- .1 Adequate lighting shall be provided throughout the entire building to ensure the safe operation and maintenance of the mechanical plant.
- .2 LED fixtures, complete with photocells, shall be installed for all outdoor lighting.
 - .1 A manual/automatic switch to bypass the photocell, located on the contactor for manual control of the exterior lighting, shall be installed in an accessible location.
- .3 Exit fixtures shall incorporate LED lighting. Fluorescent and incandescent bulbs are not permitted.
- .4 Low voltage switching is only required where specified lighting is controlled from more than three locations.
- .5 Outdoor lights shall be located away from air intakes.

.6 Isolation:

- .1 All discrete electrical components (e.g., pumps, motors, machines, heaters, etc.) shall have adequate breaker and/or disconnect installation to allow for positive, lockable isolation.
 - .1 These components shall also have local disconnects to enable isolation to minimize disruption to service during the repair of small components.

.7 Wiring:

- .1 The minimum standard for receptacles is 15-amp.
- .2 The minimum building wiring gauge shall be AWG #12.
- .3 All wires shall follow the *Canadian Electrical Code* for color coding for 3-phase systems. For instance, in 480V systems, phase A, B, and C shall be brown/orange/black, respectively, and in 600V systems phase A, B, and C shall be black/red/blue, respectively.
 - .1 Wires sized AWG #10 and smaller shall be manufactured with such colours throughout their entire length or shall have an identifiable wrap on each end of the wire.
 - .1 This includes wires terminating in the factory installed splice box of electric motors.
 - .2 An identifiable wrap of brown, orange, or yellow phasing tape is acceptable for armoured cable.
- .4 Low voltage class II type wiring (e.g., security systems, data lines, etc.) shall be protected against mechanical damage and shall be supported every metre.
- .5 Where cables must span hallways, they shall have proper raceway support.

.8 Switches, Breakers, and Outlets:

- .1 All electrical components, including cables, shall be numbered and shall be easily traceable from panel to end service.

- .2 Switches and receptacles, both interior and exterior, shall be identified via a weatherproof label with the circuit supplied and panel it originates from, including panel and circuit identifier (for example: Panel 2E, ccts #41, #43, #45).
 - .1 Junction boxes shall be labelled with their voltage and cabinet feeds (for example: 347/600 VAC Panel 2D).
- .3 120-volt outlets shall be provided on all roofs, where required and shall be weatherproof rated.
- .4 Receptacles and network outlets for office equipment rooms shall be mounted a minimum of 1.2 m above the finished floor.
- .9 **Equipment Schedules:**
 - .1 Panel schedules shall be typed; handwritten schedules will not be accepted. Electronic Excel files (spreadsheets) capable of modification shall be submitted to the Municipality as part of the Construction Completion Certificate application.
- .10 **Security:**
 - .1 Conduits required to be used for the future security system shall be installed as part of the construction of the mechanical plant.
 - .1 Conduit shall be a minimum size of 20 mm.
 - .2 Grounding conductors shall be installed in all conduits and sized as per the *Canadian Electrical Code*.
- .11 **Control Panels:**
 - .1 All control panels manufactured by the equipment supplier shall be CSA approved with no exposure of live bus bars/lugs of incoming supply voltage.
 - .1 If an acceptable control panel is not available, a CSA special inspection shall be conducted to confirm the acceptability of an available product prior to installation.
 - .2 Control panels shall have reset buttons mounted on the cabinet door.
- .12 **Lunchrooms and Kitchens:**
 - .1 Lunchrooms and kitchens shall have electrical capacity for two microwaves (separate dedicated circuits), a coffee pot (separate dedicated circuit), a kettle, a toaster, a spare outlet, and a fridge (separate dedicated circuit).
 - .2 20-amp circuit T-receptacles and alternated plugs shall be used.
- .13 **Electronic 3-Phase Monitors:**
 - .1 Electronic 3-phase monitors shall be installed for all 3-phase motors in each HVAC AHU.
 - .2 Electronic 3-phase monitors with LED visual indication shall be installed to monitor under voltage, over voltage, and frequency for all 3-phase motor control centres involved in the flow of water/sewage.
- .14 **Fire Alarms:**
 - .1 Fire alarms and end of line resistors shall be wall-mounted in a location that is accessible without the use of a ladder.
 - .2 Fire alarm systems shall be Class A systems (i.e., programmable/addressable).

- .3 Fire alarms zones/addressable units shall be clearly identified with wire tags on all wires in every spliced location and device installation.
- .4 The area the fire alarm duct detectors sample/draw air from shall be identified on the main panel schedule.
 - .1 Room numbers, areas, and the physical location of the detector shall be identified.
- .5 An audible signalling device controlled via the fire alarm panel shall be installed outside the main entrance of every building requiring a fire alarm system.
 - .1 Signage for fire alarms shall be supplied and installed by the Contractor.
- .6 Fire zones shall be properly labelled on the panel with an indication of the location or room (for example: ZONE 1 LOBBY).
- .15 **Fire Suppression:**
 - .1 An approved fire suppression system shall be used in electrical and server rooms. The Consulting Engineer shall contact the Municipality for more information.
- .16 **Server Rooms:**
 - .1 Server rooms shall be temperature controlled to 30°C.
- .17 **Washrooms:**
 - .1 Washrooms shall incorporate high efficiency blown air hand dryers.
 - .1 Each hand dryer shall be installed on a dedicated 20-amp circuit, or as required to meet manufacturer specifications.
- .18 **Other Considerations:**
 - .1 Junction boxes located in ceiling spaces shall be painted and marked with the appropriate colour coding and origin of circuitry. Colour coding shall follow applicable NFPA and ISA standards.
 - .2 Additional power shall be run to eavestroughs for installation of electrical heat tracing.
 - .1 This shall be calculated as a major electrical load.
 - .3 All control relays shall have visual coloured indication or LED illumination to indicated when they have been energized.
 - .4 Generator controlled building louvers (intake and exhaust) shall automatically open when the generator is running. Manual draft operation is not acceptable.
 - .1 Engine louver systems shall have an operating range of -50°C to +40°C.
 - .5 Fire hall cord reel capacity shall have a 20-amp minimum circuit capacity and shall conform to vehicle requirements.
 - .6 Indicator lights are required on all magnetic starters over 1 hp for the indication of an overload or single-phase condition. A red LED light shall be installed from the auxiliary contacts of such motor contactors.
 - .1 Alarms shall be tied into the BMS.
 - .7 A dedicated circuit for all lifting hoists/cranes and overhead doors shall be provided.
 - .8 An eight-channel auto dialler with a dedicated landline phone service shall be provided.
 - .9 Electrical equipment require an arc flash study completed to IEEE 1584.1.

- .1 Proper labels shall be applied prior to turnover; refer to the Municipality's *Electrical Safety Program*.
- .2 Based on the recommendations of the arc flash study, arc flash rating boundaries shall be marked on the floor and appropriate labels shall be affixed to the equipment.
- .10 Each photo copier and fax machine requires a dedicated 20-amp T-receptacle.
- .11 Parking lot receptacles shall use an intelligent management system.
- .12 The control panels for generators installed outside of a mechanical plant shall contain thermostat-controlled heaters to maintain a minimum internal temperature suitable for the electronics inside.
- .13 Cabinets shall have a durable signage (such as a Lamacoid plaque, or approved equivalent) mechanically fixed to their doors.

9.3.5 Instrumentation and Control

- .1 Mechanical plants shall have instrumentation and control systems which will allow the station to run unattended.
- .2 New instrumentation and control systems shall be fully integrated and compatible with the Municipality's existing central control system.
- .3 The nature of the instrumentation and control system will vary depending on the size, type, and function of the mechanical plant.
 - .1 The Consulting Engineer shall coordinate with the Municipality to confirm the requirements for each mechanical plant on a case-by-case basis.
 - .2 The minimum acceptable requirements are as follows:
 - .1 Station discharge flow shall be measured using a magnetic flow meter.
 - 1. The flow meter shall be installed with a bypass to allow for easy repair/replacement.
 - .2 Water level indicators/controllers shall be ultrasonic type 3.
 - .3 A station discharge pressure indicator shall be provided.
 - .4 The following alarms shall be provided:
 - 1. Dry well flooding alarm,
 - 2. Intruder alarm at all entrances,
 - 3. Pump failure alarm,
 - 4. Pump motor thermal and moisture leakage protection alarms,
 - 5. Main power failure alarm,
 - 6. Standby generator alarms, and
 - 7. Odour control failure alarm (if applicable).
 - .5 A pump hand/off/auto indicator shall be provided.
 - .6 Mechanical float switches for wet well high and low-level alarms shall be provided as back-ups for the ultrasonic indicator/controller.
 - .7 Building HVAC alarms and controls shall be provided.

- .8 A visible alarm light which turns on if there is an HVAC system failure, and as per applicable codes (e.g., *Nation Fire Code - Alberta Edition*), shall be mounted outside the building, near the main entrance.

.4 Alarms System:

- .1 Alarms shall be locally indicated and shall be integrated with the mechanical plant's Supervisory Controls and Data Acquisition (SCADA) system.
- .2 The alarm system shall have a UPS battery-powered back-up supply to allow the system to operate for at least 8 h after a power failure.

.5 Instruments:

- .1 Instruments, sensors, and mechanical float switches installed within a wet well or limited access area shall be accessible and removable without entering the wet well or limited access area.
- .2 Instruments which have local indication, or which require access for programming, shall be installed at eye level and with sufficient light, where practicable.
- .3 Instruments and electrical or control panels which require occasional access shall be readily accessible.
- .4 Powered instruments shall have separate fuses. Fuses shall be labelled.
- .5 Instruments shall be easily accessible for maintenance (including removal, where applicable) and programming.

.6 Gas Detection:

- .1 Gas detection shall be considered in all mechanical plants that contain combustion engines (including generators and vehicles).
 - .1 Sensor placement shall consider the source of the gas and the locations where gases will likely collect or stratify. The gas detector shall report to the BMS.
- .2 Gas detection instruments mounted more than 1.5 m above finished floor shall have calibration tubing and accessories installed to allow calibration without the use of a ladder or lifting device.
- .3 Refer to the Municipality's *Water & Wastewater Infrastructure - Gas Detection Standards* for procedural, design, installation and commissioning requirements.
- .7 Instruments and control systems (HMIs and PLCs) shall be electrically protected by a surge control system and shall be powered by a UPS.
- .8 Local SCADA systems shall use a local historian to prevent loss of data.
 - .1 Local historians shall offload data to the master SCADA storage facility twice daily if a master facility exists.
- .9 Communication equipment shall have data line surge protection.
- .10 ISA Standards may be specified by the Municipality for the purchase and installation of instruments.
- .11 Water and wastewater mechanical plants shall be connected to the Municipality's regional SCADA system.
- .12 Dedicated data lines and UPS power shall be provided in the area where BMS and network switch systems are located.
- .13 Proximity switches shall be installed on all check valves involving the control of water or wastewater.

- .1 Signals shall be transmitted to control panels and shall be equipped with appropriate alarms in no flow conditions during pump operation.
- .14 Pressure switches shall be identified with a waterproof label indicating the date of calibration for setpoints.

9.3.6 Plumbing and Heating

- .1 Natural gas shall be used as the main fuel source for heating and ventilation systems that use natural gas as a main fuel source shall be provided for all pumphouses where natural gas service is available.
- .2 **Cooling:**
 - .1 Mechanical refrigeration cooling is typically not required and will be assessed by the Municipality on a case-by-case basis.
- .3 **Ventilation:**
 - .1 Ventilation systems shall conform to all applicable municipal and provincial codes.
 - .2 Forced ventilation shall be provided for:
 - .1 Rooms, compartments, pits, and other enclosures below ground floor,
 - .2 Areas where an unsafe atmosphere may develop, and
 - .3 Areas where excessive heat build-up may occur.
 - .4 A dehumidification system shall be provided in areas where excess moisture could cause safety hazards or damage to equipment.
- .5 **Heating:**
 - .1 Heating systems shall have sufficient capacity to prevent freezing temperatures in any part of the mechanical plant during the coldest anticipated weather conditions.
 - .2 Unit heaters shall be less than 117 kW (400,000 BTUH).
 - .3 Thermostats shall identify the unit they control via a Lamacoid or an approved equivalent.
- .6 Vapour/air barriers shall be inspected prior to closing in walls.
- .7 **Boilers:**
 - .1 Boilers shall have an electronic LED hour meter and electronic LED counter, complete with an external reset, installed independently of factory controls.
 - .2 Boilers installed in mechanical plants shall be less than 750 kW (2,600,000 BTUH).
 - .3 Boilers/HVAC units shall have a waterproof lockable power disconnection switch within visual distance of the equipment.
- .8 **Piping and Valves:**
 - .1 Wet piping shall not be located over electrical service panels.
 - .2 Isolation valves are required on piping to minimize disruption to service during the repair of small components.
 - .3 Piping, valve, and related appurtenances shall be labelled/numbered and easily traceable from source to end service.

.9 Pumps:

- .1 Heating water and glycol pumps shall be installed in locations accessible for maintenance.
 - .1 The height shall not exceed 1.35 m above the floor or platform.
- .2 Sump pumps, if required, shall be located in areas accessible for maintenance.
- .3 Submersible pumps shall have an emergency float control override in the event that a float control becomes inoperable.
- .10 Mechanical plants that do not have municipally supplied water service (i.e., mechanical plants that have truck haul service) shall have sheltered, above ground, dual tank water storage.
 - .1 The shelter shall be heated, secure, and attached to the mechanical plant.

.11 Air:

- .1 HVAC outdoor air filtration shall be incorporated prior to contact with coils/ductwork.
- .2 Air intakes for make-up air units/furnaces shall not be located above or near loading docks, parking lots, or vehicle through-ways.
- .3 Outside air supply for mechanical rooms shall be provided based on equipment requirements.
- .4 High efficiency cartridge filters shall be used for air filtration for heating/air conditioning. Dispensable rolled filters are not permitted.
- .12 Rooftop units are to be avoided, in consideration of acoustics, fumes, aesthetics, and maintenance.
 - .1 If rooftop units are installed, they shall be set back 2.4 m from the roof edge.

.13 Plumbing:

- .1 Backflow prevention and odour traps are required in floor drains.
- .2 In-floor plumbing lines shall be inspected prior to pouring concrete.
- .3 Touchless water faucets, urinals, and automatic toilet flush-o-meters shall be powered by building power, self-powered via solar energy, or kinetic energy motion activated. Battery only fixtures are not acceptable.
- .14 Generator exhaust systems shall have hospital grade or better silencers and shall be directed away from neighbouring buildings.
- .15 Building HVAC shall be controlled by a local BMS. The local BMS shall be mapped back to the Municipality's regional BMS system.
- .16 Alarms for critical ventilation systems (e.g., ventilation systems to lower classification, odour control systems, etc.) shall be integrated into the plant's SCADA system.

9.3.7 Compressed Air Systems

- .1 Compressed air systems shall have:
 - .1 Dual air compressors (one duty, one standby),
 - .2 A receiver,
 - .3 A dryer,
 - .4 A filter,
 - .5 Controls, and

- .6 All necessary appurtenances to supply dry and clean air for pneumatic equipment.
- .2 Each compressor shall be capable of continuously supplying air at a rate of at least twice the maximum anticipated consumption.

9.3.8 Potable Water Supply

- .1 A potable water service from the Municipality's distribution system shall be provided.
 - .1 The minimum service size is 50 mm; however, the Consulting Engineer shall determine the required service size based on the anticipated maximum demand and service length.
 - .1 Pressure sustaining valves are required on water services larger than 50 mm in diameter.
 - .2 Water for potable water pumphouses may be drawn from the pump discharge line or other suitable supply point having adequate pressure.
 - .3 Where necessary, a pressure reducing valve capable of maintaining the service line water pressure between 350 kPa and 700 kPa shall be provided.
- .2 The water service for non-domestic uses (e.g., cooling, gland sealing, hose bibbs, etc.) shall have a reduced pressure backflow preventer.
 - .1 Water for domestic use shall be drawn from a point upstream of the backflow preventer.
- .3 A minimum of 1 hose bibb shall be provided in the wet well area (50 mm), in the dry well area (25 mm), and on the exterior of the station (25 mm, non-freezing).
- .4 Where piped water supply is not feasible, a potable water holding tank with a minimum capacity of 4,500 L shall be provided.

9.3.9 Sump Drainage

- .1 Subgrade structures that may be exposed to contaminated fluids (e.g., pumphouse dry wells) shall be drained by gravity to a sanitary sewer.
 - .1 If gravity drainage is not feasible, sumps shall have a pump.
 - .1 Pump capacity shall be 200 L/min minimum.
 - .2 Pump shall be controlled via a mechanical float switch.
- .2 Liquid discharged from a sump shall be considered contaminated and shall be discharged to a sanitary sewer or other approved wastewater disposal system.
- .3 The floor shall drain towards the sump at a minimum slope of 1.0%.

9.3.10 Aesthetics and Architecture

- .1 The Consulting Engineer shall confirm aesthetic and architectural requirements with the Municipality.
 - .1 Specific architectural treatments, signage, and landscaping are required for sites visible to the public.
- .2 Mechanical plants shall be of masonry and steel construction; below grade structure shall be concrete.
- .3 Refer to **Section 10** for landscaping standards.

9.3.11 Personnel Considerations

- .1 In larger mechanical plants, the Municipality may require offices, telephones, storage areas/rooms, and/or workshop areas. The Consulting Engineer shall contact the Municipality to confirm these requirements on a case-by-case basis.
- .2 Non-slip safety floors shall be used.

9.3.12 Lifting Equipment

- .1 Lifting equipment (e.g., cranes, hoists, I-beams, monorails) intended for the lifting of operational equipment for transport on service vehicles shall have a capacity of 1.5 times the heaviest load anticipated, with allowance for impact.
- .2 I-beams/monorails shall extend beyond the exterior of the building by a minimum of 2 m, with sufficient distance and reach to directly load onto service vehicles.
 - .1 Doors shall be manufactured to accommodate the I-beams/monorail, with appropriate neoprene weather stripping.
- .3 The lifting device to be centered over the equipment.
- .4 If an I-beam/monorail are not used, an engineered lift point shall be installed so heavy equipment can be safely removed/installed from its location using a lifting device.
- .5 Lifting equipment shall meet all applicable provincial and federal standards.
- .6 Elevators shall conform to AEDARSA standards.

9.3.13 Security

- .1 Mechanical plants shall be designed to minimize the potential for vandalism.
- .2 Mechanical plant sites shall be enclosed by a chain link fence, complete with locking double gate.
- .3 Exterior illumination shall have light sensitive switches.
- .4 Exterior doors and access hatches shall be provided with security locks to the satisfaction of the Municipality.
 - .1 Access hatches shall be located within the building structure.
- .5 Intruder alarms at all entrances shall relay to the Municipality's central control system.
- .6 Contact the Municipality for specific requirements for the keying of all locks and for current security system requirements.

9.4 Water Pumphouses**9.4.1 General**

- .1 The Municipality uses pumphouses to pressurize transmission and distribution mains as a means of conveying water to higher elevations that cannot be reached by gravity.
- .2 Pumphouses are typically hydraulically connected to an adjacent or nearby water reservoir, to meet the storage demands of the service area and to provide hydraulic balancing of the pumping cycles.

- .1 In locations where there is no reservoir, the pumphouse is referred to as a **booster station**.
 - .1 In these locations, the pumphouse operates in-line from a dedicated transmission main.
 - .2 Booster stations connected to distribution networks are generally discouraged due to the potential for fluctuation in water pressure in the influent lines.
- .2 Pumping stations that handle wastewater are referred to as **lift stations**.
- .3 The Municipality has standardized several components of the water pumphouse; these standards are available upon request.
- .4 This section describes the requirements for potable water pumphouses; for lift station requirements, refer to **Section 9.7**.

9.4.2 Hydraulic Design Parameters

- .1 The need for a water pumphouse shall be confirmed during preliminary discussions between the Owner and the Municipality.
 - .1 The Consulting Engineer shall refer to the Municipality's current *Water Master Plan*.
- .2 The design flows and pressures for water pumphouses shall be based on the parameters and computation methods outlined in **Section 7**.
- .3 The design period for sizing water pumphouses shall be a minimum of 25 years.
 - .1 If the initial capacity of the proposed water pumphouse is to be less than the 25-year design capacity, the station shall be designed to allow the capacity to be increased in stages, when required, without requiring significant changes to the existing structural, architectural, mechanical, electrical, or instrumentation systems.

9.4.3 Sump and Intake Design

- .1 Sumps and intakes shall be designed in accordance with the Hydraulic Institute's *American National Standard for Pump Intake and Design* (ANSI/HI 9.8).
- .2 Minimum submergence shall not be less than the pump manufacturer's recommendations.
- .3 The net positive suction head (NPSH) required at the operation point and at the best efficiency point shall be at least 7 kPa less than the NPSH available.
- .4 Open sumps shall have an overflow and a drain point.
- .5 Provision shall be made to allow over-pumping or bypassing of the water pumphouse.

9.4.4 Pump and Driver Selection

- .1 Proposed pump and driver packages shall conform to the applicable AWWA standards.
- .2 Service pumps shall be vertical turbine or horizontal split case centrifugal pumps.
- .3 Diesel and natural gas pumps are not permitted for high flow pumps used for fire suppression.
- .4 Pump shafts and line shafts shall be stainless steel.
- .5 Pumps shall have their maximum efficiency within the normal operating range.

- .6 Maximum pump speed shall be 1,800 rpm; however, slower speed pumps are preferred.
- .7 Pumps shall be variable speed.
 - .1 Service pumps shall be driven by open drip proof, NEMA Design A or B, CSA approved electric motors with 1.15 service factors.
- .8 Service pumps shall be sized such that the station can meet the peak hour demand with the largest pump out of service. Jockey pumps can be used to meet average day demands.
- .9 High flow pumps shall be sized for the fire flows indicated in **Section 7**.
- .10 In-line booster pumps shall be canned vertical turbine or horizontal split case pumps.
 - .1 Vertical turbine pumps with threaded suction connections may be acceptable for in-line booster pumps if the inlet arrangement complies with the pump manufacturer's recommendations, and at the discretion of the Municipality.
- .11 Horizontal split case pumps and vertical turbine pumps with threaded suction connections shall be tested to a hydraulic pressure of twice the maximum operating pressure or 1.5 times the shutoff head, whichever is greater.
- .12 Intermittent type pumping systems including pumps with bladder type pressure tanks may be acceptable when the average flow is less than 0.25 L/s, at the discretion of the Municipality.

9.4.5 Pipes, Valves, and Fittings

- .1 Magnetic type flow meters shall be installed on all discharge headers.
- .2 **Check valves** shall:
 - .1 Be installed in each pump discharge line, between the pump and the discharge isolating valve.
 - .2 Be tilting disc type with dashpot-controlled closing or globe style silent checks.
 - .3 Have an external arm, to allow for position monitoring, with a proximity style limit switch.
- .3 **Isolating valves** shall:
 - .1 Be installed on each pump suction and pump discharge line.
 - .2 Be AWWA Standard C504 short body flanged butterfly valves.
 - .3 Be provided 10 diameters upstream in booster stations.
 - .4 Allow the mechanical plant to continue to operate during removals.
- .4 Motorized or hydraulic pump **control valves** shall be installed to reduce water hammer during pump start and stop.
 - .1 The pump discharge isolating valve may be motorized to function as a pump control valve.
- .5 **Air release valves** shall be installed on the discharge header.
 - .1 Air release and vacuum valves shall be installed between the pump discharge and the check valve on wet well vertical turbine pumps which do not have a separate pump control valve discharging back to the wet well.
- .6 Pipes and valves shall be:
 - .1 Adequately supported,

- .2 Tied down by commercially available supports or concrete pillow blocks,
- .3 Spaced in accordance with the manufacturer's specifications, and
- .4 Restrained against thrust where necessary.
- .7 A flexible coupling shall be installed on each pump discharge line to enable easy removal of the pump and check valve.
- .8 Process pipe material shall be type 304 stainless steel.
 - .1 Type 316 stainless steel shall be used where the piping is exposed to high chlorides.
 - .2 AWWA C900 PVC may be acceptable where PVC will meet lifecycle functional and system pressure requirements, at the discretion of the Municipality.
 - .3 Epoxy coated ASME B31.3 standard wall carbon steel process piping is generally not permitted.
 - .1 In circumstances where the use of other materials is not feasible, standard wall carbon steel pipe may be acceptable, at the discretion of the Municipality.
 - .4 Stainless steel joints shall be pickled per ASTM A380/A380M and shall be neutralized and rinsed.
 - .5 Stainless steel welds shall be passivated after weld completion as per ASTM A967/A967M.
- .9 Pipework shall be painted (except for stainless steel) and colour coded to GHS (Globally Harmonized System for the Classification and Labelling of Chemicals; formerly WHMIS) standards and Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*.
 - .1 Alternatively, pipework may be banded with the appropriate colours, at the discretion of the Municipality.
- .10 Process pipework shall be labelled with commodity and direction of flow.

9.4.6 Chemical Systems

- .1 The requirement for a chlorination system shall be determined on a case-by-case basis, through discussions between the Consulting Engineer and the Municipality.
- .2 Chlorination systems shall meet the requirements of the Chlorine Institute's *Chlorine Basics* manual.
 - .1 Contact the Municipality to confirm specific chlorination system requirements during preliminary engineering design.
- .3 In some cases, additional system(s) to feed other chemicals may be required.
 - .1 In such cases, the installation(s) shall be as required by the Municipality and as recommended by the equipment supplier(s).
- .4 Refer to Alberta Environment's *Standards and Guidelines for Municipal Works, Waterworks, Wastewater and Storm Drainage Systems* for chemical containment requirements and for the design of chemical storage facilities.
- .5 Chemical systems shall meet the requirements of Occupational Health and Safety Legislation.

9.4.7 Prefabricated Stations

- .1 The use of prefabricated water pumphouses is not permitted, except for truck fill stations.

9.5 Truck Fill Stations

- .1 Truck fill stations are required for rural and regional water supply systems that rely on trucked water service.
- .2 The Municipality will only approve a new truck fill station if it can be demonstrated that a piped water supply system is not feasible.
 - .1 When considering a new truck fill station, a cost-benefit analysis is required and shall take into consideration the cost of trucking water over the design life of the station as well as the socioeconomic costs of water truck traffic on local roadways.
- .3 The truck fill shall be incorporated into the local pumphouse and reservoir wherever possible.
- .4 The truck fill supply shall have a minimum pumping capacity of 1,000 L/min.
 - .1 If required, a separate supply shall be provided for bucket (portable container) fills.
 - .1 Bucket fill customer connection must be sufficiently adaptable to meet the needs of customers filling a variety of containers.
 - .2 For rehabilitation of existing bucket fills, the Consulting Engineer shall confirm the existing configuration with the Municipality.
- .5 All water supplied from fill points shall be metered independently from the distribution system supply.
- .6 An overhead exterior truck fill arm shall be provided a minimum of 5.2 m above ground level (measured to the centre of the arm). The arm shall project a minimum of 2.5 m into the drive lane.
- .7 The design of truck fill stations shall be such that there will be no cross-contamination during or after filling a truck or barrel.
 - .1 At minimum, an air gap is required.
- .8 A card lock system, compatible with the Municipality's current card lock system, to activate the fill station shall be provided.
 - .1 Exterior card lock systems shall be protected from extreme cold and heat, capable of operation between -50°C and +40°C.
- .9 Truck fill stalls shall have heated pads.
- .10 The truck fill station site shall be graded to provide positive drainage and to accommodate overfill.
- .11 Truck fill stations shall be designed to prevent chlorinated water from entering the sewer system or being released to the environment.
- .12 Truck fill stations shall be designed to operate between temperatures of -50°C and 40° C.
- .13 Signage identifying the truck fill station, applicable fees, and safety precautions shall be provided.
 - .1 Bucket fills shall be capable of accepting multiple payment methods (i.e., coins and credit).
 - .2 Coin lockboxes shall be constructed securely and shall have sufficient capacity to hold \$200 in accepted coinage.

9.6 Water Reservoirs

9.6.1 Hydraulic Design Parameters

- .1 Reservoirs are required to:
 - .1 Balance variations in peak hour and/or peak day demands,
 - .2 Provide storage of water to meet fire flow demands, and
 - .3 Maintain potable water supply in the event of a source failure.
- .2 As per Alberta Environment's *Standards and Guidelines for Municipal Works, Waterworks, Wastewater and Storm Drainage Systems*, the required storage volume is calculated based on the sum of:
 - .1 **Equalization storage**: 25% of the peak day flow,
 - .2 **Fire storage**, and
 - .3 The greater of:
 - .1 **Emergency storage** (in the event of a supply interruption): 15% of the average day flow, or
 - .2 **Disinfection Contact Time** (T_{10}) storage.
- .3 The storage volume required to meet fire flow demands (fire storage) shall be assessed in accordance with the Fire Underwriters Survey *Water Supply for Public Fire Protection - A Guide to Recommended Practice in Canada* document.
- .4 The total system demand shall be determined as outlined in **Section 7**.
 - .1 Future demands shall be determined from consideration of past trends and planned development(s).
- .5 The design period for reservoir sizing shall be a minimum of 25 years.
- .6 The optimum location for a reservoir is between the supply source and the distribution system.
 - .1 Locating reservoirs as close as possible to the centre of demand, to minimize the size of distribution mains, is recommended.
- .7 If topography permits, reservoirs shall feed the distribution system by gravity, subject to maintaining minimum system pressure as identified in **Section 7**.
- .8 The watermain from the reservoir to the distribution system shall be sized with sufficient capacity to convey the greater of:
 - .1 Peak hour demand, or
 - .2 Peak day demand plus fire flow.
- .9 A combined inlet/outlet watermain may be acceptable for reservoirs located within the distribution system, at the discretion of the Municipality.
 - .1 In these cases, separate metering of flows is required, and short-circuiting shall be prevented.
- .10 Reservoirs and associated equipment shall be designed and installed in accordance with Alberta Environment's *Standards and Guidelines for Municipal Works, Waterworks, Wastewater and Storm Drainage Systems*.

9.6.2 Operating Philosophy

.1 Gravity Feed:

- .1 Gravity feed reservoirs shall be constructed where local topography permits and shall be at a sufficient elevation to pressurize the distribution system as per the requirements outlined in **Section 7**.

.2 Pumped Feed:

- .1 Where it is necessary to pump from the reservoir into the supply system, the pumps shall be sized to meet the greater of:
 - .1 Peak day demand plus fire flow, or
 - .2 Peak hour demand.
- .2 The pumphouse shall be designed in accordance with **Sections 7** and **9.4**.
- .3 The design of reservoirs shall minimize the risk of stagnation caused by the retention of water for long periods of time.
 - .1 The reservoir inlet shall be located at the opposite end of the reservoir as the outlet to avoid short-circuiting.
 - .2 Baffles or barrier walls shall be used to promote water circulation.
 - .1 The design of baffles and barrier walls shall include provisions for access by divers for inspection and maintenance.
- .4 Reservoirs shall be equipped with an electrically operated control valve located in the inlet main.
 - .1 The valve shall be designed to close when the reservoir level is 150 mm below the overflow level.
 - .2 A mechanism shall be added to the valve to maintain a minimum upstream pressure within the fill line, where required.
 - .3 Fill control valves shall be sized in accordance with the manufacturer's recommendations.
- .5 Inlet and outlet mains shall be fitted with valves to permit isolation of the reservoir.
 - .1 Unless otherwise required by the Municipality, the reservoir shall be divided into a minimum of two sections and the pump wet well shall be divided into a minimum of two sections to permit cleaning of one section without an interruption in service to the distribution system.

9.6.3 Reservoir Types

- .1 Reservoirs shall be reinforced concrete and shall have an approved exterior waterproofing coating applied.
- .2 The type of reservoir shall be determined on a case-by-case basis, based on serviceability, maintenance, and economic considerations.
- .3 Other types of reservoirs may be acceptable, at the discretion of the Municipality, pending approval of a request for Deviation.

9.6.4 Structural Considerations

.1 Foundation Design:

- .1 A detailed geotechnical investigation shall be carried out at each proposed reservoir location as per **Section 2.10.4.1**.
- .2 The reservoir foundation and yard piping shall be designed and constructed in accordance with the recommendations in the geotechnical investigation.

.2 Structural Design:

- .1 Structural design shall be in accordance with:
 - .1 CSA A23.1/A23.2: Concrete materials and methods of concrete construction/Test Methods and Standard Practices for concrete, and
 - .2 CSA A23.3; Design of concrete structures.
 - .3 The American Concrete Institute's ACI CODE-350 may also be referenced.
- .2 The use of low shrinkage concrete for the reservoir structure is recommended to minimize the risk of cracking.

.3 Foundation Drainage:

- .1 The foundation drainage system shall be based on the recommendations in the geotechnical report.
- .2 A weeping tile drain with a minimum diameter of 150 mm shall be provided around the perimeter of the reservoir at a minimum depth of 500 mm below the reservoir floor level.
- .3 The weeping tile drain shall be discharged via gravity, where possible, or pumping to a storm sewer.
- .4 The weeping tile drain shall be designed such that it will not surcharge under normal operating conditions.

.4 Insulation:

- .1 Exposed above grade surfaces shall have insulation equivalent to a minimum of RSI-7.
 - .1 Insulation shall have steel cladding or equivalent to provide protection from the elements.
- .2 Below grade surfaces with less than 0.6 m of cover shall have insulation equivalent to a minimum of RSI-3.5.

.5 Construction Joints:

- .1 Construction joints located beneath the overflow level shall be cast with integral extruded ribbed PVC waterstops.
 - .1 Waterstops shall be continuous with pre-welded corner and intersecting pieces.
- .2 Construction joints shall be located to minimize the risk of concrete cracking.

.6 Reservoir access hatches shall have curbs.

9.6.5 Environmental Considerations

- .1 The environmental impact of the reservoir at the proposed location shall be considered.
- .2 The reservoir site shall be landscaped as per the requirements outlined in **Section 10**.

9.6.6 Drawdown/Drainage

- .1 Reservoirs shall be capable of being drawn down/drained.
- .2 The reservoir floor shall have a minimum slope of 1:400 to the drain pipework or sump.
- .3 Vacuum breakers shall be provided.

9.6.7 Overflow

- .1 The reservoir shall have an emergency gravity overflow system designed to convey the maximum possible reservoir inflow rate.
- .2 The overflow system shall be protected against ingress by insects, birds, or small animals.
- .3 The overflow system shall discharge into a suitable surface drainage system or soakaway pit capable of conveying the discharge flow.
- .4 The overflow system shall be protected against backflow from the storm sewer system by installing a check valve in an accessible location.

9.6.8 Venting

- .1 Each reservoir cell shall require air vents sized based on one 100 mm diameter vent per 1,000 m³ of reservoir capacity.
- .2 Vents from the water reservoir, below the water pumphouse shall be designed to discharge to the exterior of the building through the water pumphouse.
- .3 Exterior vents shall be a minimum of 1 m above the ground surface.
- .4 Vents shall be fitted with removable insect screens.

9.6.9 Instrumentation

- .1 Each cell of a reservoir shall have an ultrasonic or radar type level indicator/controller.
 - .1 A float back-up is required.
- .1 The discharge pipe and fill line shall have a magnetic type flow meter.
- .2 Where pumps draw directly from the reservoir, low level shutdown controls shall be provided.
- .3 Where a reservoir is required to provide fire storage in addition to balancing peak day flows, controls shall be provided to prevent depletion of the fire storage during normal system operation.
- .4 Refer to [Section 9.3.5](#) for additional instrumentation requirements.

9.6.10 Testing

- .1 Testing of reservoirs shall be performed as per the requirements outlined [Section 11](#) and the Municipality's *Standard Construction Specifications*.

9.6.11 Maintenance Considerations

- .1 Reservoirs shall be designed to be accessible for underwater maintenance.
- .2 Each water storage cell shall have a sump to collect water when draining the storage cell.
- .3 Reservoir cells shall be arranged such that they can be isolated without the need to shutdown the pumphouse when a single water storage cell is taken out of service.
- .4 Each clearwell shall have a 100 mm diameter sample port.

9.6.12 Other Considerations

- .2 Buried reservoirs shall have positive drainage away from the roof; water shall not pond on top of the buried reservoir roof.
- .3 Operation controls shall include dual pressure transmitter, turbidity analyzer, and total chlorine analyzer.
 - .1 The telemetry from these instruments shall be connected to the Municipality's SCADA system and site landline alarm dialer.
- .4 A pressure sustaining valve may be required on plant service water lines, at the discretion of the Consulting Engineer.
- .5 Control signal and PLC panel wiring shall use 4-20 mA or 24 VDC.

9.7 Sanitary Sewage Lift Stations

9.7.1 General

- .1 Sanitary sewage lift stations shall be designed with a wet well/dry well configuration as shown on the Standard Details in [Section 13](#).
- .2 Sanitary sewage lift station names shall be as directed by the Municipality.
- .3 All tags shall be Lamacoid (or approved equivalent) standard black lettering on white background and shall be attached with adhesive or plastic tie wrap.
 - .1 The Consulting Engineer shall contact the Municipality to confirm the current naming convention for tags.
- .4 The Municipality has standardized several components of the lift station; these standards are available upon request.

9.7.2 Civil Considerations

- .1 Consideration shall be given to the location of sanitary sewage lift stations relative to existing or proposed adjacent development in order to minimize impacts (e.g., aesthetic/visibility, odour, and noise).
 - .1 Sanitary sewage lift stations adjacent to school sites are not permitted.

9.7.3 Hydraulic Design Parameters

- .1 The need for a sanitary sewage lift station shall be confirmed during preliminary discussions between the Owner and the Municipality.
 - .1 The Consulting Engineer shall refer to the Municipality's current *Wastewater Master Plan*.
 - .2 Sanitary sewage lift stations with flows less than 50 L/s are not permitted, without prior approval from the Municipality.
 - .3 Sanitary sewage lift stations shall only be permitted when a gravity system is not feasible.
- .2 The design flow for sanitary sewage lift stations shall be based on the parameters and computation methods outlined in **Section 5**.
- .3 The design period for sizing sanitary sewage lift stations shall be a minimum of 25 years.
 - .1 If the initial capacity of the proposed sanitary sewage lift station is to be less than the 25-year design capacity, the station shall be designed to allow the capacity to be increased in stages, when required, without requiring significant changes to the existing structural, architectural, mechanical, electrical, or instrumentation systems.

9.7.4 Influent Structures

- .1 Detailed engineering calculations shall be provided in the pre-design report, outlining the sizing of the wet well per the following requirements of this section.
 - .1 Refer to **Section 2.9.2.3** for the requirements for mechanical plant pre-design reports.
- .2 Wet wells shall be designed in accordance with the Hydraulic Institute's *American National Standard for Pump Intake and Design* (ANSI/HI 9.8) and the recommendations of the pump manufacturer.
- .3 **Wet well sizing:**
 - .1 Wet well size shall be determined based on:
 - .1 Average day, peak dry hour, and peak wet weather flows,
 - .2 Pump cycle time,
 - .3 Pump capacity,
 - .4 Storage capacity, and
 - .5 Pump starts per hour.
 - .1 Shall not exceed the manufacturer's recommendations.
 - .2 The active wet well volume shall be such that all sewage within the discharge forcemain can be replaced during one pumping cycle.
 - .1 This is a requirement when sags in the forcemain exist.
 - .3 Wet wells shall be sized to prevent frequent pump starts and short run cycles while also minimizing total retention time.
 - .1 Total retention time in the wet well and forcemain shall be kept to a minimum (generally less than 4 hours) to avoid anaerobic fermentation and the resultant production of odourous, hazardous, and corrosive gases.
 - .2 Otherwise, provisions shall be made to control anaerobic conditions (e.g., odour control).

- .4 Only one sewer connection shall be provided into a wet well to convey sewage from the collection system.
 - .1 If more than one sewer enters the site or is required to be connected to the lift station, a collection manhole shall be provided as a junction point for all incoming sewers.
 - .1 Stubs shall be provided for future connections, where required.
- .5 The inlet sewer shall be sized to accommodate the maximum lift station design capacity. The inlet manhole shall have high level monitoring connected to the PLC and SCADA system.
- .6 Excessive entrainment of air in the sewage entering the wet well shall be avoided to prevent entrained air from reducing pump performance or causing loss of prime.
 - .1 This may be addressed by drop tubes inside wet wells (for small lift stations), grade adjustments, or a drop manhole upstream of the lift station. The Consulting Engineer is responsible for selecting an approach that is suitable for the situation.
- .7 Influent shall not enter the wet well at an elevation lower than the normal high liquid level for the ultimate design capacity flow rate.
- .8 **Shutoff valves:**
 - .1 An influent shutoff valve shall be provided on the inlet to the wet well.
 - .1 The influent shutoff valve shall be accessible from the main floor of the operating room.
 - .2 Shutoff valves shall be suitable for raw sewage service.
- .9 Wet wells shall be designed to minimize areas where debris may accumulate.
 - .1 Benching with a minimum slope of 1:1 in the direction of the suction inlets is required.
 - .1 The cross sectional area and shape of the wet well above the benching shall be constant.
- .10 Suction inlets shall be of the bell-mouth (flared) type to minimize vortexing and accumulation of solid material.
- .11 The depth from the "pump off" level to the floor of the wet well shall be kept to a minimum, to minimize dead storage volume.
 - .1 The required depth shall be based on the suction pipe inlet conditions, pump manufacturer's requirements, NPSH, priming requirements, and vortex control measures.
- .12 If a grinder is required, it shall be installed within the main channel in a manner to minimize sediment build-up at the grinder.
 - .1 The inlet channel shall be configured to permit isolation and bypassing of the grinder. The bypass shall allow for manual screening, drying, and debris removal.
- .13 The inlet channel shall follow a straight alignment, with no bends, and shall slope towards the sump.
 - .1 Sufficient benching shall be provided to maintain scouring velocity within the channel.
- .14 When it is not possible to accommodate **clause 9.7.4.13**, FRP grating material is required and cleaning ports, with hinged grating, are required to facilitate manual cleaning.
- .15 A removable extraction pipe shall be installed in the wet well with a camlock for sucking out grit from the wet well sump.

- .16 Overflows to storm sewers, stormwater management facilities, natural watercourses, or outfalls are not permitted.
- .17 The **critical flood line** is defined as the water level at which surcharge in gravity mains will result in sewer back-up into private property.
 - .1 The critical flood line shall be identified on the Record Drawings and shall be permanently marked on the walls of the wet well.

9.7.5 Pump Selection

- .1 One more pump than necessary shall be installed in each sanitary sewage lift station, for redundancy.
 - .1 When only 2 pumps are installed, each must be capable of meeting the maximum design flow.
 - .2 For larger lift stations, the number of units shall be selected such that the range of inflow can be met without starting and stopping pumps too frequently and without requiring excessive wet well storage capacity.
- .2 Pumps shall be of the centrifugal, non-clog type and shall have been designed specifically for use with wastewater.
- .3 Pumps shall be self-priming and shall include a method for removing air from the system.
- .4 Pumps shall have their maximum efficiency within the normal operating range.
- .5 Maximum pump speed shall be 1,800 rpm; however, lower speed pumps are preferred.
- .6 Pumps shall be variable speed, drip proof, squirrel cage motors.
 - .1 Motors shall be sized to handle the maximum load anticipated from the specified operating conditions.
- .7 Pumps shall be sized such that the lift station is able to handle the maximum anticipated flow with the largest pump out of service.
- .8 Pumps shall be engineered to be removable without dewatering or entering the wet well.
- .9 If seal water is used for the pumps, the dry well sump pump shall be sized to handle the maximum pump seal water discharge flow rate which would occur in the event of a pump seal failure.
- .10 The Consulting Engineer shall contact the Municipality to confirm current product standards.

9.7.6 Structural Considerations

- .1 **Structural Design**
 - .1 Structural design shall be in accordance with CSA S900.2 Structural design of wastewater treatment plants.
- .2 **Stairs, Ladders, and Platforms:**
 - .1 Dry wells and wet wells require stairs and safety landings, regardless of the space classification, including a minimum 2.1 m headroom.
 - .2 Stairways shall be sized to allow for emergency services to attend to and remove personnel from the space the stairway is servicing.

- .3 Wet well stairs shall include a landing stop at the wet well platform level; an extendable ladder shall be provided from the wet well platform to the floor of the wet well sump.
- .4 Wet wells shall have a platform located above the sewage inlet to allow access to the wet well for inspection, repairs, and maintenance.
 - .1 Platform grating shall have removable sections to allow for the removal and servicing of wet well equipment and cleaning.
 - .2 Platform cut-outs shall be provided for level bulbs, level sensor, vac truck hose access for clean out of the sump, grinder removal, and to permit cleaning of the wet well walls.
 - .1 Cut-outs shall be covered with removable or hinged sections if the holes pose a tripping hazard or are large enough to step into.
- .5 Stairs, ladders, and platforms shall be constructed from FRP material with stainless steel fasteners.
 - .1 These structures shall not block walkways or inhibit access for the operation and servicing of equipment.
 - .2 FRP grating shall be clipped or secured in place to prevent it from floating if the lift station is flooded.
 - .1 The perimeter sections of grating shall be hinged to facilitate cleaning below the grating.
- .6 An engineered fall arrest system is required at any floor penetrations or fixed ladders where there exists a fall hazard exceeding 3 m or if any other hazard which could cause injury exists.
 - .1 Fall protection equipment shall be clearly labelled on drawings with load ratings stated.
- .3 **Hatches:**
 - .1 There shall be handrails around all openings and hatches that present a safety hazard.
 - .1 Handrails around hatches shall be removable and shall have a self-closing swing gate on one side.
 - .2 Handrail sleeves shall be recessed in the floor.
 - .2 Hatches are required in floors, to facilitate removal of equipment and materials from spaces below the ground floor level.
 - .3 Hatches shall be flush with the floor; no hatch appurtenances shall protrude above the finished floor.
 - .4 Hatches shall have a latch to securely hold the hatch closed.
 - .5 Hatch openings in electrical and operating rooms shall have secondary safety grating that closes separately from the main hatch.
 - .1 A safe working distance shall be provided around electrical equipment, as per the recommendations of the arc flash study.
 - .6 Hatches shall be made of aluminum and shall be designed to withstand the loads they are likely to encounter during their service life.
- .4 **Dry wells:**
 - .1 Dry wells shall have a sump covered with removable grating.
 - .1 A keyway trench to direct liquid to the sump is required at the base of the walls.
 - .2 The dry well layout shall be such that all equipment and valves are accessible.

- .1 There shall be a minimum horizontal clearance of 1 m on two sides and a minimum vertical clearance of 1 m.
- .2 Vertical clearance between the monorail and floor shall take into consideration the height of future equipment, the truck bed, and the hoist.
- .3 A laydown area next to equipment shall be provided.
- .5 The pump removal monorail shall be capable of extending a minimum of 1 m beyond the exterior wall of the building.
- .6 A lifting hook or eyelet shall be installed over heavy equipment (e.g., valves) to allow maintenance staff to secure a strap to support equipment during removal.
- .7 Subsurface structures shall be made of sulphate-resistant cast-in-place concrete with additives to prevent water seepage.
 - .1 The wet well surface shall receive an approved coating specifically designed to protect the concrete from the deleterious effects of sewage.
- .8 Concrete floors shall have a non-slip surface and shall be treated with Lithochrome colour hardener in "Platinum Grey" or an equivalent colour approved by Municipality.
- .9 Floor and walkway surfaces shall be sloped to a point of drainage.
- .10 Floors beside hatches and under monorails shall be rated for loads from the equipment being lifted.
- .11 **Lifting Equipment:**
 - .1 Refer to **Section 9.3.12** for additional lifting equipment requirements.
 - .2 Permanent hoist equipment shall be provided to permit the removal and/or replacement of sewage pumps and grinder.
 - .3 The capacity of all lifting equipment shall be clearly posted on the equipment.
 - .4 Eyebolts in the walls and ceilings shall be provided for rigging chain hoists or come-alongs.
 - .5 A powered hoist is required.
 - .1 If operation is anticipated to occur less frequently than annually, a manual hoist may acceptable, at the discretion of the Municipality.
 - .6 Trolley shall be manual gear driven.
 - .7 Rust resistant chain hoists complete with chain baskets are required over cable hoists.
 - .8 Sufficient vertical clearance is required to lift equipment over handrails.

9.7.7 Architectural Considerations

- .1 Sanitary sewage lift stations shall have the following area designations:
 - .1 Operating Room (over wet well),
 - .2 Wet Well Platform,
 - .3 Wet Well Sump,
 - .4 Pump Room,
 - .5 Electrical Room,
 - .6 Washroom,

- .7 Meter Platform,
- .8 Dry Well, and
- .9 Generator Room.
- .2 **Operating Room:**
 - .1 The operating room shall be within the building envelope.
 - .2 The operating room, wet well platform and wet well shall be separate from all other areas and shall have a separate entrance from the exterior.
- .3 **Pump Room:**
 - .1 The pump room shall be provided with an insulated roll up door that can accommodate the removal of pumps and other equipment from the building.
- .4 **Generator Room:**
 - .1 The generator room shall be independent from the electrical room.
 - .2 There shall be a designated area to securely store site-specific spare parts and operational items.
 - .1 A steel storage cabinet shall be located in the generator room.
 - .2 Wall space shall be provided for the lockout board station and a broom, mop, and squeegee.
- .5 Heating and ventilation equipment and valves shall be housed within the building.
- .6 Brick work shall be full split face and shall have 2 coats of clear graffiti sealant applied to the exterior.
 - .1 Bricks shall be grey, unless otherwise specified by the Municipality.
- .7 Interior walls shall be painted white.
- .8 **Doors:**
 - .1 Where extendable monorails require a high door frame, a split vertical door is required.
 - .1 The standard door shall be located below the monorail door and the monorail door shall act independently of the standard door.
- .9 Sanitary sewage lift stations shall have one 600 mm by 3,000 mm seamless aluminum sign (3 mm thickness) on a 50 mm x 50 mm x 6 mm aluminum tube frame with square corners.
 - .1 The sign colour shall be high quality outdoor paint, suitable for metal surfaces, of charcoal grey (e.g., Benjamin Moore Graphite 1603) with a matte finish.
 - .1 Lettering shall be 6 mm thick brushed aluminum cut-out letters, matte finish, and:
 - 1. 100 mm height for large lettering, and
 - 2. 64 mm height for small lettering.
 - .2 The font shall be as per the Municipality's *Brand Standards*.
 - .3 Signs shall include the Municipality's logo (460 mm wide), the station name, and the civic address, and shall be installed on the side of the building that faces the access road.
 - .2 Refer to the *Brand Standards* document, available on the Municipality's website.

9.7.8 Pipes, Valves, and Fittings

.1 Approved Materials:

- .1 All nuts, bolts, and other fasteners used in wet well areas shall be 316 stainless steel.
 - .1 Washers and bushings shall be used if fasteners are used on a dissimilar metal.
- .2 Process piping shall be Schedule 10, 316 stainless steel, meeting ASTM A312/A312M.
 - .1 Stainless steel joints shall be pickled per ASTM A380/A380M and stainless steel welds shall be passivated after weld completion as per ASTM A967/A967M.
 - .2 Stainless steel joints shall be neutralized and rinsed.
- .3 Steel pipe, standard wall thickness, meeting ASTM A139/A139M or ASTM A53/A53M may also be acceptable, at the discretion of the Municipality.
- .4 Pipes located in wet wells shall have the surface of the pipes and fittings coated both internally and externally with coal tar epoxy.
- .5 Pipes located in dry wells shall be coated both internally and externally with polyethylene or epoxy type coating.
- .6 Buried pipe under the facility and within the excavation zone of the lift station shall be a minimum of standard wall welded steel with yellow jacket exterior and cement or epoxy coated interior.
- .7 Piping within the lift station shall have a minimum pressure rating of 900 kPa.

.2 Pipe Sizing:

- .1 Suction piping shall be sized to result in average velocities between 0.75 m/s and 1.5 m/s.
- .2 Discharge piping shall be sized to result in average velocities between 0.9 m/s and 2.5 m/s.
- .3 Future increases in capacity shall be considered when sizing piping.
- .4 Pump suction and discharge piping shall have a minimum diameter of 100 mm.

.3 Maintenance Considerations:

- .1 The wet well shall be equipped with a fixed pipe.
 - .1 One end shall terminate above the wet well platform and the other end shall terminate on the exterior of the operating room.
 - .2 This pipe shall be designed to facilitate regular extraction of solids from the wet well by a vac truck without having to extend hoses into the wet well.
 - .3 Both ends of the pipe shall be equipped with 100 mm camlock connections and caps.
 - .4 The pipe shall also have a removable extension that can extend into the active wet well storage zone.
- .2 A pipe off the discharge header shall be provided to enable pumping into a vac truck.
 - .1 The pipe shall terminate outside the building.
 - .2 This pipe shall have an isolation valve, 100 mm camlock and cap, and a drain valve.
 - .3 Label pipe as "Pump Out" on the exterior of the building.
- .3 A flanged wye shall be provided after the discharge header for the launching of pigs for cleaning the forcemain.

.4 Suction Lines:

- .1 Each pump shall have its own suction line from the wet well.
- .2 Suction lines require a wall casting with flanges on both sides of the concrete wall and a water stop cast into the wall.
- .3 Suction lines shall be kept as short as possible and shall incorporate an isolating valve.
 - .1 Valve design shall be such that the interior is free of obstructions which could accumulate debris that may prevent tight shutoff.

.5 Discharge Lines:

- .1 Discharge lines shall be designed to withstand the maximum pump discharge pressure, plus anticipated surge pressure.

.6 Pipe Support:

- .1 Reduce vibrations from pumps by:
 - .1 Adequately supporting piping, valves, and joints, and
 - .2 Anchoring the pump firmly to the pump base and providing both horizontal and vertical supports.
- .2 The Consulting Engineer shall contact the pump manufacturer for additional recommendations.

.7 Isolation Valves:

- .1 Isolation valves greater than 100 mm in diameter shall be full port plug valves with a top mounted wheel operator.
- .2 Isolation valves of up to 100 mm in diameter shall be ball valves with a handle operator.

.8 Shutoff Valves:

- .1 A shutoff valve shall be included on the discharge line from each pump, between the check valve and the discharge header, to permit isolation of each pumping unit.

.9 Check Valves:

- .1 Non-slam flapper check valves with counterweights shall be installed horizontally on pump discharge lines.
- .2 A limit switch is required on the check valve to identify when the valve is open and closed.

.10 Air Release Valves:

- .1 A combination air release/vacuum valve is required on the forcemain discharge header.
- .2 Air release valves shall be provided at all high points on the discharge piping.

.11 Drain Valves:

- .1 Drain valves shall be provided at all low points, with a 50 mm camlock to enable connection of a hose for draining the sump.

.12 Connectors:

- .1 Flexible connections shall be installed at key locations in the pump discharge piping and discharge header to protect the equipment and structure from premature failure.
 - .1 Flexible connections shall be non-metallic and accessible for maintenance.

- .2 Victaulic couplings shall be installed along piping at locations necessary for maintenance.

.13 Other Considerations:

- .1 Recirculation pipes shall be provided for aeration and suspension of grit and solids in the wet well.
- .2 Sewage from the discharge header shall be piped to the wet well and shall discharge near the bell mouth suction line.
- .3 Valves on recirculation piping shall be manually operated and shall normally be closed.
- .4 Each pump discharge line shall be equipped with a flush connection complete with a 25 mm ball valve and camlock.
- .5 The sump pump shall discharge into the wet well at a point above the maximum high water level.
 - .1 A brass swing check valve shall be provided in the discharge pipe to prevent backflow of wastewater into the sump.
- .6 Pipework shall be painted (except for stainless steel) and colour coded to GHS standards and Alberta Environment's *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems*.
 - .1 Alternatively, pipework may be banded with the appropriate colours, at the discretion of the Municipality.
- .7 Process pipework shall be labelled with commodity and direction of flow.
- .8 Vent piping shall tie back into the wet well, terminating above high water level.

9.7.9 Building Mechanical Considerations

.1 Ventilation:

- .1 Ventilation shall be provided for all rooms in accordance with applicable regulations and building codes.
 - .1 Separate ventilation systems shall be provided for areas with a different hazard rating, such as wet and dry wells.
- .2 Where ductwork is required to penetrate walls separating wet and dry well areas, an automatic shutoff damper shall be provided to prevent migration of hazardous gases when the air system is not operating.
- .3 Suitable equipment shall be installed to provide for continuous ventilation; refer to NFPA 820.
 - .1 The system shall be configured to revert to lower air volumes as allowed by NFPA 820.
- .4 Provision shall be made to detect and actuate an alarm if the ventilation system should fail.
 - .1 A buzzer shall be located inside the building and a red pilot light shall be located on the outside of the building.
 - .2 This alarm shall be connected to the overall lift station control system for annunciation.
- .5 Wet well ventilation shall be continuous and capable of providing at least 6 complete air changes per hour, as per the building usage requirements.
 - .1 Air shall be forced into the wet well rather than exhausted from it.
 - .2 Odour control on wet well discharge air is required in all residential areas.

- .6 Ventilation shall have sufficient capacity to provide 6 complete air changes per hour with 21°C discharge air.
 - .1 Unit heaters shall be equipped with a modulating burner complete with stainless steel exchanger.
 - .2 A low discharge temperature shutdown with no airflow alarm shall be provided in the system.
 - .3 Make-up air units may consist of natural gas heaters using aluminized heat exchangers.
- .2 **HVAC System:**
 - .1 HVAC systems must return to service automatically following a power interruption.
 - .2 Noise from HVAC shall not exceed 42 dBA at the property line, in consideration of noise levels within adjacent properties.
 - .3 An alarm shall sound upon failure of HVAC make-up air units.
 - .1 The alarm shall be connected to the facility PLC and the Municipality's SCADA system.
- .3 **Hydrogen Sulphide Considerations:**
 - .1 Hydrogen sulphide (H₂S) is heavier than air; therefore, fresh air (heated and thermostatically controlled) shall be forced into each area at a point higher than and sufficiently separated from the exhaust.
 - .2 The exhaust shall be 150 mm above the floor in dry wells and 150 mm above the high water level in wet wells.
 - .3 In wells with a depth greater than 4.5 m, multiple inlets and outlets shall be considered during design.
- .4 **Heating:**
 - .1 Heating systems shall be designed to minimize heating costs and the entire lift station shall be designed considering energy conservation.
 - .2 The following shall be considered:
 - .1 High efficiency furnaces or make-up air units, and
 - .2 Heat recovery units to recover waste heat from exhausted air.
 - .3 HVAC heating and ventilation equipment shall be accessible for maintenance without the use of portable ladders or other temporary facilities.
 - .1 Fixed ladders with tie-off points above the ladder shall be provided as required.
 - .4 Place heaters and direct ventilation to minimize the risk of build-up of ice around exterior doors.
 - .5 Unit heaters shall be located to facilitate regular servicing.
 - .1 The units shall be electric and sized to prevent the facility from freezing should the primary heater for the make-up air units fail.
 - .2 Cabtire cable shall be used to allow unit heaters to be unplugged and swiveled for maintenance.
 - .6 Water heaters shall be natural gas fired tankless units.
 - .1 Water heaters shall be accessible for operation, service, and maintenance.
 - .2 Electric water heaters are not permitted where other fuels are available.

.5 **Water Servicing:**

- .1 Lift stations require a potable water service.
 - .1 The water service shall have a pressure transmitter to monitor the service pressure. The pressure transmitter shall be wired to the PLC/HMI.
- .2 There shall be no physical connections that might cause contamination of the potable water supply.
- .3 Backflow prevention and cross-connection control shall comply with federal, provincial, and municipal regulations.
- .4 The water meter shall be supplied by the Municipality.
- .5 Service water shall be supplied to both the wet well platform and the dry well, complete with a 50 mm diameter hose bibb, local check valve, and a wall mounted hose hanger.
 - .1 A pressure sustaining valve may be required in areas of low average day flow due to the risk of dropping pressure too quickly in the distribution main.

.6 **Floor Drains:**

- .1 Running trap or trap primers shall be provided for floor drains.

.7 **Gas Detection:**

- .1 Gas detection measuring and locations shall be provided as per the Municipality's *Water & Wastewater Infrastructure - Gas Detection Standards* for procedural, design, installation and commissioning requirements.
 - .1 Gas detection shall be as follows:

Green	normal operation
Amber	process alarm
Blue	H ₂ S
Red	all other gas detection conditions
 - .2 Gas detection devices shall be equipped with 4-20 mA signal and on-board relays.

.8 **Impacts on Neighbouring Properties:**

- .1 Mechanical dampers, louvers, ventilation, and exhausts shall be arranged to minimize the impact to neighbouring properties.

.9 **Approved Materials:**

- .1 The Consulting Engineer shall contact the Municipality to confirm current product standards.

9.7.10 Electrical Considerations

.1 **General Considerations:**

- .1 The required voltage for sanitary sewage lift station pumping gear is 600 VAC, with 208 VAC and 120 VAC for the stepped down voltages.
- .2 The motor control centre and lighting panel shall have a minimum of 20% spare capacity.
 - .1 A laminated single line diagram shall be mounted on the motor control centre.
- .3 Arc flash studies completed to IEEE 1584 and 1584.1 shall be used to determine the electrical fault potential and severity. Electrical design shall minimize arc flash exposures.

- .4 Electrical equipment shall be labelled with arc flash and shock hazard according to the Municipality's *Electrical Safety Program*.

.2 Diesel Generator:

- .1 A diesel generator is required for standby power.
- .2 The generator shall be designed to power the full building loads and all duty pumps running concurrently.
- .3 The generator shall have a double wall fuel storage tank located under the generator, inside the building, with sufficient fuel to run the generator at full load for 24 hours without refueling.
 - .1 The fuel tank shall have an analog fuel indicator on the tank and a digital fuel indicator (connected to the lift station control system) which can trigger an alarm at a pre-set low level.
- .4 The generator shall be equipped with louver controls (fresh air, outside vent, and recirculate) and an automatic transfer switch.
- .5 The generator shall be sized to accommodate future loads according to the pumping capacity staging plan, assuming it is practicable to do so. Any approval for deviation from this standard is at the discretion of the Municipality.
- .6 The generator power transfer switch shall be designed to automatically switch to generator power when the facility loses utility power and to automatically return to utility power once it returns, considering motor wind-down.
- .7 The noise generated by the lift station when measured at any point 3 m from the building shall not exceed 80 dBA.
 - .1 The noise generated by the lift station when measured at the property lines shall not contravene the Municipality's Community Standards Bylaw.
- .8 There shall be an exterior mounted lockable fuel fill panel, complete with indicator lights that annunciate at least four-point fuel levels within the fuel tank and an audible low-level indication.
 - .1 The fuel fill cabinet shall be located to allow for a fuel truck to park within 5 m of the cabinet.
 - .2 The cabinet shall be accessible from a sidewalk or parking lot.

.3 Pump Power:

- .1 Main pump motors shall operate on 600 V, 60 Hz, 3 phase power.
- .2 Pump drives shall be equipped with appropriately sized harmonic power filters for all process pumps.
- .3 Pumps shall be powered by variable frequency drives complete with pilot lights (run, fault), hour meters, amp meter, and Hand-Off-Auto switch.
- .4 The pump power and control cable junction box shall be located at the meter platform level.
- .5 Junction boxes shall not be located below the 1:100 year flood elevation.
- .6 The power and control cables between the pump and the junction box shall be easily removable and replaceable when the pump is removed and replaced for service.
- .7 The sump pump shall be plugged in 1.2 m above the floor.

.4 **Receptacles:**

- .1 120 V receptacles shall be provided at the following locations, at a minimum:
 - .1 Generator Room,
 - .2 Electrical Room,
 - .3 Pump Room,
 - .4 Meter Platform,
 - .5 Dry Well,
 - .6 Operating Room, and
 - .7 Outside the building, near doorways.

.5 **Lighting:**

- .1 LED lighting shall be used for all lighting within sanitary sewage lift stations.
- .2 Lighting shall be explosion proof in the operating room/wet well and in other areas as required by the *Canadian Electrical Code* and NFPA 820.
- .3 The wet well and dry well design lighting level shall be 1,000 lux.
 - .1 Light fixtures shall be installed above the anticipated flood level and shall be accessible for service.
- .4 One light shall permanently stay on and shall be located by the entrance in both the operating room and electrical room.
- .5 Emergency back-up lighting shall be provided.
 - .1 Emergency back-up wall packs shall be connected to their respective room's lighting circuit.
 - .2 Lighting circuits, including emergency lighting, shall have their own dedicated circuit(s).
- .6 Exterior lighting shall be provided on all sides of the building.
 - .1 Lighting near building entrances shall come on when dark; all other lighting shall come on at night with motion detection.
 - .2 Exterior lighting shall be supplemented with manual switches inside building.
 - .3 Exterior lighting shall not create a nuisance to neighbouring properties.
 - .4 Exterior lighting shall be operated by photocells.
 - .5 Exterior lighting fixtures shall be located on the building, rather than on light poles.
- .7 Four pilot lights shall be placed at the entrance to the operating room and shall be push to test, colour as follows:

Green	normal operation
Amber	ventilation failure
Blue	H ₂ S
Red	all other gas detection conditions

- .1 Label each above the light and provide a shade so lights are visible in direct sunlight.
- .8 All lighting shall be accessible for maintenance without scaffolding or removal of other equipment.
- .9 Lighting fixtures in below grade applications shall be watertight.

.6 Cables and Wires:

- .1 Cables and wires shall be labelled at all junctions, junction boxes, and terminal boxes.
 - .1 Labelling shall be referenced on the Record Drawings.

.7 Approved Products:

- .1 The Consulting Engineer shall contact the Municipality to confirm current product standards.

9.7.11 Instrumentation and Control Considerations**9.7.11.1 Instrumentation****.1 Flow Metering:**

- .1 A magnetic flow meter is required on the discharge header with a bypass line around the meter.
- .2 Lift station discharge flow metering and trend logging is required.
- .3 The metering arrangement and flow trend logging shall allow for individual pump performance measurement.
- .4 Metering accuracy shall be within 1% of the actual flow.
- .5 The flow meter shall be sized based on the design flow.

.2 Pressure Measurements:

- .1 12 mm pipe taps with shutoff valves suitable for quick connect pressure gauges shall be provided on each pump suction and discharge line.
 - .1 The location of these taps shall be such that they are accessible and isolated from sewage by an isolation ring.
- .2 Pressure gauges shall be a compound pressure/vacuum type, equipped with a diaphragm seal and isolation valves.
 - .1 Gauges provided for discharge lines shall be liquid filled with a maximum range of at least twice the operating pressure.
 - .2 Gauges shall be stainless steel with dual units of kPa/psi.
- .3 A pressure transmitter with a valve manifold shall be installed on the discharge header.
 - .1 The pressure transmitter shall have HART capability.

.3 Wet Well Level:**.1 Level Indicator Transmitter:**

- .1 A level control instrument is required.
 - .1 Hydrostatic/pressure level transducers are recommended for areas where foaming of the sewage is expected.
 - .2 The Consulting Engineer shall contact the Municipality to confirm the type of level control instrument to be used on a case-by-case basis.
- .2 Level control instruments shall be installed such that they can be activated or removed from the wet well platform for testing and servicing.
- .3 Level control sensing devices shall be located such that their performance is not affected by turbulent flows entering the well or by the turbulent suction of the pumps.

- .4 Floats shall be located such that cables do not get tangled.
- .5 Submersible level elements shall be installed in stilling wells to minimize the risk of sensor anomalies.
- .6 Level elements require intrinsic safety, either through design or intrinsically safe barriers mounted in non-hazardous areas.
- .7 Level transmitters shall be installed in non-hazardous areas.
- .8 Level transmitters require a minimum of two relay outputs.
- .2 **Back-up Level Controller:**
 - .1 Four back-up level bulbs are required.
 - .1 Each level bulb shall be installed such that it can be removed for cleaning and servicing from the wet well platform level.
 - .1 Level bulbs shall be mounted on an engineered or standard metal bar or plate.
 - .2 All level bulbs installed in hazardous areas are required to be rated for the area of installation or shall be connected to intrinsically safe barriers.
 - .3 The redundant level control bulbs and level transmitter relays shall be connected to a supplemental smart relay (Zelio) control system that will automatically take over control of the pumps should the lift station's main level controller fail.
 - .1 The following signals shall be wired to the smart relay for back-up control of the pumps.
 - .1 High-High (bulb),
 - .2 High (bulb),
 - .3 High (LIT),
 - .4 Low (LIT),
 - .5 Low (bulb), and
 - .6 Low-low (bulb).
 - .2 The duplicate high and low signals (one from each of bulb and LIT) shall be set to approximately the same height and shall both start and stop the pumps.
 - .2 The control sequence shall be as follows:
 - .1 Start lead pump when the following is true:
 - .1 One or more of high (LIT), low (bulb), or low-low (bulb) are active; and
 - .2 High-high (bulb) is not active.
 - .2 If pumps have been started for the high-high signal, pumps shall run for a minimum of **X minutes*** after the high-high signal has cleared (*the default is 3 minutes but shall be configured during commissioning).
 - .3 PLC failure detection is determined by a wired PLC output to the smart relay (Zelio) controller that pulses.
 - .1 The smart relay (Zelio) controller will start the pump(s) based on the high level float delay timers if the PLC fails to do so, without the need to detect if the PLC has failed.
 - .2 Upon PLC failure detection, the level transmitter relays shall be used by the smart relay (Zelio) to start/stop the pumps at normal start/stop levels.

- .3 The timers shall be set such that the smart relay (Zelio) will not start a pump if the PLC is operating correctly.
- .3 A lamp on the front of the control panel shall be installed and shall illuminate when the smart relay (Zelio) is actively running a pump.
- .3 The dry well sump shall be equipped with a flood detection level bulb that is connected to the PLC and SCADA system for annunciation.
- .4 Level control instruments shall be terminated in junction boxes located at the main floor, in an area above the flood zone, and connected to intrinsically safe interfaces.
 - .1 Junction boxes shall not be inside the wet well.
- .5 A minimum of 100 mm is required between each level setpoint.
- .4 Smoke and/or heat detectors shall be located in the electrical and generator rooms.
- .5 The exterior doors shall be equipped with switches for intrusion alarms.
- .6 Transmitter displays shall be remotely located on the main level of the operating room or electrical room as applicable.
- .7 Cables shall have a tag at the instrument and junction box identifying the instrument.
 - .1 Laminated labels shall be located on both ends of all wires inside the PLC, junction box, or instrument terminals.
- .8 The Consulting Engineer shall contact the Municipality to confirm current product standards.

9.7.11.2 Control

.1 General:

- .1 A control narrative shall be prepared by the Consulting Engineer and shall be included in the Operations & Maintenance Manual for the lift station.
- .1 Current and future operating parameters shall be included in the control narrative.
- .2 On/off colour designation for motor control center lights, pushbuttons, and HMI interfaces shall be as follows:

Green	off
Amber	fault/trip
Red	running
- .3 The duty/standby pump shall be automatically switched after each run cycle.

.2 On-site Control System:

- .1 The HMI shall be mounted on the PLC panel and shall provide an on-site control system.
- .2 The HMI screen size shall be a minimum of 250 mm, with colour display.
- .3 The HMI interface shall, as a minimum, include all items on the Tag List.
- .4 The control panel and electrical equipment shall be located to prevent being flooded.
- .5 The PLC shall have a minimum spare capacity of 20%.
- .6 The PLC program shall not be password protected and shall not contain any password protected internal logic.

- .7 On-site control systems shall be housed inside a prefabricated CSA approved electrical panel, equipped with a UPS battery back-up that is sized to provide a minimum of 30 minutes of back-up power to all connected loads running at full capacity.
- .8 A maintenance mode shall be included in the programming of the PLC and shall be accessible via the human machine interface (HMI) to avoid nuisance alarms when maintenance is being done.
 - .1 The maintenance mode shall automatically cancel and re-enable alarms if left on for an extended period.
- .9 PLC/HMI equipment, software, shop drawings, schedule, and site-specific program files shall be reviewed by the Municipality prior to installation.
 - .1 The supplier shall conduct a test bench for all equipment to be installed. The test bench results shall be documented and provided to Municipality.
- .10 The PLC shall have a memory card for application back-up and data storage. The memory card shall be formatted by the PLC manufacturer and shall be installed in the PLC.
- .3 **SCADA:**
 - .1 On-site control systems shall be able to communicate with the Fort McMurray Wastewater Treatment Plant SCADA systems via Modbus TCP/IP through an Ethernet radio and the Municipality's SCADA backhaul network communication.
 - .2 On-site parameters that require monitoring and/or controlling by the SCADA system shall include, as a minimum, items indicated on the Tag List.
 - .3 The station shall have an industrial Ethernet switch near the PLC controller with one port for the controller and another for the radio equipment.
 - .1 A 1 m wide x 1 m high x 0.6 m deep space shall be provided on the wall near the PLC for installation of radio network hardware.
 - .4 SCADA equipment, software, site specific program files, license and warranty agreements, and all relevant documentation shall be transferred to Municipality in hardcopy and electronic file format.
 - .1 Refer to **Section 3** for Record Drawing submission requirements.
- .4 An 8 channel alarm dialer is required and shall be an independent back-up to the PLC alarms.
 - .1 Alarms and messages to be programmed into the alarm dialer shall be specified by the Municipality.
- .5 **Alarm Telemetry:**
 - .1 Automated remote sensing and telemetry equipment shall be provided at each sanitary sewage lift station.
 - .1 This equipment shall provide for the detection of the status of selected operating conditions and transmission of appropriate alarms to the monitoring facilities established and operated by the Municipality.
 - .2 The following systems shall be monitored by the controller and shall be further detailed in the alarm telemetry list:
 - .1 Smoke and/or heat detection,
 - .2 Wet well level,
 - .3 Redundant wet well level,

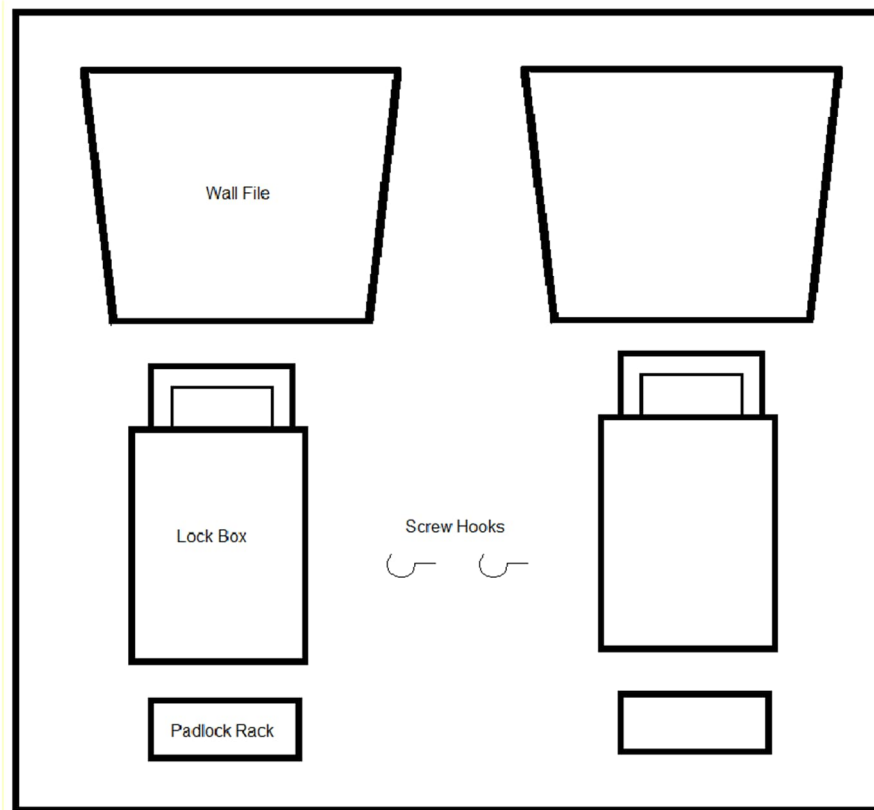
- .4 Generator,
- .5 Power phase and surge detection,
- .6 Dry well flood detection,
- .7 Amps and Hz from sewage pumps,
- .8 Sewage and sump pumps,
- .9 HVAC equipment,
- .10 Flow meter,
- .11 Utility and automatic transfer switch,
- .12 Exterior door status,
- .13 Hazardous atmosphere detection (if there are gas detectors),
- .14 Building temperature,
- .15 Discharge check valve position,
- .16 Pressure, and
- .17 UPS status.
- .3 The control system shall be able to display the graphical trends of the following items as a minimum:
 - .1 Wet well level,
 - .2 Discharge flow of each pump, and
 - .3 Discharge pressure of each pump.
- .6 The Consulting Engineer shall contact the Municipality to confirm current product standards, detailed controller telemetry list, and HMI standard.

9.7.12 Health and Safety

- .1 A two-piece washroom is required, complete with:
 - .1 A large utility sink, and
 - .2 Space for a medium size garbage container.
- .2 The following safety equipment is required for each sanitary sewage lift station:
 - .1 Wall mounted holders for boxes of disposable gloves and ear plugs,
 - .2 Fire extinguisher located near points of egress according to applicable codes and regulations, and
 - .3 Cederroth (or approved equivalent) eye wash bracket for a 500 mL bottle, a sterile eye wash bottle, and an instructional sign to be mounted next to the bracket.
 - .1 Two eyewash locations shall be provided, one in the electrical room and one in the operating room.
- .3 A lockout station board with two of each of the following components shall be provided; refer to **Figure 9-1** for the required layout. The Consulting Engineer shall contact the Municipality to confirm current product standards.
 - .1 Lock box wall mount,
 - .2 Padlock rack,
 - .3 Screw hooks, and

- .4 Vertical orientation wall files.

Figure 9-1 Lockout Station Board Layout



9.8 Commissioning and Operator Training

9.8.1 General Requirements

- .1 The procedures outlined in this section are general only; more detailed requirements may be necessary, depending on the type and complexity of the mechanical plant.
- .2 Commissioning shall follow these steps:
 - .1 Pre-commissioning (refer to [Section 9.8.2](#)),
 - .2 Commissioning (refer to [Section 9.8.3](#)), and
 - .3 Turn-over (refer to [Section 9.8.4](#)).

9.8.2 Pre-Commissioning

- .1 Submit the required construction completion documentation as described in [Section 2.18](#).
- .2 Develop a detailed procedure and appropriate schedule(s) with timelines for training and commissioning activities.
- .3 Pre-test all items individually and as a process to ensure they are ready for operation and provide the supporting documentation to the Municipality.

- .4 Arrange for specialty testing by certified personnel.
 - .1 Confirm the types and dates of testing and the certification(s) of personnel with the Municipality prior to conducting the specialty testing.
- .5 Provide all instruments required to safely test, adjust, balance, and verify operation of all equipment and processes.
- .6 Inspect all equipment to ensure all equipment, processes, and infrastructure are safe, complete, work as intended, and secure.
- .7 Ensure manufacturers' instructions for lubrication, cooling fluids, and other requirements have been complied with throughout pre-commissioning and commissioning.
- .8 Provide a list of all provided warranties and recommended inspections and maintenance for the mechanical plant.
- .9 Provide competent, experienced, and, if necessary, factory-trained personnel to supervise the installation, inspection, testing, verification, training, and commissioning.
- .10 Provide a list of all recommended spare parts and chemicals.
- .11 Coordinate a joint inspection with the Municipality to ensure the mechanical plant is ready to proceed to the commissioning stage.
- .12 Provide a minimum of 2 weeks' notice to the Municipality prior to operator training and commissioning.
- .13 Provide 2 bound sets and 1 electronic (PDF) copy of the Operation and Maintenance (O&M) Manual to the Municipality prior to Commissioning.
 - .1 The O&M Manual shall include a process functional specification completely describing the design and operational philosophy of the facility, including:
 - .1 Process schematic diagram,
 - .2 PLC ladder logic printouts, and
 - .3 Unrestricted electronic copies of PLC controller programs.
 - .2 The O&M Manual shall include all components, units, and systems of the mechanical plant.
 - .1 The Consulting Engineer shall provide an electronic spreadsheet (in Microsoft Excel format) containing the schedule of all of the manufacturers' recommended maintenance activities for these components, units, and systems.
 - .3 The PDF copy of the O&M Manual shall not be restricted or locked and must be searchable and indexed with headings.
 - .4 The operating/control philosophy for water reservoirs shall be included in the O&M Manual. Fire storage level and volume shall be clearly stated in the operating/control philosophy.

9.8.3 Commissioning

- .1 Commissioning shall generally include the Owner's personnel operating the complete system for a 30-day period and the Municipality's personnel operating the complete system for the following 2-week period, under the Owner's supervision.
 - .1 These operating times are subject to change, depending on the complexity of the facility.
- .2 Operation of existing mechanical plants and facilities shall be performed by the Municipality.
 - .1 The Contractor shall provide a parallel, temporary system during construction and commissioning or shall provide for 24/7 monitoring and emergency repairs of the facility.
- .3 During the commissioning period, the Owner shall continue to perform all required Maintenance as per the manufacturers' requirements.
- .4 During the commissioning period, the Owner shall continually demonstrate that the operation of the entire mechanical plant, as well as individual components, is correct and in accordance with the manufacturers' performance criteria.
- .5 It shall be demonstrated to the Municipality that the equipment/processes will perform safely as specified in all levels of operation, including variation in flow, pressure, speed, and control.
- .6 All alarm conditions and monitoring, including malfunctions, safety devices, interlocks, remote alarm reporting, and annunciations shall be confirmed to the Municipality.
- .7 During the Owner's period of operation, the Municipality's operators shall observe the operation and receive appropriate instruction.
- .8 During the following period, the Owner shall observe the Municipality's personnel operating the equipment and provide any necessary guidance.
 - .1 The Owner may be billed for operator time if there are excessive commissioning issues.
 - .2 The Contractor shall provide acceptable training, proactive maintenance schedules, and a list of recommended tools and procedures for the Municipality's maintenance personnel.
 - .3 Based on the Contractor's recommendations, the Municipality shall provide maintenance personnel fitting their recommendations.
 - .4 The Contractor shall then provide training for the appropriate municipal maintenance staff to maintain the mechanical plant.
- .9 **Testing Systems:**
 - .1 Each individual piece of equipment shall be tested by itself and in combination with related items to ensure:
 - .1 The equipment is installed and ready for operation, and
 - .2 The subsystem the equipment is attached to is installed and working correctly in the process the equipment is a component in.
 - .2 Test, adjust, check, and lubricate each individual item of equipment and ensure SCADA systems are fully operational and in communication with any remote location determined by the Municipality.
 - .3 Testing and start-up procedures shall involve the Municipality's maintenance personnel.

.10 Lubrication and Spare Parts:

- .1 Sufficient lubricants for all equipment shall be provided for all testing and trial runs and in sufficient additional quantity for 12 months of operation by the Municipality.
- .2 All lubricants shall be supplied with GHS documentation.
 - .1 Identify lubricants by brand, grade, and item of equipment for which it is intended.
- .3 Operate, drain, and flush out bearings and refill with a new change of oil before completion of commissioning.
- .4 Type of lubricants shall be as recommended by the respective manufacturer and in consultation with the Municipality's operation personnel.
- .5 Provide all spare parts as deemed necessary by the manufacturers and the Municipality for 12 months of operation.
 - .1 Identify spare parts by brand, grade, and item of equipment for which it is intended.
- .6 Provide all special tools required for servicing and maintaining the equipment.
- .11 Provide an electronic schedule of Building Life Cycle components, per **Section 9.3.1**.

9.8.4 Turn-Over

- .1 The Municipality will assume complete responsibility for operation of the mechanical plant only upon successful completion of commissioning, training, satisfactory testing results, demonstration of the ability to meet all safety and regulatory requirements, a successful walk-through (including municipal staff), repair of any deficiencies, and submission of O&M Manuals and Record Drawings.

9.9 Equipment

- .1 The Municipality uses specific manufacturers of equipment and accessories which are common throughout their systems.
 - .1 Therefore, specific standard equipment (make and model) may be requested by the Municipality.
 - .2 The Consulting Engineer shall contact the Municipality to confirm current product standards.

10 LANDSCAPE AND PARK DEVELOPMENT

10.1 General

- .1 This section outlines minimum requirements for Landscape Development within the Municipality, including the development of Open Spaces, parks, playgrounds, sports fields, boulevards, buffer strips, amenity areas, Public Utility Lots (PULs), walkways, trails, medians, and Recreation Facilities.
 - .1 Standard Details relating to landscape and park development are provided in **Section 13**.
- .2 These standards provide the minimum design criteria to be used in the preparation of specifications and drawings. These standards may be exceeded if warranted by the Landscape Architect.
- .3 Refer to the Municipality's *Standard Construction Specifications* for requirements for the construction of items in this section.

10.2 Maintained Parks

10.2.1 General

- .1 Types of Maintained Parks include:
 - Neighbourhood parks,
 - Community parks,
 - Elementary/junior high school sites,
 - District parks,
 - High school sites,
 - Linear parks, and
 - Regional parks.
- .2 **Table 10-1** describes the characteristics of each type of Maintained Park.
- .3 Maintained Parks require a water service for irrigation, at a minimum. The Owner's Consultant shall take this into consideration when sizing the water service, along with demands from uses within the Maintained Park which will require potable water.
 - .1 Contact the Municipality for specifications pertaining to irrigation.
- .4 **Sections 10.2.2** through **10.2.8** provide additional requirements for each type of Maintained Park.

10.2.2 Neighbourhood Park

- .1 In addition to those outlined in **Table 10-1**, a neighbourhood park has the following characteristics.
 - .1 It can not be combined with a school site.
 - .2 The play area and equipment are located in visible areas for safety, security, and public awareness.
 - .3 It has a passive recreation area for sitting or picnics.
 - .4 If the Municipality determines that a water service is not required, any plant material that is located more than 30 m from the road right-of-way shall be drought tolerant.

10.2.3 Community Park

- .1 In addition to those outlined in **Table 10-1**, a community park has the following characteristics.
 - .1 The play area and equipment are located in visible areas for safety, security, and public awareness.
 - .2 It has an open play area for sports and/or active recreation.
- .2 A stormwater management facility may be incorporated into a community park.
- .3 In new developments, the Developer shall consult with the Municipality to determine which additional amenities are to be included in a new community park. Potential amenities include:
 - .1 Multi-purpose pad for tennis courts, basketball courts, skate park, and/or boarded outdoor rink,
 - .2 Sports fields,
 - .3 Spray park, and/or
 - .4 Public art.

10.2.4 Elementary/Junior High School Sites

- .1 In addition to those outlined in **Table 10-1**, elementary/junior high school sites have the following characteristics.
 - .1 The play areas and equipment are located in visible areas for safety, security, and public awareness.
 - .2 There shall be one playground per school.
 - .3 They have an open play area for sports and/or active recreation.
- .2 In new developments, the Developer shall consult with the Municipality to determine which additional amenities are to be included in new elementary/junior high school sites. Potential amenities include:
 - .1 Multi-purpose pad for tennis courts, basketball courts, skate park, and/or boarded outdoor rink,
 - .2 Sports fields,
 - .3 Spray park, and/or
 - .4 Public art.
- .3 Refer to **Section 10.2.9** for additional requirements for school sites.

10.2.5 District Park

- .1 In addition to those outlined in **Table 10-1**, a district park has the following characteristics.
 - .1 It may be combined with Recreation Facilities and/or sports facilities.
 - .2 The play area and equipment are located in visible areas for safety, security, and public awareness.
- .2 In new developments, the Developer shall consult with the Municipality to determine which additional amenities are to be included in a new district park. Potential amenities include:
 - .1 Multi-purpose pad for tennis courts, basketball courts, skate park, and/or boarded outdoor rink,
 - .2 Athletic track or Class A sports field(s),
 - .3 Spray park,
 - .4 Public art, and/or
 - .5 Off-leash dog area.

10.2.6 High School Sites

- .1 In addition to those outlined in **Table 10-1**, high school sites have the following characteristics.
 - .1 They can be combined with a Recreation Facility or sports facility.
 - .2 The play areas and equipment are accessible to users of all levels of ability when combined with a district park, Recreation Facility, or sports facility.
- .2 In new developments, the Developer shall consult with the Municipality to determine which additional amenities are to be included in new high school sites. Potential amenities include:
 - .1 Multi-purpose pad for tennis courts, basketball courts, skate park, and/or boarded outdoor rink,
 - .2 Athletic track or Class A sports field(s), and/or
 - .3 Public art.
- .3 Refer to **Section 10.2.9** for additional requirements for school sites.

10.2.7 Linear Park

- .1 A **linear park** is a Municipal Reserve that provides a green space linkage between other Maintained Parks and/or Environmental Reserves.
- .2 In addition to those outlined in **Table 10-1**, a linear park has the following characteristics.
 - .1 It has a minimum width of 20 m.
 - .2 It has a passive recreation area for sitting or picnics.
 - .3 Plant material that is located more than 30 m from the road right-of-way shall be drought tolerant.

10.2.8 Regional Park

- .1 In addition to those outlined in **Table 10-1**, a regional park has the following characteristics.
 - .1 It is combined with a Recreation Facility, sports facility(ies), or Environmental Reserve whenever possible.
 - .2 In new developments, it may be combined with an existing Municipal Reserve or Environmental Reserve to provide the minimum size required.
 - .1 In these cases, MR credit will be given for the portion of MR contributed by the Developer for the regional park.
 - .3 The play area and equipment are located in visible areas for safety, security, and public awareness.
- .2 In new developments, the Developer shall consult with the Municipality to determine which additional amenities are to be included in a new district park. Potential amenities include:
 - .1 Multi-purpose pad for tennis courts, basketball courts, skate park, and/or boarded outdoor rink,
 - .2 Athletic track or Class A sports field(s),
 - .3 Spray park,
 - .4 Public art,
 - .5 Interpretive trails,
 - .6 Picnic areas,
 - .7 Off-leash dog area, and/or
 - .8 An indoor facility (e.g., community/interpretive centre or clubhouse).

Table 10-1 Types of Maintained Parks

Characteristic	Type						
	NBHD ¹	COMM ²	ELEM/JR ³	District	High School	Linear	Regional
Adjacent land use(s)	• HDR ⁴ • Sr. Citizen ⁵						
Accessible by		• Walking • Bicycling	• Walking • Bicycling				
Adjacent roadway(s)	Local	• Local • Collector	• Local • Collector	Collector	Collector		• Collector • Arterial
Can be combined with (park)	Community	ELEM/JR ³	Community	High School	District		
Service area within radius of	0.5 km	1 km	1 km	3 km	3 km		10 km
Minimum size	0.4 ha	2.4 ha	2.4 ha	5.5 ha	5.5 ha	0.2 ha	20 ha
Portion of MR for a development	15-20%	40-60%	40-60%	40-60%	40-60%	10%	60%
Minimum grassed area of	800 m ²					800 m ²	
Accessibility level	High	High	High	High	High	High	High
Water service (diameter)	75 mm	100 mm	100 mm	100 mm	100 mm		100 mm

Notes:

¹ NBHD = Neighbourhood.

² COMM = Community.

³ ELEM/JR = Elementary/Junior High School.

⁴ HDR = high density residential.

⁵ Sr. Citizen = senior citizen housing.

10.2.9 Land Assembly

- .1 In new and existing communities, Maintained Parks shall be part of the Municipal Reserve; for more information, refer to the *Municipal Government Act*.
- .2 Land required for school sites shall be as per **Table 10-2**.

Table 10-2 Land Requirements for School Sites

School Site	Land Requirement		
	Per School	For MR	Total
Elementary/Junior High	1.5 ha	2.4 ha	3.9 ha
Senior High	3.0 ha	5.5 ha	8.5 ha
Shared (two schools); Elementary/Junior High	1.5 ha	3.6 ha	6.6 ha
Shared (two schools); Senior High	3.0 ha	8.25 ha	14.25 ha

- .3 A minimum of 30% of the perimeter of a Maintained Park shall abut municipal roadways, to ensure identity and exposure for the park and public accessibility.

10.2.10 Owner's Responsibility

- .1 Each Maintained Park site is to be fully landscaped, including all site preparations, grading, topsoil, turf, trails, site fixtures, and other park amenities as specified in this section.
- .2 Water service requirements for irrigation shall be as per **Table 10-1**.
 - .1 Construction specifications and standard details for irrigation are available from the Municipality upon request.
 - .2 The water service shall include:
 - .1 A curb stop located within the park, 2 m from the park property line,
 - .2 A self-draining standpipe located within the park, 3 m inside the park property, installed within a valve box.
 1. The standpipe shall have a drainage pit installed at its base,
 2. The valve box shall be heavy-duty, lockable, and sized to fit the application.
 - .3 Electrical heat tape and tracer wire on the service pipe, and
 - .4 A water meter and vault.
 - .3 Refer to **Section 7** for additional information.
- .3 Each Maintained Park requires an electrical service and separate electrical meter for future automated irrigation system and lights.
- .4 Lighting is required in Intensive Use Areas as follows:
 - .1 Along regional trail networks, and
 - .2 At seating nodes and landscape features.
- .5 Solar powered lighting may acceptable, at the discretion of the Municipality.

- .6 Storm and sanitary services:
 - .1 Are required for regional and district parks, and school sites.
 - .2 May be required for neighborhood, community, and linear parks, at the discretion of the Municipality.
- .7 Off-street parking is required as per **Table 10-3**.
 - .1 The Municipality may reduce parking requirements for park sites with two or more recreational uses.
 - .2 Additional parking may be required for amenities in **Sections 10.2.2** through **10.2.8**, at the discretion of the Municipality.

Table 10-3 Off-street Parking Requirements for Maintained Parks

Type of Amenity	Off-street Parking Requirement (Number of Stalls)					
	NBHD ¹ Park	Community Park	District Park	Linear Park	Regional Park	School Sites
Playground	N/A	1 per 10 m ² of play area	1 per 10 m ² of play area	N/A	1 per 10 m ² of play area	N/A
Sports Field	N/A	15 per field	20 per field	N/A	20 per field	N/A
Athletic Track	N/A	N/A	20 per track	N/A	20 per track	N/A
Court	N/A	4 per court	4 per court	N/A	4 per court	N/A
Outdoor Rink	N/A	15 per rink	15 per rink	N/A	15 per rink	N/A
Skate Park	N/A	1 per 50 m ² of skate area	1 per 50 m ² of skate area	N/A	1 per 50 m ² of skate area	N/A
Spray Park	N/A	1 per 10 m ² of spray area	1 per 10 m ² of spray area	N/A	1 per 10 m ² of spray area	N/A
Open Space	N/A	N/A	1 per ha of MOS ²	N/A	1 per ha of MOS ²	N/A
Picnic Site	N/A	N/A	1 per table	N/A	1 per table	N/A
Off-leash Dog Area	N/A	N/A	1 per 0.3 ha of OLA ³	1 per 0.3 ha of OLA ³	1 per 0.3 ha of OLA ³	N/A
Spectator Facility	N/A	1 per 4 seats	1 per 4 seats	N/A	1 per 4 seats	N/A

Notes:

¹ NBHD = neighbourhood.

² MOS = maintained Open Space.

³ OLA = off-leash area.

- .8 Bicycle parking shall be provided as follows:
 - .1 There shall be a minimum of 5 parking spaces provided for each park type, with the exception of linear parks.
 - .1 Within linear parks, bicycle parking spaces shall be provided in conjunction with each seating node.
 - .2 Bicycle parking spaces and racks shall be as per **Section 10.9.2**.

10.3 Open Spaces

10.3.1 Greenspace Corridors

10.3.1.1 Description

- .1 The greenspace corridor system consists of the following items:
 - .1 **Trail systems** - to provide access and linkages to recreational opportunities, commercial areas, and/or education facilities throughout the community.
 - .2 **PULs and rights-of-way** - to provide passive recreation opportunities and pedestrian linkages.
 - .3 **Boulevards and medians** - to provide aesthetically pleasing streetscapes, pedestrian linkages, visual screens, and/or sound abatement.

10.3.1.2 Trail Systems

- .1 New trails connecting to existing trails shall match the surface treatment and width of the existing trail, unless otherwise directed by the Municipality.
- .2 Trails developed in Environmental Reserves shall be designed to minimize any disturbances to landform or vegetation.
- .3 Trails and pathways are permitted in Municipal Reserves, Environmental Reserves, building or environmental setbacks, PULs, utility rights-of-way, and road rights-of-way (in boulevards).

10.3.1.3 PULs and Rights-of-Way

- .1 Clearing for the installation of underground utility lines shall be minimized, to avoid unsightly cut lines through existing vegetation.
- .2 PULs and rights-of-way shall be connected to Maintained Parks, where possible, to create continuous greenspace corridors.
- .3 **PULs** in new developments may receive MR credit for land that is functional and safe for recreation purposes, with a minimum width of 20 m and a maximum slope of 2%.
 - .1 The percentage of MR credit the area will receive shall be determined by the Municipality on a site-by-site basis.
 - .2 Determination of MR credit for PULs will be based on:
 - .1 Access and connectivity within the Open Space and trail network, and
 - .2 Provided amenities and facilities.

- .4 **Stormwater management facilities** in new developments may receive MR credit for land that is functional and safe for recreation purposes, with a minimum width of 10 m, a maximum slope of 5%, and some form of recreational or community amenity (e.g., trail, gazebo, or seating node).
 - .1 The percentage of MR credit the area will receive shall be determined by the Municipality on a site-by-site basis.
 - .2 Determination of MR credit for stormwater management facilities will be based on:
 - .1 100% MR Credit for areas above the 1:100-year water level,
 - .2 50% MR Credit for areas between the 1:25 year and 1:100-year water levels, and
 - .3 No MR credit for areas below the 1:25 year water level.

10.3.1.4 Boulevards and Medians

- .1 Planting and grading in boulevards shall complement adjacent natural vegetation.
- .2 Existing vegetation, slopes, and topography shall be used to buffer views, where possible.
- .3 Boulevards and buffers along roadways shall be within the road right-of-way and shall not constitute part of the Municipal Reserve dedication in new developments.
- .4 Landscaping in islands or medians shall be low or no maintenance.
 - .1 Refer to **Section 10.10** for the requirements for hardscaped medians and boulevards.

10.3.2 Environmental Reserves

10.3.2.1 Description

- .1 Environmental Reserves are an important component in the overall Open Space system.
- .2 Environmental Reserves provide areas for passive recreation and nature-oriented recreation (e.g., bird and animal watching, hiking, biking, cross-country skiing, etc.).

10.3.2.2 Site Considerations

- .1 Areas of diverse or unique natural resources such as lakes, streams, marshes, vegetation, or topography shall be preserved.
 - .1 Development in these areas shall cause minimal damage to the environment.
 - .2 The protection and management of the natural or historic environment shall be of primary concern; recreational use shall be a secondary objective.

10.3.2.3 Land Assembly

- .1 Recreational enhancements to Environmental Reserves will not receive credit towards the Municipal Reserve dedication in new developments; however, the Municipality encourages Developers to take advantage of ER areas through the installation of trails, bench nodes, viewing platforms, and/or educational/historic signage.

10.3.2.4 Owner's Responsibility

- .1 Encroachment into a natural area is prohibited without the express written consent of the Municipality, except for approved works to support the installation of items described in [Section 10.3.2.3](#).
- .2 Environmental Reserves shall be temporarily fenced and protected from construction activities until construction completion.
- .3 Any natural areas that are damaged during construction must be rehabilitated and re-vegetated to the satisfaction of the Municipality.

10.4 Site Preparation

10.4.1 Erosion and Sedimentation Control

- .1 Erosion and Sedimentation controls shall adhere to BMPs as directed by the RMWB ECO Plan Framework.

10.4.2 Protection of Plant Material

- .1 Plant material to be preserved shall be:
 - .1 Of high quality and worthy of preservation as determined by the Municipality or an appointed representative (e.g., certified arborist, Landscape Consultant).
 - .2 Clearly indicated on the Clearing, Stripping, and Interim Grading Plan.
 - .3 Surrounded by a **plant material protection zone** (PMPZ).
 - .1 The PMPZ shall extend beyond the drip line of trees by a minimum of the larger of:
 - .1 1.0 m, or
 - .2 15 cm for every 1 cm of DBH.
 - .2 The PMPZ shall extend beyond the edge of existing shrubs by a minimum of 1.0 m.
 - .3 The PMPZ will be delineated by orange safety fencing, of a minimum height of 1.2 m, secured with iron stakes or wood posts spaced at a minimum of 2.4 m on centre.
 - .4 The limits of the PMPZ shall be inspected and approved by the Municipality prior to commencement of construction.
 - .2 The safety fencing shall be maintained in good condition and shall not be removed or altered without obtaining permission from the Municipality.
 - .3 Tree protection measures require sign-off from the Municipality.
 - .4 Only close cut (hand clearing) will be permitted within the PMPZ.
 - .1 Any work within the PMPZ requires approval from the Municipality and may require the on-site presence of a representative from the Public Works Department (Parks Branch) for the duration the work within the PMPZ is taking place.
 - .5 The following construction activities are prohibited within the PMPZ:
 - .1 Excavation,
 - .2 Grubbing,
 - .3 Filling (raising the elevation of the ground),
 - .4 Cutting (lowering the elevation of the ground),

- .5 Vehicular traffic,
- .6 Soil compaction,
- .7 Storage of materials or equipment, and
- .8 Disposal of liquids or other substances.

10.4.3 Clearing and Grubbing

- .1 Plant material shall not be removed from any Municipal or Environmental Reserve without written approval from the Municipality.

10.4.4 FireSmart Considerations

- .1 Existing vegetation within 100 m of a development that is designated to remain shall meet the recommendations of the Neighbourhood Wildfire Hazard Assessment prepared for the development, and/or the guidelines set forth in *FireSmart: Protecting Your Community from Wildfire*, and *FireSmart Guide to Landscaping*.
- .2 The following outlines requirements for Priority Zones 1, 2, and 3, as defined in the Municipality's *Guide to FireSmart Landscaping*.

.1 Priority Zone 1: Fuel Removal

- .1 This zone covers the area within 10 m of any permanent structure.
- .2 The purpose of this zone is to help prevent a fire from being carried toward or away from a building.
- .3 Remove all highly flammable vegetation in this area.
- .4 Additional tree clearing to accommodate drainage may be required, at the discretion of the Municipality.
- .5 This area shall be graded, topsoiled, and seeded; the seed mix is dependant on the application.

.2 Priority Zone 2: Fuel Reduction

- .1 This zone covers the area beyond 10 m and within 30 m of any permanent structure.
- .2 The purpose of this zone is to reduce the wildfire threat.
- .3 Remove all dead trees, whether standing or fallen, in this area.
- .4 Thin coniferous trees in this area such that there is a minimum separation of 3.0 m between coniferous trees.
- .5 Prune all ladder fuels (low branches) to a minimum of 2.0 m above ground level in this area.

.3 Priority Zone 3: Fuel Management

- .1 This zone covers the area beyond 30 m and within 100 m of any permanent structure.
- .2 The purpose of this zone is to manage vegetation where the interface hazard is extreme, due to fuel types and/or slope.
- .3 Apply fuel reduction as outlined for Priority Zone 2.

- .3 Chip removed plant material and disperse amongst the forest floor, to a thickness not exceeding 50 mm.
- .4 FireSmart protection clearing is subject to review and approved by the Municipality prior to commencement of clearing operations.

10.4.5 Fill

- .1 Fill material shall be free of sticks, stones and debris greater than 50 mm, and any material which is subject to rot or corrosion.
- .2 Fill material shall be inspected by the Municipality prior to installation.
- .3 Scarify the existing grade to a minimum depth of 100 mm prior to placing fill.
- .4 When bedrock is present, a minimum of 750 mm of clean fill shall be placed over the bedrock.
- .5 Place fill material in loose layers not exceeding 150 mm in depth. Each layer shall be compacted to 95% SPMD prior to placing subsequent layers.

10.5 Topsoil and Surface Treatment

10.5.1 Topsoil

- .1 Topsoil shall be provided in accordance with the Municipality's *Standard Construction Specifications*.
- .2 Every effort shall be made to preserve and reuse existing topsoil on-site. Salvage of topsoil shall be in accordance with the government of Canada's *A Guide to Soil Salvage*.
- .3 Topsoil shall be installed and compacted to a minimum depth of:
 - .1 150 mm for seeded areas,
 - .2 100 mm for sodded areas, and
 - .3 500 mm for shrub beds.
- .4 Trees shall be planted with a sufficient topsoil volume to allow the trees to thrive at mature size; refer to **Tables 10-4** and **10-5**.

Table 10-4 Required Topsoil Volumes for Coniferous Trees

Category ¹	Hole Diameter (Larger of)	Soil Volume ²
Small (less than 5 m spread)	1.5 m or 3x rootball	7 m ³
Medium (5 m to 15 m spread)	2.5 m or 3x rootball	21 m ³
Large (greater than 15 m spread)	3.5 m or 3x rootball	28 m ³

Notes:

¹ As per approved plant list (**Section 10.6.9**).

² Soil volumes may be reduced by one-third if the trees are placed in continuous, shared soil trenches.

Table 10-5 Required Topsoil Volumes for Deciduous Trees

Category ¹	Hole Diameter (Larger of)	Soil Volume ²
Small (less than 4 m spread)	2.0 m or 3x rootball	7 m ³
Medium (4 m to 9 m spread)	2.5 m or 3x rootball	21 m ³
Large (greater than 9 m spread)	3.5 m or 3x rootball	28 m ³

Notes:

¹ As per approved plant list ([Section 10.6.9](#)).

² Soil volumes may be reduced by one-third if the trees are placed in continuous, shared soil trenches.

- .5 Topsoil depth, finished grades, and seedbed shall be inspected and approved by the Municipality prior to sodding, seeding, or hydroseeding.

10.5.2 Bioswales

- .1 A two-layer soil structure with a depth of 0.45 m shall be provided for bioswales.
 - .1 The rooting zone (top layer) shall be 0.10 m to 0.15 m deep and shall be composed of 15-30% compost and 70-85% topsoil.
 - .2 The percolation zone (bottom layer) shall be 0.30 m to 0.35 m deep and shall be composed of 100% topsoil.
- .2 The soil structure shall be firm against deep foot-printing but shall not be over-compacted.
- .3 An underdrain, consisting of a drain rock layer with perforated pipe may be required, at the discretion of the Owner's Consultant. The drain rock shall meet the requirements of the Municipality's *Standard Construction Specifications*.
- .4 Refer to [Section 6](#) for additional information relating to bioswales.

10.5.3 Sod

- .1 Sod shall be provided in accordance with the Municipality's *Standard Construction Specifications*.
- .2 Areas to be sodded shall be topsoiled in accordance with [Section 10.5.1](#).
- .3 Sod is required in Intensive Use Areas, grassed swales, and boulevards, and for patchwork in areas of established turf.
- .4 Sod shall be extended:
 - .1 4.5 m beyond the limits of Intensive Use Areas.
 - .2 1.5 m beyond the edges of trails in Maintained Parks and greenspace corridors.
 - .3 2.0 m from the centre line, on each side, of grassed swales.
- .5 The Owner shall be responsible for providing and maintaining adequate barricades and signs to protect freshly sodded areas until the turf is established.

10.5.4 Seed

- .1 Seed shall be provided in accordance with the Municipality's *Standard Construction Specifications*.
- .2 Areas to be seeded shall be topsoiled in accordance with **Section 10.5.1**.
- .3 Seeding is acceptable for all other areas not sodded (as specified in **Section 10.5.3**), dependant on size, accessibility, and terrain.
- .4 A wetland seed mix is required for areas such as creeks, wetlands, and riparian zones.
 - .1 The wetland seed mix shall be approved by the Municipality. Authorizations may be required from Alberta Environment prior to disturbance of a water body.
- .5 The Owner shall be responsible for providing and maintaining adequate barricades and signs to protect freshly seeded areas until the turf is established.

10.5.5 Hydroseed

- .1 Hydroseed shall be provided in accordance with the Municipality's *Standard Construction Specifications*.
- .2 Areas to be seeded shall be topsoiled in accordance with **Section 10.5.1**.
- .3 Hydroseeding is acceptable for all other areas not sodded (as specified in **Section 10.5.3**), dependant on size, accessibility, and terrain.
- .4 The Owner shall be responsible for providing and maintaining adequate barricades and signs to protect freshly hydroseeded areas until the turf is established.

10.6 Plant Material

10.6.1 General

- .1 Plant material shall be provided in accordance with the Municipality's *Standard Construction Specifications*.
- .2 Refer to the Municipality's *Urban Forest Strategy* for additional information.
- .3 The use of Collected Plants is prohibited unless approval is provided by the Municipality in writing.
- .4 The Municipality may reject plant material from a specific source if there is a concern related to the spread of disease or pests.
- .5 Preservation of existing mature trees within the road right-of-way or park space may fulfill all or a portion of the tree planting requirements for new developments.
 - .1 This shall be dependant on the size, health, and quality of the existing mature trees.
 - .2 The Developer shall consult with the Municipality to verify suitable mature trees for this purpose.

10.6.2 Design, Quantities, and Sizes

- .1 The quantities indicated in **Table 10-6** are required for new developments and street renewals/rehabilitations.

Table 10-6 Planting Requirements

Application	Trees	Shrubs	Comments
Maintained Parks			
Smaller than 1 ha	1 per 100 m ²	Covering 1% to 6% of site area	In areas consisting mainly of sports fields, tree quantities and sizes may be reduced. ¹
Larger than 1 ha	1 per 150 m ²		
Stormwater Management Facilities (Dry Ponds, Wet Ponds, and Constructed Wetlands) ²			
Smaller than 1 ha	1 per 100 m ²	Covering 1% to 6% of site area	
Larger than 1 ha	1 per 150 m ²		
Roadways			
Urban local	1 per 10 m, or residential lot ³	Not required	On each side of the roadway.
Urban collector	1 per 10 m	Not required	On each side of the roadway.
Urban arterial boulevards	1 per 10 m	1 per 1.2 m	On each side of the roadway.
Urban arterial medians	1 per 10 m	See Comments	Shrubs may be placed in medians. ¹
Miscellaneous			
Off-street parking areas	1 per 5 stalls	1 per stall	

Notes:

¹ At the discretion of the Municipality.

² Above the high water level.

³ Whichever is greater.

- .1 For off-street parking areas:
 - .1 Plant material shall be placed around the perimeter of the parking area and in parking islands.
- .2 For urban arterial roadways:
 - .1 Shrubs shall be placed in shrub beds.
 - .2 Trees may be placed in shrub beds, at the discretion of the Municipality.
- .3 Plant sizes shall be as indicated in **Table 10-7**.

Table 10-7 Plant Size Requirements

Plant Material	Minimum Size ¹
Deciduous Species	
Trees	50 mm Caliper
Shrubs	600 mm height
Coniferous Species	
Trees	2 m height
Shrubs	600 mm spread

Note:

¹ Plant sizes may be reduced, depending on the species and application and at the discretion of the Municipality.

- .2 The Municipality discourages monoculture planting and encourages planting design which incorporates a diversity of tree species hardy to the region to reduce the spread of pests and disease and the potential loss of a single species within a localized area.

10.6.3 Special Requirements for Boulevard Trees

- .1 The Consulting Engineer shall inform the Shallow Utility companies of the intent to plant boulevard trees.
 - .1 For development projects, this shall occur at the time the Consulting Engineer requests the Shallow Utility designs from the Shallow Utility companies; refer to **Section 8** for more information.
- .2 The locations of proposed boulevard trees shall be included on the Landscape Plan; refer to **Section 3.6.4.14** for more information pertaining to Landscape Plans.
- .3 Should the edge of a Tree Well be closer than 1 m from a located utility, the tree pit shall be excavated by hand and the affected utility shall be contacted to obtain approval for the installation and confirm if there are specific safety procedures to be followed.

10.6.4 Bioswales

- .1 Vegetation is a crucial component of bioswales and shall consist of grasses, rushes, and sedges in addition to shrub and tree plantings along the edges of bioswales.
- .2 Native grass species shall be provided in an effort to enhance biodiversity and wildlife habitat.
- .3 Selection of large, sturdy species is recommended as they remain upright during storm events, provide year-round cover, and prevent pedestrian movement through the swale.
- .4 Bioswales located along roadways shall incorporate salt tolerant plant species.
- .5 Mulch is susceptible to erosion and shall not be used in bioswales.
- .6 Covering the bottom of bioswales with rock is prohibited; planting is essential for the proper function of bioswales.

10.6.5 Setbacks

- .1 Tree Wells and planting beds shall be set back from non-mowable surfaces, private property, fencing, and other site fixtures.
 - .1 Setbacks for Tree Wells and planting beds shall be measured from the edges of the Tree Wells, Mulched areas, or planting beds, as applicable, and shall be as follows:
 - .1 15 m for poplar species,
 - .2 2 m for deciduous trees (with the exception of poplar species), and
 - .3 Half the maximum spread for conifers.
 - .2 Northwest Poplar and Balsam Poplar species shall be a minimum of 15 m from private property and a minimum of 10 m from hard surfaces.
 - .1 All other Poplar species, including columnar varieties, shall be a minimum of 10 m from private property and a minimum of 5 m from hard surfaces.
- .2 Trees shall be set back a minimum distance, measured from the center of the tree trunk, from Public Infrastructure, Shallow Utility infrastructure, site amenities, and property lines as per **Table 10-8**.
- .3 Setbacks are established by the respective utility/service provider and the Consulting Engineer shall review and confirm all setbacks prior to submission of the detailed design drawings for review by the Municipality.

Table 10-8 Setback Requirements for Trees

Feature	Minimum Setback (m)
Deep Utilities	
Storm and sanitary sewer mains	1.5 m
Storm and sanitary sewer services	1.5 m
Watermains	1.5 m
Water services	1.5 m
Water valves	1.5 m
Hydrants	3.0 m
Shallow Utilities	
Streetlights	3.5 m
Power hardware	3.5 m
Underground power and telecommunications ¹	1.0 m
Telecommunications ¹ pedestals	1.5 m
Gas mains and services	1.5 m
Utility poles	3.5 m
Overhead power and telecommunications ¹	7.5 m

(see next page for continuation)

Feature	Minimum Setback (m)
Signage	
Stop signs	3.5 m
Yield signs	3.5 m
Bus stop signs	3.5 m
All other types of signs	1.8 m
Arterial Roadways	
Face of curb at boulevards	3.0 m
Face of curb at medians ²	2.0 m
Collector Roadways	
Face of curb at boulevards	2.0 m
Face of curb at medians ²	2.0 m
Local Roadways	
Face of curb	2.0 m
Playgrounds & Spray Parks	
No large Canopies or suckering root systems	5.0 m
Large Canopies and/or suckering root systems	10 m
Shrub beds	3.0 m
Miscellaneous	
PULs	No trees
Easements	No trees
Driveways	1.5 m
Sidewalks	1.0 m
Street corners	As per TAC ³ requirements
Property lines	1.0 m

Notes:

¹ Term used to collectively refer to telephone, internet, fibre optic, and cable TV.

² Smaller setbacks may be acceptable, at the discretion of the Municipality.

³ TAC = Transportation Association of Canada.

- .4 Refer to the typical roadway cross sections in **Section 13** for tree locations within boulevards.

10.6.6 Staking and Tying

- .1 Stakes and ties shall be provided as per the Municipality's *Standard Construction Specifications*.
- .2 Stakes and ties shall be required until the issuance of the Final Acceptance Certificate; all staking material shall be removed at that time to prevent girdling of the tree.

10.6.7 Mulch

- .1 Mulch, where designated, shall be provided as per the Municipality's *Standard Construction Specifications*.
- .1 Limit the use of landscape Mulches to composted wood chip Mulch, in accordance with FireSmart/FireWise program research, to a depth of no greater than 80 mm to 100 mm.
- .2 Composted wood chip Mulch shall not be used within 1.5 m of a dwelling or other combustible structure.
- .2 Non-wood type Mulches require approval from the Municipality prior to installation.

10.6.8 Naturalization

- .1 Natural areas disturbed by construction shall be restored with native plant material.
 - .1 When selecting native plant material, the following shall be considered:
 - .1 The surrounding environment,
 - .2 Existing and new drainage patterns and slopes, and
 - .3 Soil conditions.
- .2 Naturalization programs require an appropriate mix of trees, shrubs, ground covers, and wildflower seed mixes.
 - .1 A minimum of 25% of the plant material shall be of larger sizes (minimum 50 mm Caliper).
- .3 Every effort shall be made to restore the site to its original condition or better.
- .4 Forestry stock, seedlings, deciduous tree whips, and propagated and rooted cuttings are acceptable.
- .5 All plant material shall be nursery grown stock with the exception of Collected Plants.
- .6 Any donor sites and areas to receive Collected Plants shall be identified and approval from the Municipality is required prior to installation.
- .7 Acceptable levels of shrub survival at final acceptance shall be 80% with a minimum density of 1 plant per m².
- .8 More stringent requirements for naturalization may be required, at the discretion of the Municipality, depending on the sensitivity of the area.

10.6.9 Approved Plant Material

- .1 **Tables 10-9** through **10-14** outline plant material approved by the Municipality and **Table 10-15** lists the Municipality's prohibited plant material.
- .2 Plants identified in *FireSmart Guide to Landscaping* are denoted with * after the Common Name and are considered lower risk.
- .3 Plants indicated as being recommended in the *Wildlife Friendly Landscaping* brochure referenced in the BearSmart guidelines are denoted with 🐻 after the Common Name.
- .4 The BearSmart guidelines shall be considered when selecting plant material.
 - .1 Fruiting plants are not permitted within or adjacent to Maintained Parks or school sites.

- .5 Plant material not indicated in **Tables 10-9** through **10-14** may be acceptable, at the discretion of the Municipality.

Table 10-9 Approved Coniferous Trees

Botanical Name	Common Name	Hardiness Zone ¹	Sp. ² (m)	Ht. ³ (m)	Drought Tolerant?
Medium Trees (5 m to 15 m spread)					
<i>Picea glauca</i>	White Spruce	2	5	15	✓
<i>Picea pungens</i> 'Glaucua'	Colorado Blue Spruce	2	5	15	✓
<i>Pinus sylvestris</i>	Scots Pine	3	5	12	✓
Small Trees (spread less than 5 m)					
<i>Abies balsamea</i>	Balsam Fir	2	3	10	
<i>Abies sibirica</i>	Siberian Fir	2	3	10	
<i>Picea glauca</i> cultivars	White Spruce	2			✓
<i>Picea pungens</i> cultivars	Blue Spruce	2			✓
<i>Pinus aristata</i>	Rocky Mountain Bristlecone Pine	2	2	4	✓
<i>Pinus banksiana</i>	Jack Pine	2	3	12	✓
<i>Pinus cembra</i>	Swiss Stone Pine	3	4	12	✓
<i>Pinus contorta</i> var. <i>latifolia</i>	Rocky Mountain Lodgepole Pine 	2	3	15	✓
<i>Larix laricina</i>	Tamarack	2	3	12	
<i>Larix sibirica</i>	Siberian Larch	2	3	12	✓

Notes:

¹ Canada's Plant Hardiness Zone

² Typical mature spread

³ Typical mature height

Table 10-10 Approved Coniferous Shrubs

Botanical Name	Common Name	Hardiness Zone ¹	Sp. ² (m)	Ht. ³ (m)	Drought Tolerant?
<i>Picea pungens</i> 'Glauca Globosa'	Globe Blue Spruce	2	2	2	✓
<i>Picea pungens</i> 'Montgomery'	Montgomery Blue Spruce	2	1	3	✓
<i>Pinus mugo</i> and cultivars	Mugo/Swiss Mountain Pine	1			✓
<i>Juniperus communis</i> 'Effusa'	Effusa Common Juniper	2	2	< 1	✓
<i>Juniperus horizontalis</i> cultivars	Bar Harbor Juniper	2			✓
<i>Juniperus sabina</i> cultivars	Spreading Juniper	2			
<i>Juniperus scopulorum</i> cultivars	Rocky Mountain Juniper	2			

Notes:

¹ Canada's Plant Hardiness Zone

² Typical mature spread

³ Typical mature height

Table 10-11 Approved Deciduous Trees

Botanical Name	Common Name	Hardiness Zone ¹	Sp. ² (m)	Ht. ³ (m)	Drought Tolerant?
Large Trees (spread greater than 9 m)					
<i>Acer negundo</i>	Manitoba Maple/Box Elder	2	10	12	✓
<i>Celtis occidentalis</i>	Common Hackberry *	2	12	15	
<i>Fraxinus pennsylvanica</i> and cultivars	Green Ash *	2			
<i>Populus balsamifera</i>	Balsam Poplar *	2	12	25	
<i>Populus</i> x 'Brooks #6'	Brooks #6 Poplar *	2	12	20	
<i>Populus</i> x 'Northwest'	Northwest Poplar *	2	12	15	
<i>Tilia americana</i>	American Linden *	2	10	16	
<i>Ulmus americana</i> 'Brandon'	Brandon Elm	2	12	15	✓
<i>Ulmus pumila</i>	Siberian Elm	2	10	12	
Medium Trees (4 m to 9 m spread)					
<i>Acer ginnala</i>	Amur Maple *	2	5	6	✓
<i>Acer negundo</i> 'Baron'	Baron Manitoba Maple ⁴	2	9	12	✓
<i>Betula papyrifera</i>	Paper/White Birch *	2	9	12	
<i>Betula pendula</i> 'laciniata'	Cutleaf Weeping Birch *	2	8	12	
<i>Crataegus</i> x 'Snowbird'	Snowbird Hawthorn *	3	5	5	✓
<i>Crataegus</i> x 'Toba'	Toba Hawthorn *	3	5	5	✓

(see next page for continuation)

Botanical Name	Common Name	Hardiness Zone ¹	Sp. ² (m)	Ht. ³ (m)	Drought Tolerant?
Elaeagnus angustifolia	Russian Olive	2	6	6	✓
Fraxinus nigra	Black Ash	2	7	14	
Fraxinus nigra 'Fallgold'	Fallgold Black Ash	2	5	13	
Crataegus succulenta	Fleshy Hawthorn *	2	4	5	✓
Fraxinus mandschurica 'Mancana'	Mancana Manchurian Ash	3	7	12	
Fraxinus x 'Northern Gem'	Northern Gem Ash	2	9	13	✓
Fraxinus x 'Northern Treasure'	Northern Treasure Ash	2	7	13	✓
Malus baccata	Siberian Crab Apple *	2	4	5	
Populus x 'Assiniboine'	Assiniboine Poplar *	2	8	18	
Populus x 'Hill'	Hill Poplar *	2	6	18	
Prunus maackii	Amur Cherry *	2	5	7	
Quercus macrocarpa	Bur Oak *	2	8	10	✓
Salix alba 'Sericea'	Silky White Willow * 🟢	2	7	16	
Medium Trees (4 m to 9 m spread); continued					
Salix acutifolia	Sharp Leaf Willow * 🟢	2	7	16	
Salix pentandra	Laurel Leaf Willow * 🟢	2	7	16	
Sorbus americana	American Mountain Ash	2	5	8	
Sorbus decora	Showy Mountain Ash	2	6	8	
Tilia x 'Dropmore'	Dropmore Linden *	2	7	12	
Tilia x 'Harvest Gold'	Harvest Gold Linden *	2	8	12	
Small Trees (spread less than 4 m)					
Crataegus arnoldiana	Arnold Hawthorn *	2	3	4	✓
Malus x (cultivars)	Crabapple *	2			
Populus x 'Tower'	Tower Poplar *	3	2	15	
Populus tremula 'Erecta'	Columnar Aspen * ⁵	2	2	10	

Notes:

¹ Canada's Plant Hardiness Zone

² Typical mature spread

³ Typical mature height

⁴ Also known as Baron Box Elder

⁵ Cultivars resistant to Bronze Leaf Disease

Table 10-12 Approved Deciduous Shrubs

Botanical Name	Common Name	Hardiness Zone ¹	Sp. ² (m)	Ht. ³ (m)	Drought Tolerant?
Acer ginnala 'Fireball'	Fireball Amur Maple *	2	1.3	1.3	
Caragana arborescens	Common Caragana *	2			✓
Caragana frutex 'Globosa'	Globe Caragana	2	0.9	0.9	✓
Caragana pygmaea	Pygmy Caragana	2	1.3	0.9	✓
Cornus alba cultivars	Dogwood	3			
Cornus sericea	Red Osier Dogwood *	2	3.0	3.0	
Cornus sericea 'Flaviramea'	Golden-Twig Dogwood ⁴ *	2	2.0	2.0	
Corylus americana	American Hazelnut	2	2.0	3.0	
Cotoneaster integerrimus	Common Cotoneaster	2	1.5	1.5	
Cotoneaster lucidus	Hedge Cotoneaster	2	1.5	2.5	✓
Elaeagnus x 'Jefmorg'	Silverscape Olive	2	1.5	1.8	
Hippophae rhamnoides	Sea-Buckthorn	2	4.0	4.0	✓
Hydrangea arborescens 'Annabelle'	Annabelle Hydrangea	3	1.3	1.3	
Hydrangea paniculate 'Grandiflora'	Peegee Hydrangea	3	1.3	1.3	
Lonicera caerulea 'Edulis'	Sweetberry Honeysuckle *	3	1.3	1.3	
Lonicera tatarica and cultivars	Tatarian Honeysuckle *	3	4.0	4.0	
Lonicera x (cultivars)	Honeysuckle *	3			
Paxistima canbyi	Cliff Green	2	0.6	0.9	
Philadelphus lewisii 'Waterton'	Waterton Mockorange * 🌱	2	1.5	2.0	✓
Philadelphus lewisii 'Blizzard'	Blizzard Mockorange * 🌱	2	1.5	1.5	✓
Physocarpus opulifolius 'Dart's Gold'	Dart's Gold Ninebark *	2	1.8	1.8	✓
Potentilla fruticosa cultivars	Shrubby Cinquefoil *	2			
Prunus besseyi	Western Sandcherry *	2	1.0	1.0	
Prunus x cistena	Purple-Leaf Sand Cherry *	2	1.5	2.0	
Prunus tenella	Russian Almond	3	0.9	0.9	
Prunus fruticosa	Mongolian Cherry	2	1.5	1.5	
Prunus tomentosa	Nanking Cherry *	2	2.0	2.0	
Prunus triloba 'Multiplex'	Double Flowering Plum *	2	2.5	2.5	
Ribes alpinum	Alpine Currant *	2	1.0	1.5	
Ribes alpinum 'Green Mound'	Green Mound Alpine Currant *	2	1.3	1.3	

(see next page for continuation)

Botanical Name	Common Name	Hardiness Zone ¹	Sp. ² (m)	Ht. ³ (m)	Drought Tolerant?
Ribes aureum	Golden Currant	2	1.5	1.5	
Rosa rugosa 'Hansa'	Hansa Rugosa Rose *	2	1.3	1.4	✓
Rosa x 'Thérèse Bugnet'	Thérèse Bugnet Rose	2	1.5	1.8	
Rosa x rugosa cultivars	Explorer series Roses *	2			
Rosa foetida 'Harrison's Yellow'	Harrison's Yellow Rose	2	1.5	2.0	
Rosa x arkansana cultivars	Parkland series Roses	2			
Rosa rubrifolia	Red Leaf Rose	2	1.5	2.0	
Salix brachycarpa 'Blue Fox'	Blue Fox Willow * ☐	2	1.0	1.0	
Salix repens argentea	Silver Creeping Willow * ☐	2	2.0	0.3	
Salix salicola 'Polar Bear'	Polar Bear Willow * ☐	2	2.0	5.0	
Sorbaria sorbifolia	False Spirea	2	2.0	2.0	
Spiraea	Spirea species and cultivars * ☐	3			
Syringa	Lilac species and cultivars * ☐	2			
Viburnum lentago	Nannyberry	2	2.5	4.0	
Viburnum opulus 'Nanum'	Dwarf European Cranberry	3	0.6	0.6	
Viburnum trilobum and cultivars	Highbush Cranberry *	2			

Notes:

¹ Canada's Plant Hardiness Zone

² Typical mature spread

³ Typical mature height

Table 10-13 Approved Native Plant Material

Botanical Name	Common Name	Hardiness Zone ¹	Sp. ² (m)	Ht. ³ (m)	Drought Tolerant?
<i>Alnus viridis</i>	Green Alder	2	2	3	
<i>Alnus tenuifolia</i>	Mountain Alder *	2	4	6	✓
<i>Amelanchier alnifolia</i>	Saskatoon Serviceberry *	2	2	3	✓
<i>Arctostaphylos uva-ursi</i>	Bearberry/Kinnikinnick *	2	1	< 1	
<i>Betula pumila</i>	Swamp Birch *	2	2	2	
<i>Betula glandulosa</i>	Dwarf Birch *	2	2	2	
<i>Corylus cornuta</i>	Beaked Hazelnut *	2	2	3	✓
<i>Elaeagnus commutata</i>	Wolf-Willow/Silverberry *	2	2	2	✓
<i>Juniperus horizontalis</i>	Creeping Juniper	2	2	< 1	✓
<i>Juniperus communis</i>	Common Juniper	2	2	< 1	
<i>Ledum groenlandicum</i>	Bog Labrador Tea	2	< 1	< 1	
<i>Lonicera involucrata</i>	Bracted Honeysuckle *	2	2	3	✓
<i>Potentilla fruticosa</i>	Shrubby Cinquefoil *	2	2	2	
<i>Ribes oxycanthoides</i>	Canadian Gooseberry	2	1	1	✓
<i>Rosa acicularis</i>	Prickly Wild Rose	1	1	1	✓
<i>Rubus idaeus</i>	Wild Red Raspberry *	2	1	2	✓
<i>Salix discolor</i>	Pussy Willow * ☞	2	4	5	✓
<i>Shepardia argentea</i>	Silver Buffaloberry *	2	3	3	✓
<i>Shepardia canadensis</i>	Canada Buffaloberry *	2	3	3	
<i>Symphoricarpos albus</i>	Common Snowberry *	2	2	2	✓
<i>Symphoricarpos occidentalis</i>	Western Snowberry *	2	1	1	
<i>Vaccinium myrtilloides</i>	Common Blueberry *	2	< 1	< 1	
<i>Vaccinium vitis-idaea</i>	Mountain Cranberry/Lingonberry *	2	< 1	< 1	
<i>Viburnum trilobum</i>	High-Bush Cranberry	2	2	3	
<i>Viburnum edule</i>	Lowbush Cranberry	2	1	1	

Notes:

¹ Canada's Plant Hardiness Zone

² Typical mature spread

³ Typical mature height

Table 10-14 Recommended Boulevard Trees

Botanical Name	Common Name	Hardiness Zone ¹	Sp. ² (m)	Ht. ³ (m)	Drought Tolerant?
Acer negundo	Box Elder	2	10	12	✓
Acer negundo 'Baron'	Baron Manitoba Maple ⁴	2	9	12	✓
Fraxinus nigra	Black Ash	2	7	14	
Fraxinus nigra 'Fallgold'	Fallgold Black Ash	2	5	13	
Fraxinus pennsylvanica and cultivars	Green Ash *	2			
Prunus maackii	Amur Cherry *	2	5	7	
Tilia americana	American Linden *	2	10	16	
Tilia x 'Dropmore'	Dropmore Linden *	2	7	12	
Tilia x 'Harvest Gold'	Harvest Gold Linden *	2	8	12	
Ulmus americana 'Brandon'	Brandon Elm	2	12	15	✓
Ulmus pumila	Siberian Elm	2	10	12	

Notes:

¹ Canada's Plant Hardiness Zone

² Typical mature spread

³ Typical mature height

⁴ Also known as Baron Box Elder

Table 10-15 Prohibited Plant Material

Botanical Name	Common Name
Prunus padus var. <i>commutata</i>	Common Mayday
Prunus pensylvanica	Pin Cherry
Prunus virginiana 'Schubert'	Schubert Chokecherry
Prunus virginiana 'Melanocarpa'	Black Chokecherry

Note: The list of prohibited plant material may be updated periodically. Contact the Municipality for the current list.

10.7 Trail Development

10.7.1 General

- .1 The Municipality has three classes of trails (Class 1, Class 2, and Class 3), which are described in [Sections 10.7.2](#) through [10.7.4](#).
- .2 Refer to the Municipality's *Active Transportation Functional Plan* for additional information.

10.7.2 Class 1 Trails

10.7.2.1 Description

- .1 Class 1 trails are the spine of the Municipality's overall trail system and generally provide a buffer between residential areas and sensitive land uses adjacent to residential areas (such as highways, arterial roadways, railways, or industrial land uses).
- .2 Where possible, uninterrupted access shall be provided to Class 1 trails, along their full length.
- .3 Class 1 trails shall:
 - .1 Accommodate two-way traffic,
 - .2 Serve a broad range of uses,
 - .3 Be fully accessible during warmer months, and
 - .4 Be surfaced with asphalt, concrete, or paving stones.
- .4 Class 1 trails include multi-use trails adjacent to arterial and collector roadways
 - .1 Other trails within the active transportation network may be designated Class 1, at the discretion of the Municipality.

10.7.2.2 Access and Location

- .1 Access to and extension of Class 1 trails shall be provided in new developments, in accordance with the relevant Area Structure Plan and/or Outline Plan.
- .2 Where possible, Class 1 trails shall be located along top-of-bank areas abutting creeks, rivers, and/or ravines.
- .3 Class 1 trails shall be located in all primary pedestrian routes, Municipal Reserves, Public Utility Lots, and areas that are not environmentally sensitive.
 - .1 Primary pedestrian routes shall generally be located along the perimeter of development areas; however, the Consulting Engineer shall coordinate with the Municipality to confirm the location(s) of primary pedestrian routes.

10.7.2.3 Aesthetics and Alignment

- .1 Existing trees and plant material along the alignment of Class 1 trails shall be retained, where possible, and shall be supplemented with plant material that will enhance aesthetics and aid in screening.
- .2 Bench nodes are required every 500 m; see [Section 10.9.2](#) for details.

- .3 The alignment of Class 1 trails shall be curvilinear to fit the natural form of the land.
- .1 Straight lines and constant curve radii shall be avoided.
- .4 Class 1 trails may require site-specific signage, at the discretion of the Municipality.

10.7.2.4 Width

- .1 Class 1 trails shall have a minimum width of 3 m.
- .2 Intersections, entrances and exits from highly used activity nodes, curves, and/or excessive grades may require the width of the trail to be increased, at the discretion of the Consulting Engineer.

10.7.3 Class 2 Trails

10.7.3.1 Description

- .1 Class 2 trails provide the opportunity for ancillary trail loops to augment and expand the Class 1 trail system.
- .2 Class 2 trails shall:
 - .1 Prioritize providing secondary pedestrian routes,
 - .2 Serve a broad range of uses, and
 - .3 Be surfaced with asphalt, concrete, or paving stones.

10.7.3.2 Access and Location

- .1 Class 2 trails shall be located to provide increased opportunities for contact between users and natural environments.
- .2 Class 2 trails shall be located in all secondary pedestrian routes, Municipal Reserves, Public Utility Lots, and areas that are not environmentally sensitive.
 - .1 Class 2 trails are permitted to lead users to the boundaries of environmentally sensitive areas, such as Environmental Reserves.

10.7.3.3 Aesthetics and Alignment

- .1 The alignment of Class 2 trails shall meander to follow the existing terrain.
- .2 Bench nodes are required every 500 m; see [Section 10.9.2](#) for details.
- .3 Class 2 trails shall be less “uni-directional” than Class 1 trails.

10.7.3.4 Width

- .1 Class 2 trails shall have a minimum width of 2.5 m.
- .2 Intersections, entrances and exits from highly used activity nodes, curves, and/or excessive grades may require the width of the trail to be increased, at the discretion of the Consulting Engineer.

10.7.4 Class 3 Trails

10.7.4.1 Description

- .1 Class 3 trails provide opportunities for contact with nature and natural systems.
- .2 Areas adjacent to Class 3 trails shall be left in a natural state.
- .3 Class 3 trails shall:
 - .1 Be designed to accommodate high use from select user groups, and
 - .2 Be surfaced with gravel, unless otherwise required by the Municipality.

10.7.4.2 Access and Location

- .1 Class 3 trails shall be located in natural areas such as Environmental Reserves.

10.7.4.3 Aesthetics and Alignment

- .1 The alignment of Class 3 trails shall cause minimal disturbance to the surrounding environment and shall follow the natural terrain of the area wherever possible.

10.7.4.4 Width

- .1 Class 3 trails shall have a minimum width of 2.5 m.
- .2 Intersections, entrances and exits from highly used activity nodes, curves, and/or excessive grades may require the width of the trail to be increased, at the discretion of the Consulting Engineer.

10.7.5 Surfaces

10.7.5.1 Asphalt

- .1 Hot-mix asphalt used in the construction of trails shall be supplied and installed in accordance with the Municipality's *Standard Construction Specifications*.
- .2 Refer to [Section 4](#) for the trail structure.
- .3 Class 1 trails shall have a 100 mm wide thermoplastic centreline.
- .4 Class 2 trails generally do not require a centreline, except for sections which are greater than 2.5 m wide and/or have a longitudinal grade greater than 4%.

10.7.5.2 Concrete

- .1 Concrete used in the construction of trails shall be supplied and installed in accordance with the Municipality's *Standard Construction Specifications*.
 - .1 The finished surface shall be transversely brushed.
 - .2 Contraction joints shall be spaced at 1.5 m.
- .2 Refer to [Section 4](#) for the trail structure.

10.7.5.3 Paving Stones

- .1 Paving stones used in the construction of trails shall have a minimum thickness of 60 mm.
- .2 Refer to **Section 4** for the trail structure.

10.7.5.4 Gravel

- .1 Gravel used in the construction of trails shall be supplied and installed in accordance with the *Standard Construction Specifications*.
- .2 Refer to **Section 4** for the trail structure.

10.7.6 Intersections

- .1 Class 1 trail intersections shall be illuminated; see **Section 10.9.2** for more information.
- .2 Trail intersections with roadways require pedestrian crossings in accordance with **Section 4**.
- .3 Trail “tee” intersections and the placement of fencing shall be designed with consideration of the turning radii of maintenance equipment.

10.7.7 Signage and Markers

- .1 Trail stop signs are required at trail intersections with roadways.
- .2 Contact the Municipality to confirm requirements for trail signage such as maps, trail names, sharp corners, yield, steep slopes, trail narrowing, regulatory, and wayfinding.
 - .1 Refer to the *Wood Buffalo Wayfinding Strategy*, available on the Municipality’s website, for more information.

10.7.8 Right-of-Way Clearances

- .1 A minimum vertical clearance of 2.4 m shall be provided above the trail surface.
- .2 Sight lines shall be considered at intersections, steep grades, sharp crests, and curves.
- .3 A minimum horizontal clearance of 1 m shall be provided from the edges of the trail surface.
- .4 The 1 m horizontal clearance zone shall be free of fixed objects such as benches, signage, fencing, and light poles.

10.7.9 Grades, Radii, and Superelevation

- .1 In general, the maximum longitudinal slope of trails shall be 5%.
 - .1 In areas of steep topography, the maximum longitudinal slope of trails shall be 8%.
 - .2 Trails with a longitudinal slope exceeding 5% require 1.2 m long landings every 10 m.
- .2 The Consulting Engineer shall determine the required radii of a trail, based on the anticipated use and design speed of trail users.
 - .1 Radii between 30 m and 60 m are recommended.

- .3 The Consulting Engineer shall determine the required superelevation of the trail, based on the anticipated use of the trail.
 - .1 Superelevation between 2% and 5% is recommended.
 - .2 Additional superelevation may be required for trails used for cross-country skiing in areas of steep topography.

10.7.10 Drainage

- .1 Trails shall not be used for overland drainage.
- .2 Trails shall:
 - .1 Be crowned with 1% cross slopes, or
 - .2 Have a crossfall of 2%.
- .3 The finished grade on either side of the trail shall slope away from the trail, where possible.
- .4 A culvert shall be provided where surface drainage routes cross a trail.
- .5 Trails shall not be directly routed through low areas that retain surface runoff.

10.7.11 Root Barriers

- .1 Root barriers are required along trail sections located within 10 m of plant species which are known to have aggressive rooting systems, such as populus and salix.
 - .1 Root barriers shall be installed for the full length of the drip line of these tree(s).
- .2 Vertical root barriers are required on the side(s) of the trail where the trees exist.
 - .1 Vertical root barriers shall be 40 mm HDPE and shall extend to a minimum depth of 500 mm below the trail surface.
- .3 Horizontal root barriers shall be a non-woven weed barrier and are required for the entire width of the trail.

10.8 Sports Fields and Recreation Facilities

- .1 Refer to the Standard Details in **Section 13** for the size requirements for sports fields and Recreation Facilities.
- .2 All sports field equipment (such as goal posts, bleachers, backstops, and dugouts) shall be specified on the detailed landscape drawings and shall be installed as per the manufacturer's specifications.
 - .1 Contact the Municipality for current product standards.
- .3 Each sports field shall be irrigated with an automatic irrigation system or with standpipes at locations approved by the Municipality.
 - .1 Contact the Municipality for *Sports Field Irrigation Standards and Specifications*.

10.9 Site Fixtures

10.9.1 Play Structures

10.9.1.1 General

- .1 Western Red Cedar is permitted for use on playground structures. Any other wood products require approval from the Municipality prior to installation.
- .2 Galvanized slide beds may be used, at the discretion of Municipality, and dependant upon site and slide alignment.
- .3 Play environments that foster natural experiences in a manner that is safe and manageable are strongly encouraged and may include:
 - .1 Outdoor spaces designated for play and comprised of natural components such as hills, logs, water, sand, mud, and/or boulders.
 - .2 Incorporation of vegetation intended to replicate the natural environment, where possible.
 - .3 Traditional playground components supplemented with natural play experiences.

10.9.1.2 Accessibility

- .1 Providing accessible play opportunities for persons with disabilities is a basic criterion of all playground planning and design.
- .2 Refer to CSA Z614 for accessibility requirements.
- .3 50% of all play components in a playground shall be accessible.
- .4 Accessible routes may be at or above grade and shall have a minimum clear width of 1.5 m and a maximum slope of 6%.
- .5 A variety of accessible play components shall be provided in each playground.
 - .1 Examples of play components include rocking, swinging, climbing, spinning, and sliding.

10.9.1.3 Drainage

- .1 Play areas shall have a minimum slope of 2% toward weep holes or an adjacent drainage swale.
 - .1 Filter fabric is required to prevent loose surfacing material from entering the drainage system.
- .2 A drainage system, complete with French drain(s), is required where grades do not allow for surface drainage to an adjacent drainage swale.
 - .1 Play area drainage systems shall have a minimum slope of 4.2% to a French drain.
 - .2 The French drain shall be wrapped in filter fabric and surrounded by a minimum thickness of 25 mm of pea gravel.
 - .3 The play area drainage system shall connect to the municipal storm sewer.
- .3 An alternate means of drainage may be required for play areas surrounded by hard surfaces.

10.9.1.4 Playground Edging/Borders

- .1 The distance between play equipment and playground edging (the safety zone) shall meet the requirements of CSA Z614.
- .2 Playground edging shall be level with the adjacent finished grade.
- .3 Playground edging shall be cast-in-place concrete with the following dimensions:
 - .1 250 mm x 250 mm,
 - .2 Inside top edge rounded to a radius of 50 mm, and
 - .3 Outside top edge rounded to a radius of 25 mm.
- .4 Concrete shall be supplied and installed in accordance with the Municipality's *Standard Construction Specifications*.
- .5 Expansion joints at 3 m spacing are required.
- .6 Wood, plastic, and metal playground edging are not permitted.
- .7 Refer to the Standard Details in **Section 13** for more information.

10.9.1.5 Playground Surfacing

- .1 Playground surfacing shall be engineered wood fibre or poured-in-place rubber meeting the requirements of ASTM F1292.
 - .1 Pea gravel, synthetic tiles, sand, and rubber crumb surfacing are not permitted.
- .2 Engineered wood fibre shall be installed as per manufacturer's specifications to a minimum compacted depth of 350 mm.
- .3 Engineered wood fibre surfacing requires a drainage system.
- .4 Wear mats are required under swings.
 - .1 Wear matting shall have minimum dimensions of 1.8 m length and 1.2 m width.
 - .2 The center wear matting shall be located directly under the bottom of a motionless swing seat.

10.9.2 Site Furniture

10.9.2.1 General

- .1 The Municipality shall be consulted during preliminary design to confirm the required furniture standards to be included.
- .2 All site furniture shall be installed as per manufacturer's specifications.

10.9.2.2 Materials and Fixtures

- .1 Contact the Municipality for current product standards.
- .2 **T-Gates:**
 - .1 T-gates are required where trails connect or intersect with roadways or parking areas.

.3 Waste Receptacles:

- .1 Recycle bins shall be painted "Recycle Blue" and shall have a standard lid with restrictor plate inside.
- .2 Decals for waste receptacles and recycle bins shall be supplied by the Municipality.
- .3 Waste receptacles shall be installed on a 120 mm thick cast-in-place concrete pad.
 - .1 The concrete pad shall be supported by 100 mm of compacted granular base.
 - .2 The concrete pad shall be level with the adjacent finished grade.
 - .3 The waste receptacle shall be mounted to the concrete pad as per manufacturer's specifications.
- .4 Waste receptacles shall have a minimum clear zone of 0.6 m on at least one side and 0.6 m behind the receptacle for access and bag removal. The clear zone shall be level.
- .5 Waste receptacles shall be located a minimum of 5 m from seating areas and a minimum of 1 m from sidewalks, trails, and roadways.

.4 Illumination:

- .1 Lighting shall be designed in accordance with IES standards, with consideration of CPTED principles.
- .2 Lighting is required along trails at roadway crossings, Class 1 trail intersections, bridges, underpasses, and activity nodes.
- .3 Lighting is required at outdoor Recreation Facilities such as ice rinks and football fields.
- .4 Light fixtures shall reflect light downward, toward the ground surface or features, and shall not reflect light outward.
- .5 Light fixtures shall be a minimum of 5 m above finished grade.
- .6 Wooden light poles may be acceptable, at the discretion of the Municipality.
- .7 Outdoor electrical panels shall be mounted above snow level.

.5 Benches:

- .1 Benches shall be installed on a 120 mm thick cast-in-place concrete pad.
 - .1 The pad shall be a minimum of 600 mm wider than the fixture, unless otherwise specified.
 - .2 The concrete pad shall be supported by 100 mm of compacted granular base.
 - .3 The concrete pad shall be level with the adjacent finished grade.
 - .4 The bench shall be mounted to the pad as per manufacturer's specifications.

.6 Picnic Tables:

- .1 Picnic tables shall be installed on a 120 mm thick cast-in-place concrete pad.
 - .1 The pad shall be a minimum of 600 mm wider than the fixture, unless otherwise specified.
 - .2 The concrete pad shall be supported by 100 mm of compacted granular base.
 - .3 The concrete pad shall be level with the adjacent finished grade.
 - .4 The picnic table shall be mounted to the pad as per manufacturer's specifications.

.7 Bicycle Racks and Parking Spaces:

- .1 Bicycle racks shall be placed to accommodate bicycle parking spaces and aisles as follows:
 - .1 Each bicycle parking space shall be a minimum of 0.6 m wide x 1.8 m deep.
 - .2 Each bicycle parking space shall have a minimum vertical clearance of 2 m.
 - .3 Each bicycle parking space shall be directly accessible by a minimum 1.5 m wide aisle.
- .2 Bicycle parking spaces and access aisles shall be concrete, asphalt, or paving stones.

10.9.3 Uniform Fencing

10.9.3.1 General

- .1 Fencing shall be installed as per the Municipality's *Standard Construction Specifications*.
- .2 Fencing shall be installed between Public Open Spaces and adjacent land uses as per **Table 10-16**.

Table 10-16 Locations and Types of Fencing

Adjacent Land Use	Type of Fence ¹
Roadways and alleys	Post and rail
Private property (residential lot)	Wood screen
Maintained Parks and sports fields,	Wood screen
Trails	Post and rail
Public Utility Lots	Wood screen
School sites	Wood screen
Municipal land (e.g., fire hall)	Wood screen
Neighbourhood commercial sites	Wood screen
Parking lots at Maintained Parks	Post and rail

Note:

¹ Chain link fencing may be acceptable as an alternative to wood screen fencing, at the discretion of the Municipality.

- .3 Refer to the Standard Details in **Section 13** for additional information.
- .4 Fencing shall be offset:
 - .1 150 mm into private property, or
 - .2 150 mm into the park property, as applicable.
- .5 Refer to **Section 4** for the requirements for sound barrier fencing.
- .6 The location of pedestrian gates is subject to approval by the Municipality.
- .7 Pedestrian gates shall be 1 m wide and shall open towards the private property side of the fence.

10.9.3.2 Chain Link Fencing

- .1 Chain link fencing shall be installed as per the Municipality's *Standard Construction Specifications*.
- .2 Refer to the Standard Details in **Section 13**.

10.9.3.3 Post and Rail Fencing

- .1 Refer to the Standard Details in **Section 13**.

10.9.3.4 Wood Screen Fencing

- .1 Refer to the Standard Details in **Section 13**.

10.9.3.5 Locks and Security

- .1 Contact the Municipality for specific locking requirements.

10.10 Medians, Boulevards, and Entrance Features

10.10.1 General

- .1 Median and boulevard treatment is dependant on the adjacent land use(s).

10.10.2 Medians

- .1 Medians shall be hard surfaced for the full width from back of curb to back of curb in the following situations:
 - .1 The median is located along a high traffic volume thoroughfare,
 - .2 There is a steep road gradient, requiring a higher use of salt and sand during winter operations,
 - .3 Along residential areas in the vicinity of neighbourhood commercial areas, and
 - .1 In these situations, trees complete with tree grates shall be placed along the centre of the median.
 - .4 Along industrial areas and business parks.
 - .1 In these situations, salt tolerant shrubs shall be placed along the median.
- .2 Hard surfaced medians shall have removable planter boxes installed, at the discretion of the Municipality.

10.10.3 Boulevards

- .1 Boulevard treatment within 1.5 m of the back of curb on major collector and arterial roadways shall be hardscaped to reduce the impact of winter salt and sand operations on plant material.
- .2 Hardscaping options include:
 - .1 Concrete, including patterned or coloured concrete,
 - .1 This option may be appropriate for street-facing commercial areas and shall consider creating a continuous concrete boulevard incorporating the sidewalk.
 - .2 Permeable pavers,
 - .3 Artificial turf,

- .4 Rip rap,
- .5 Mulch bed, and
- .6 Exposed aggregate concrete with tree grates.
- .3 The boulevard surface treatment is subject to the approval of the Municipality.
- .1 The Owner's Consultant shall contact the Municipality to confirm the appropriate boulevard surface treatment for the project.

10.10.4 Entrance Features

- .1 The Municipality encourages the incorporation of entrance features for new developments.
- .2 The boulevard treatment options presented in **Section 10.10.3** shall be considered for entrance features.

10.11 Inspection, Approval, and Warranty Period

- .1 Refer to **Sections 2.18** through **2.22** for additional information.
- .2 Landscape Development in MRs, ERs, PULs, boulevards, medians, and entrance features requires inspection and approval by the Public Works Department (Parks Branch).
- .3 The growing season is generally considered to be from May 15 to October 15 annually, weather permitting.
 - .1 Joint municipal inspections of Municipal Improvements that contain Landscape Development shall take place during the growing season.
- .4 A representative from the Public Works Department (Parks Branch) shall be present for the planting of trees and shall be provided 72 hours' notice prior to being required on site.
- .5 Sign-off from the Municipality is required when plantings are being inspected and accepted into Urban Forestry's inventory.
- .6 Plant material that is replaced prior to the FAC joint municipal inspection is subject to a 60-day growing period before the Municipality will schedule the joint municipal inspection.
- .7 Plant material identified as requiring replacement at the FAC joint municipal inspection because it has died or failed to grow satisfactorily may be subject to an extended Warranty Period equal to the original Warranty Period, at the discretion of the Municipality.
- .8 Major deficiencies for Landscape Development components, exceeding 10% of the total quantity, will result in a six-month extension of the Warranty Period for landscaping.
- .9 The Developer may be subject to fees for inspections of Landscape Development components, as outlined in Municipality's Land Use Bylaw.

11 TESTING PROCEDURES

11.1 General

- .1 This section covers the testing procedures for Municipal Improvements installed within the Municipality.
- .2 It shall be the responsibility of the Owner to ensure that all Municipal Improvements are properly tested.
- .3 The Owner shall submit test data performed by an accredited testing company to the Municipality as per the requirements outlined in [Section 2](#).
 - .1 Failure to receive test results will be considered sufficient cause for the Municipality to not accept such work.
- .4 Refer to the Municipality's *Standard Construction Specifications* for additional requirements for testing of Municipal Improvements.

11.2 Roadway Materials Testing

- .1 Subgrade and construction materials shall be verified with a sufficient number of representative standard tests during construction, in accordance with the Municipality's *Standard Construction Specifications*.
- .2 The Owner shall ensure sufficient testing is conducted to satisfy the frequencies specified in the Municipality's *Standard Construction Specifications*.
- .3 The Owner shall engage a qualified materials testing consultant certified by the Canadian Council of Independent Laboratories (CCIL) to test representative samples of all materials to be incorporated into the pavement structure and to carry out quality assurance testing during construction.
- .4 All roadway material testing frequencies, results, and mix designs are subject to approval by the Municipality.
- .5 Refer to the Municipality's *Standard Construction Specifications* for more information.

11.3 Sanitary Sewer Testing

11.3.1 Gravity Sewers

11.3.1.1 General

- .1 Testing of gravity sewers shall depend on the elevation of the groundwater table and shall consist of:
 - .1 An infiltration or exfiltration test,
 - .2 A video inspection test, and
 - .3 A deflection test (if required).

11.3.1.2 Infiltration Test

- .1 This test shall be performed where the groundwater table is at least 1.0 m above the pipe crown at the upstream manhole.
- .2 The procedure shall be as per the Municipality's *Standard Construction Specifications*.

11.3.1.3 Exfiltration Test

- .1 This test shall be performed where the groundwater table is below the sanitary sewer.
- .2 The procedure shall be as per the Municipality's *Standard Construction Specifications*.

11.3.1.4 Video Inspection Test

- .1 CCTV inspections of the sanitary sewer system shall be carried out at construction completion and at the end of the Warranty Period.
- .2 One digital copy in colour format, and of acceptable clarity, quality, and colour, along with inspection reports and summaries of the CCTV inspection, shall be supplied to the Municipality prior to issuing the CCC and FAC.
- .3 The NASSCO PACP pipe rating system shall be used for all CCTV inspections.
- .4 Refer to the Municipality's *Standard Construction Specifications* for more information.

11.3.1.5 Deflection Test

- .1 Where CCTV inspections show evidence of excessive or non-symmetrical deflection, formal deflection tests shall be conducted in accordance with the Municipality's *Standard Construction Specifications*.

11.3.2 Forcemains

- .1 Forcemains shall be tested as per the Municipality's *Standard Construction Specifications*.

11.4 Storm Sewer Testing

- .1 Testing of storm sewers shall consist of:
 - .1 CCTV inspections of the entire storm sewer system, including catch basin leads, as per the Municipality's *Standard Construction Specifications*, and
 - .2 Deflection testing as per the Municipality's *Standard Construction Specifications* (for PVC storm sewers and catch basin leads, if required).

11.5 Watermain Testing**11.5.1 Filling and Flushing Strategies****11.5.1.1 Submissions**

- .1 A filling strategy is required for all projects involving the installation of watermain, to create an agreed upon plan for the staging and direction of fill for a new watermain.
- .2 A flushing strategy is required for all projects involving the installation of watermain, to create an agreed upon plan for the staging, direction, and rate of flow of water for flushing a watermain prior to commissioning.
- .3 Filling and flushing strategies shall be Authenticated.

11.5.1.2 General Requirements

- .1 All source water shall come from a clean, potable source.
- .2 There shall only be one source valve for each stage of filling.
- .3 Valve operation shall be planned such that unidirectional flows are achieved; the water shall not loop back on itself.

11.5.1.3 Filling Strategies

- .1 Filling strategies shall consist of a **drawing** indicating the following:
 - .1 Air release locations,
 - .2 High points on transmission mains,
 - .3 Water source for each stage of filling,
 - .4 Stage of filling:
 - .1 Current fill highlighted, and
 - .2 Completed fill highlighted,
 - .5 Valve positions for each stage of filling, and
 - .6 A legend clearly indicating the symbology used on the drawing.
- .2 Air release locations shall be at or near the high point of the watermain.
- .3 A copy of the approved filling strategy shall be on-site during filling activities.

11.5.1.4 Flushing Strategies

- .1 Flushing shall be performed in accordance with AWWA Standard C651 and as per the project's approved commissioning plan.
- .2 Flushing velocity shall be no less than:
 - .1 1.5 m/s for watermains 300 mm in diameter and smaller, and
 - .2 0.9 m/s for watermains larger than 300 mm in diameter.
- .3 Water shall be flushed a minimum of 3 times the volume of the watermain to achieve a completed flush. Water quality sampling reports, including chlorine residual, turbidity, and pH levels shall confirm a completed flush by meeting acceptable operational levels.
- .4 The source water shall flow from larger pipe to smaller pipe, wherever practical.
- .5 The flushing strategy shall include the following:
 - .1 A written flushing **procedure**,
 - .2 A **spreadsheet** indicating:
 - .1 Order of flushing segments,
 - .2 Water supply (source valve),
 - .3 Discharge location,
 - .4 Valve positions for each stage of flushing,

- .5 Pipe details for each stage of flushing,
- .6 Required discharge volume to achieve 5 times the volume of the section being flushed,
- .7 Ideal velocity, based on the size of the watermain,
- .8 Ideal flow rate to achieve the ideal velocity,
- .9 Type, size, and number of ports for discharging water,
- .10 Estimated flow rate, and
- .11 Required flush time,
- .3 A **drawing** indicating:
 - .1 Water supply (source valve),
 - .2 Current flush,
 - .3 Completed flush,
 - .4 Opened valve,
 - .5 Closed valve,
 - .6 Discharge location, and
 - .7 A legend clearly indicating the symbology used on the drawing.
- .6 **Table 11-1** shall be used to determine the number of ports required to achieve the requisite velocity.

Table 11-1 Number of Ports Required to Achieve Velocity for Flushing

Pipe Diameter (mm)	Required Flow (L/s) for 0.9 m/s Velocity	Hydrant Nozzles Required ^{1,2}		Required Flow (L/s) for 1.5 m/s Velocity	Hydrant Nozzles Required ^{1,2}	
		63.5 mm	114 mm		63.5 mm	114 mm
200	N/A	N/A	N/A	47.1	1	N/A
250	N/A	N/A	N/A	73.6	2	1
300	N/A	N/A	N/A	106.0	2	1
350	86.6	2	1	N/A	N/A	N/A
400	113.1	2	1	N/A	N/A	N/A
450	143.1	2	1	N/A	N/A	N/A

Notes:

¹ Assuming a residual pressure of 280 kPa.

² With a 280 kPa residual pressure, a hydrant flowing to atmosphere will discharge 63 L/s from a 63.5 mm nozzle and 158 L/s from a 114 mm nozzle (Source: AWWA C651).

- .7 When required flushing velocities cannot be obtained, pipe pigging/swabbing will be required. This is typical on larger diameter pipe.

11.5.2 Pressure and Leakage Testing

- .1 Pressure and leakage testing shall be in accordance with the Municipality's *Standard Construction Specifications*.

11.5.3 Flushing

- .1 Upon completion of pressure and leakage testing, watermains shall be thoroughly flushed in accordance with the Municipality's *Standard Construction Specifications*.

11.5.4 Disinfection

- .1 Disinfection shall be performed in accordance with the Municipality's *Standard Construction Specifications* and in the presence of the Municipality. Provide at least 72 h notice to the Municipality prior to conducting disinfection.
- .2 Flushing operations shall be completed before beginning disinfection.

11.5.5 Bacteriological Sampling

- .1 Bacteriological testing shall be carried out by the Owner's Representative in accordance with the Municipality's *Standard Construction Specifications*.
- .1 The test results shall be acceptable to the local Health Authority and the Municipality.

11.6 Reservoir Testing

11.6.1 Leakage Testing

- .1 Prior to testing, all visible cracks shall be sealed in an approved manner.
- .2 Leakage testing shall be conducted prior to the placement of backfill material.
- .3 The procedure shall be as follows:
 - .1 Fill reservoir to overflow level.
 - .2 Allow water to stand for 72 h to saturate the concrete.
 - .3 Top-up the water in the tanks to the original level at the end of the 72 h saturation period, measure the water elevation, and begin the leakage test.
 - .4 Measure the drop in liquid elevation over the next 48 h to determine the liquid volume loss for comparison with the allowable leakage.
 - .1 Evaporative losses shall be measured or calculated and deducted from the measured loss to determine the net leakage of the tanks.
 - .5 Inspect the exterior of the structure for visible dampness or leakage.
 - .1 There shall be no persistently damp areas on the exterior walls or visible leakage at any point on the structure.
- .4 The maximum **allowable leakage** over the duration of this test, after allowance for evaporative losses, is limited to 0.05% of the total liquid volume.
- .5 If any test shows leakage, or if leaks or persistently damp areas are visible, the structure shall be emptied, carefully examined, and all defects repaired and the test repeated until a satisfactory test has been achieved.
- .6 The water used for testing shall be potable.

11.6.2 Disinfection

- .1 Prior to disinfection, the structure shall be thoroughly cleaned of all dirt and loose material.
- .2 All equipment in contact with potable water shall be disinfected.
- .3 Chlorine used in disinfection shall be either hypochlorite solution or liquid chlorine in accordance with AWWA B300 or B301, respectively.
- .4 Leakage testing shall be performed and accepted prior to conducting disinfection of the structure.
- .5 Disinfection shall be in accordance with AWWA C652, using either of the following two methods:
 - .1 Spray and swab all interior surfaces, including the roof, with a concentrated chlorine water solution with a minimum strength of 200 mg/L free chlorine.
 - .2 Fill the structure to the overflow level with potable water to which enough chlorine has been added to provide a free chlorine residual of not less than 10 mg/L after 24 h.
 - .1 Dechlorinate the water prior to discharging.
- .6 Disinfect again those areas within the structure which have been repaired or otherwise contaminated subsequent to initial disinfection.
- .7 No disinfection shall be carried out until all measures to protect the reservoir against intrusion by insects, animals, or unauthorized personnel have been satisfactorily completed.

12 ENVIRONMENTAL AND REGULATORY CONFORMANCE

12.1 Environment and Regulatory Conformance

Regulatory conformance is the adherence to compliance documents, including but not limited to, environmental legislation, regulations, guidelines, approvals, registrations, code of practices, commitments, bylaws, agreements as well as BMPs and RMWB standards and practices. Through all phases of a project which may have an environmental or regulatory impact, activities need to be performed by qualified personnel. Project personnel shall identify, mitigate and adhere to all required regulatory conformance requirements in alignment with the statement of work, the Hazard Risk Barrier Mitigations (HRBM) table, and the RMWB ECO Plan Framework, as amended.

12.2 Preconstruction Including Design Phase

Pre-planning and designs for activities which may have an environmental or regulatory impact need to be reviewed by qualified personnel and RMWB environment and regulatory advisors. The activities need to align with the RMWB ECO Plan Framework, as amended, unless exemptions have been granted from the Municipality, in writing. The activities shall be planned to ensure regulatory conformance. Pre-planning phases shall include a review of potential historically contaminated areas and findings shall be communicated to the Municipality.

12.3 Environmental and Regulatory Requirements for Onsite Activities

Activities performed on behalf of the Municipality shall adhere to all applicable environmental laws and standards. Project objectives must include regulatory compliance to be in alignment with municipal requirements. Using the RMWB ECO Plan Framework, as amended, all activities and associated plans must outline regulatory compliance mitigations. BMPs are utilized, when applicable, to align with industry standards and protect the environment at all stages of project development.

12.4 Owner Representative Responsibility During Active Construction Activities

The onsite Owner's Representative shall contribute to continual improvement of environmental performance. Ongoing commitments and/or regulatory non-compliances shall be reported and documented in alignment with the RMWB ECO Plan Framework and/or captured as a risk in the HRBM table, as amended, and approved by the Municipality. All documentations, including relevant associated records, shall be turned over to the Municipality in a timely manner to ensure regulatory conformance.

12.5 Remediation Activities

Project pre-planning activities shall include a detailed review of potential historically contaminated areas completed by qualified personnel, as per the *Alberta Environmental Site Assessment Standards*. If historical contamination is detected it shall be reported immediately to the Municipality for conducting site assessments and planning of reporting, remediation, and disposal activities. Projects conducted for the purpose of remediation will require an Alberta Environment approved Risk Management Plan and/or Remediation Action Plan. Please refer to [Section 2.10.5.9](#) for more information regarding Risk Management Plans and Remediation Action Plans.

12.6 Groundwater Monitoring Wells (Installation, Monitoring, and Decommissioning)

Please refer to [Section 2.10.5.8.3](#) for more information.

13 STANDARD DETAILS

- .1 This section includes the Standard Details referenced throughout this document as outlined in the following table.

Standard Detail No.	Title
Section 1 - Introduction to Standards	
N/A	<i>*There are no Standard Details associated with this Section.</i>
Section 2 - Procedures for Development	
2-100	Pipeline Crossing Under Municipal Underground Utilities
2-101	Pipeline Crossing Above Municipal Underground Utilities
2-102	Pipeline Crossing of a Municipal Roadway
2-103	Utility Crossing Sign
Section 3 - Drafting & Data Submission Standards	
N/A	<i>*There are no Standard Details associated with this Section.</i>
Section 4 - Transportation, Roads, and Sidewalks	
4-100	Urban Residential Local Roadway
4-101	Urban Residential Local Cul-de-Sac
4-102	Urban Commercial/Industrial Local and Collector Roadways
4-103	Urban Residential Collector Roadway
4-104	Urban Divided Arterial Roadway (Bermed)
4-105	Urban Divided Arterial Roadway (No Berm)
4-106	Urban Undivided Arterial Roadway (Bermed)
4-107	Urban Undivided Arterial Roadway (No Berm)
4-108	Alley Cross Section
4-150	Rural Road Cross Section - Typical
4-151	Rural Road Cross Section - Walkway on Backslope
4-152	Rural Road Cross Section - Concrete Curb and Sidewalk
4-153	Rural Residential Cul-de-Sac
4-154	Rural Divided Arterial Roadway
4-200	Straight Face Curb and Gutter
4-201	Rolled Face Curb and Gutter
4-202	Standard Barrier Curb
4-203	Semi-Mountable Curb and Gutter

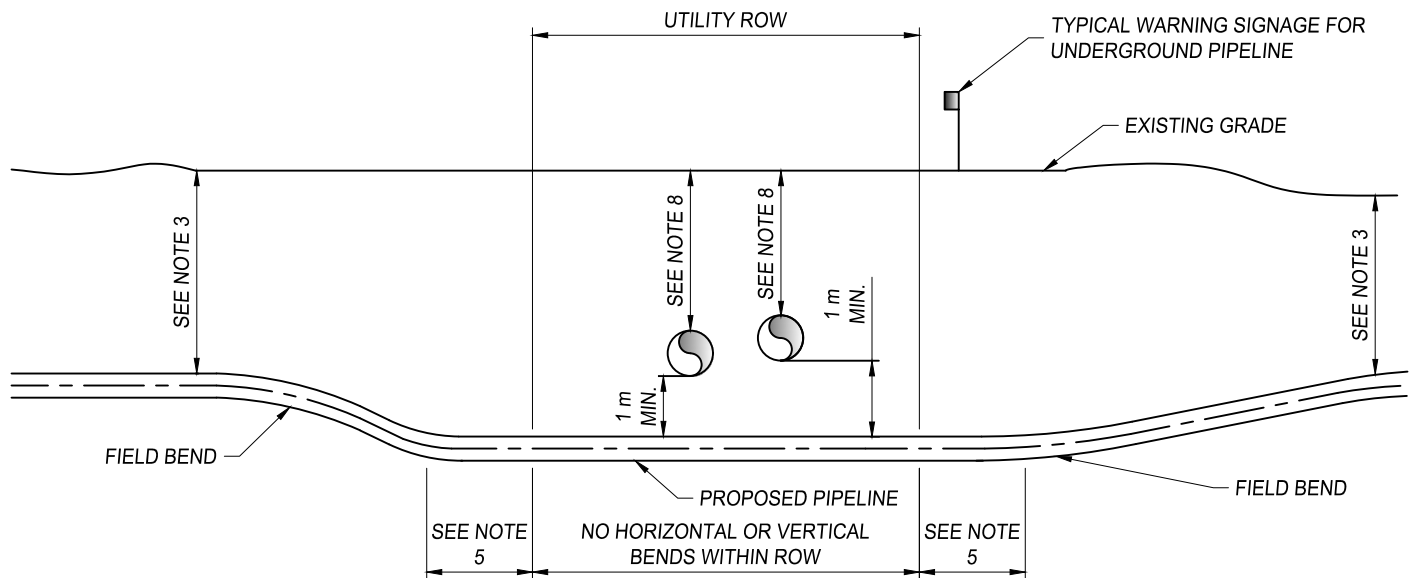
Standard Detail No.	Title
4-204	Straight Face Curb and 500 mm Gutter
4-250	Wick Drain
4-300	Concrete Swale - Plan
4-301	Concrete Swale - Cross Section
4-302	Highway Concrete Swale - Cross Section
4-303	Sidewalk and Boulevard Drainage Crossing for Separate Sidewalk
4-304	Sidewalk Drainage Crossing for Monolithic Sidewalk
4-400	Straight Face Monolithic Curb, Gutter, and Sidewalk
4-401	Rolled Face Monolithic Curb, Gutter, and Sidewalk
4-402	Separate Sidewalk
4-403	Sidewalk Joint and Finishing Details
4-404	Curb Ramp Type A (Corner; Monowalk)
4-405	Curb Ramp Type B (Corner; Separate Sidewalk)
4-406	Curb Ramp Type C (Midblock; Monowalk)
4-407	Curb Ramp Type D (Midblock; Separate Sidewalk)
4-408	Cul-de-Sac Sidewalk Requirements
4-500	Urban Driveway/Approach
4-550	Rural Driveways/Approaches
4-551	Rural Driveway/Approach Locations
4-600	Location of Bus Stop - Unchanneled Intersection
4-601	Location of Bus Stop - Channeled Intersection
4-602	Bus Bay Pullout on an Arterial Roadway
4-603	Concrete Bus Stop Pad - Retrofit
4-604	Bus Stop and Amenities Pad - Monolithic Sidewalk
4-605	Bus Stop and Amenities Pad - Separate Sidewalk
4-606	Bus Stop Pad - Rural Roadway
4-607	Bus Stop Furniture Layout
4-608	Transit Turnaround
4-609	Sawtooth Transit Bay at Transit Terminal
4-700	Urban Community Mailbox Layout
4-750	Rural Community Mailbox Pullout - Locations
4-751	Rural Community Mailbox Pullout - Cross Section

Standard Detail No.	Title
4-800	Shoulder Widening at Hydrant
4-900	Rural Mid-block Trail Crossing
4-1303	Typical Rural Utility Layout
Section 5 - Sanitary Sewer System	
5-100	Pipe Zone Bedding (Class A, A-1, B)
5-101	Pipe Zone Bedding (Class C, C-1, D)
5-120	Class I Trench Backfill
5-121	Class II Trench Backfill
5-122	Class III Trench Backfill
5-123	Class IV Trench Backfill
5-130	Type I Pipe Support
5-131	Type II Pipe Support
5-132	Type III Pipe Support
5-200	Precast Concrete Manhole
5-201	Tee-Riser Manhole
5-202	Perched Manhole
5-203	External Drop Manhole
5-204	Internal Drop Manhole
5-300	Standard Manhole Frame and Cover
5-301	Floating Manhole Frame and Cover
5-400	Sanitary Service Connection Without Riser
5-401	Sanitary Service Connection With Riser
5-402	Single Lot Residential Servicing Layout
5-403	Dual Lot Residential Servicing Layout
5-600	Sewer Line Warning Sign
5-700	Frost Cover
5-701	Pipe Insulation
5-800	Trench Backfill for Emergency Repairs in Paved Areas
Section 6 - Stormwater Management	
6-100	900 mm Diameter Catch Basin with K-7 Frame and Grate
6-101	900 mm Diameter Catch Basin with F-51 Frame and Grate
6-102	1200 mm Diameter Catch Basin Manhole

Standard Detail No.	Title
6-103	Type F-51 Catch Basin Curb Finishing Detail
6-200	Ditch Inlet With Sump
6-300	Rock Rip Rap for Outfalls and Open Channels
6-301	Rock Rip Rap for Culverts
6-400	Rock Ditch Check
6-500	Stormwater Management Facility Warning Sign
6-600	Rear to Front Lot Drainage - Type A
6-601	Rear to Front Lot Drainage - Type B
6-602	Rear to Front Lot Drainage - Type C
6-603	Split Lot Drainage - Type D
6-604	Walkout Basement Split Lot Drainage - Type W
6-700	Drainage Swale
6-750	Bioswale Along Rural Roadway
6-800	Weeping Tile and Sump Pump Discharge - Profile View
Section 7 - Water Distribution System	
7-100	Valve Installation
7-101	Bypass Valve
7-102	Valve and Hydrant Locations
7-200	Hydrant Installation
7-201	Exploded View of Dry Hydrant
7-300	Water Service Connection
7-301	Thaw Wire for Water Service
7-302	Service Abandonment
7-303	Rural Residential Trickle Fill System
7-304	Water Meter Installation Service Up to 50 mm
7-305	Water Meter - Building Installation Service Over 50 mm with Dedicated Fire Flow Line
7-306	Service Valve Rod for 19 mm, 25 mm, 38 mm, 50 mm Service Valves
7-307	Underground Meter Vault Combined Fire & Domestic Service
7-400	Underground PRV Station Schematic
7-401	Underground PRV Station Stairs and Top Slab
7-500	Poured Concrete Thrust Blocks for Horizontal Tees and Bends
7-501	Poured Concrete Thrust Blocks for Vertical Bends (Downward Thrust)

Standard Detail No.	Title
7-502	Poured Concrete Thrust Blocks for Vertical Bends (Upward Thrust)
7-600	Anode Installation at Hydrant
7-601	Anode Installation at Fittings
7-700	Combination Air Release Valve Chamber
7-800	Water Line Warning Sign
Section 8 - Shallow Utilities	
8-100	Four-Party Common Trench Stub Alignment
8-200	Duct Bank
8-201	Typical Vault Connection and Ground Rod Connection
Section 9 - Facilities	
9-100	Lift Station Wet Well/Dry Well - Elevation View
9-101	Lift Station Wet Well/Dry Well - Plan View
Section 10 - Landscape and Park Development	
10-100	Heavy Duty Paving Stones
10-101	Medium Duty Paving Stones
10-102	Light Duty Paving Stones
10-200	PUL Layouts
10-202	T- Gate in Emergency Access
10-250	Buffalo Gates - Full Assembly
10-251	Buffalo Gates - Left Gate and Upper Post Assembly
10-252	Buffalo Gates - Right Gate and Upper Post Assembly
10-300	Post and Rail Fence
10-301	Wood Screen Fence
10-302	Wood Screen Fence - Step Down
10-303	Chain Link Fence
10-304	Chain Link Fence - Gate
10-400	Concrete Border for Playground
10-401	Concrete Border for Playground - Drainage
10-402	Playground Sub-drain
10-403	Playground Sub-drain Installation
10-404	Playground Wear Mat
10-500	Tree Planting

Standard Detail No.	Title
10-501	Tree Planting on Slope
10-502	Shrub Bed Planting
10-503	Tree and Shrub Naturalization
10-504	Tree Protection
10-505	Bioswale Cross Section
10-600	Sod Installation
10-700	Urban Park Culvert
10-750	Park Water Supply
10-800	Asphalt Trails
10-801	Gravel Trails
10-850	Bench Node
10-851	Concrete for Multi-purpose Pad
10-900	Football Field Layout
10-901	Soccer Field Layout
10-902	Basketball Court Layout
10-903	Ball Diamond Layout
10-904	Backstop Layout
10-905	Backstop Assembly
10-906	Tennis Court Layout
10-907	Pickleball Court Layout
Section 11 - Testing Procedures	
N/A	<i>*There are no Standard Details associated with this Section.</i>
Section 12 - Erosion and Sedimentation Control Measures	
N/A	<i>*There are no Standard Details associated with this Section.</i>



NOTES:

- (1) A UTILITY LINE ASSIGNMENT PERMIT IS REQUIRED PRIOR TO CONSTRUCTION.
- (2) CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH CSA Z662 AND THE AUTHORITIES HAVING JURISDICTION.
- (3) MINIMUM COVER OVER PIPELINE SHALL BE AS PER THE REQUIREMENTS OF THE AUTHORITY(IES) HAVING JURISDICTION.
- (4) MINIMUM CLEARANCE FROM EXISTING UTILITIES IS AS FOLLOWS:
VERTICAL: 1 m
HORIZONTAL: 3 m
- (5) NO HORIZONTAL OR VERTICAL BENDS WITHIN: 8 m IN THE CASE OF A ROAD ROW, OR 4 m IN THE CASE OF AN EASEMENT.
- (6) PIPELINE MARKER TAPE TO BE PLACED OVER PIPELINES INSTALLED VIA OPEN CUT.
- (7) BACKFILLING SHALL BE AS PER TABLE 2-3 LOCATED IN SECTION 2.10.10.3.
- (8) THE DEPTH OF UNDERGROUND MUNICIPAL UTILITIES VARIES. PIPELINE COMPANY RESPONSIBLE FOR CONFIRMING DEPTH OF MUNICIPAL UTILITIES PRIOR TO INSTALLATION OF PIPELINE.
- (9) AS-BUILT DRAWINGS SHALL BE SUBMITTED UPON COMPLETION.

PIPELINE CROSSING UNDER MUNICIPAL
UNDERGROUND UTILITIES

REVISION DATE

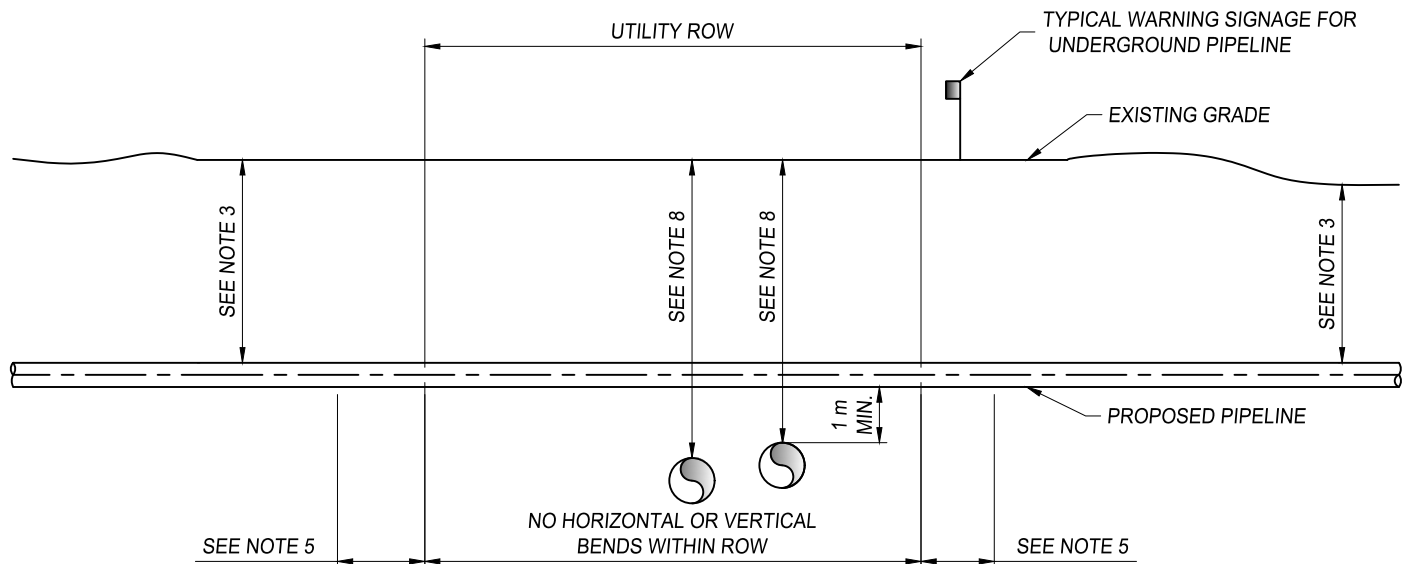
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STANDARD DETAIL #:

2-100



NOTES:

- (1) A UTILITY LINE ASSIGNMENT PERMIT IS REQUIRED PRIOR TO CONSTRUCTION.
- (2) CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH CSA Z662 AND THE AUTHORITIES HAVING JURISDICTION.
- (3) MINIMUM COVER OVER PIPELINE SHALL BE AS PER THE REQUIREMENTS OF THE AUTHORITY(IES) HAVING JURISDICTION.
- (4) MINIMUM CLEARANCE FROM EXISTING UTILITIES IS AS FOLLOWS:
VERTICAL: 1 m
HORIZONTAL: 3 m
- (5) NO HORIZONTAL OR VERTICAL BENDS WITHIN: 8 m IN THE CASE OF A ROAD ROW, OR 4 m IN THE CASE OF AN EASEMENT.
- (6) PIPELINE MARKER TAPE TO BE PLACED OVER PIPELINES INSTALLED VIA OPEN CUT.
- (7) BACKFILLING SHALL BE AS PER TABLE 2-3 LOCATED IN SECTION 2.10.10.3.
- (8) THE DEPTH OF UNDERGROUND MUNICIPAL UTILITIES VARIES. PIPELINE COMPANY RESPONSIBLE FOR CONFIRMING DEPTH OF MUNICIPAL UTILITIES PRIOR TO INSTALLATION OF PIPELINE.
- (9) AS-BUILT DRAWINGS SHALL BE SUBMITTED UPON COMPLETION.

PIPELINE CROSSING ABOVE MUNICIPAL
UNDERGROUND UTILITIES

REVISION DATE

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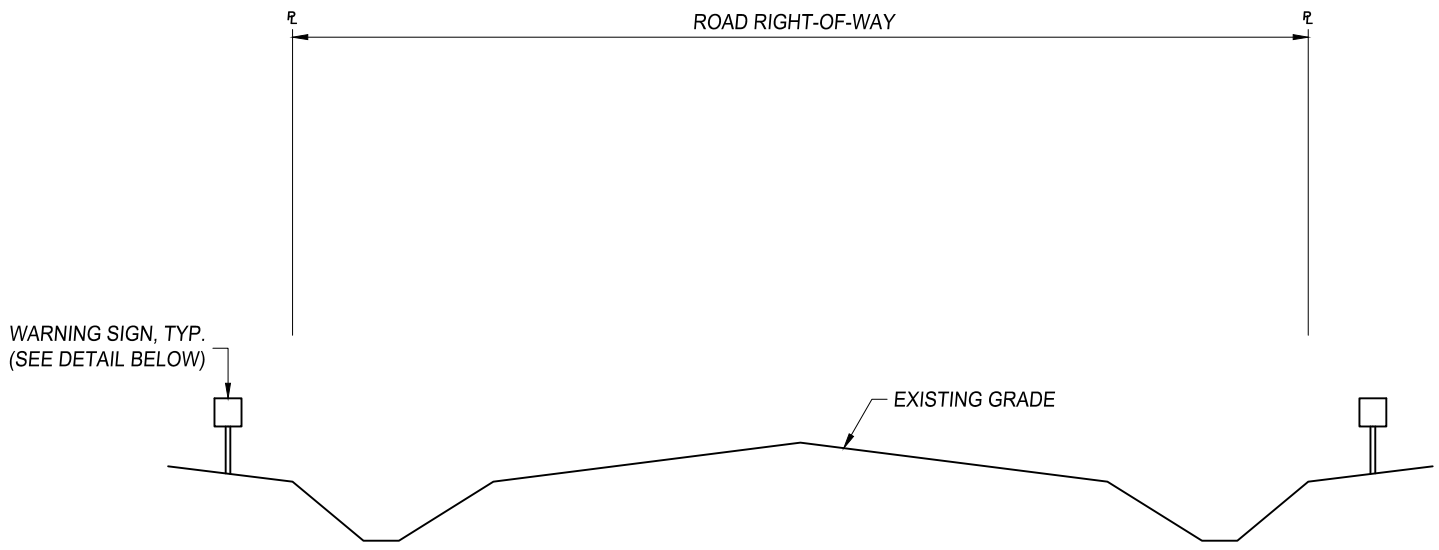
STANDARD DETAIL #:

2-101

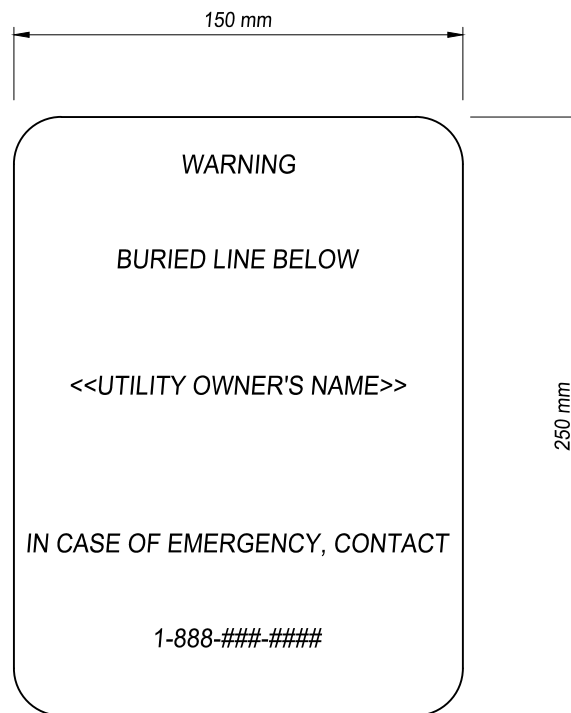


- (1) A UTILITY LINE ASSIGNMENT PERMIT IS REQUIRED PRIOR TO CONSTRUCTION.
- (2) CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH CSA Z662 AND THE AUTHORITIES HAVING JURISDICTION.
- (3) BACKFILLING SHALL BE AS PER TABLE 2-3 LOCATED IN SECTION 2.10.10.3.
- (4) PIPELINE MARKER TAPE TO BE PLACED OVER PIPELINES INSTALLED VIA OPEN CUT.
- (5) MINIMUM COVER OVER PIPELINE SHALL BE AS PER THE REQUIREMENTS OF AUTHORITY(IES) HAVING JURISDICTION.

- (6) THERE SHALL BE NO HORIZONTAL OR VERTICAL BENDS WITHIN 8 m OF THE ROAD ROW.
- (7) PIPELINE ROW WIDTH SHALL BE AS PER THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.
- (8) PIPELINE COMPANY RESPONSIBLE FOR CONFIRMING LOCATION AND DEPTH OF MUNICIPAL UTILITIES PRIOR TO INSTALLATION OF PIPELINE.
- (9) AS-BUILT DRAWINGS SHALL BE SUBMITTED UPON COMPLETION.



SECTION



DETAIL

NOTES:

- (1) WARNING SIGN TO BE MOUNTED ON METAL POST IN GROUND.
- (2) SIGN TO BE MANUFACTURED AS PER THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION.

UTILITY CROSSING SIGN DETAIL

REVISION DATE

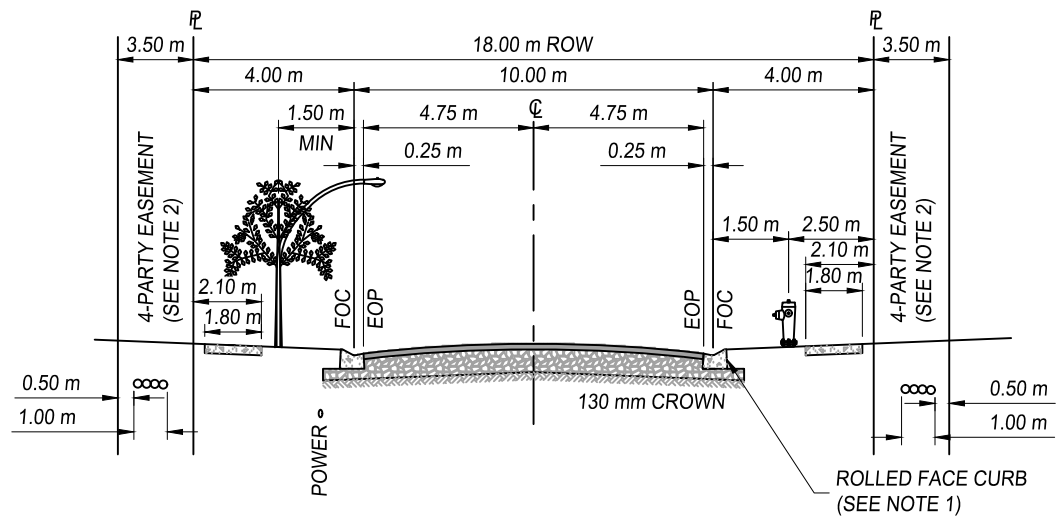
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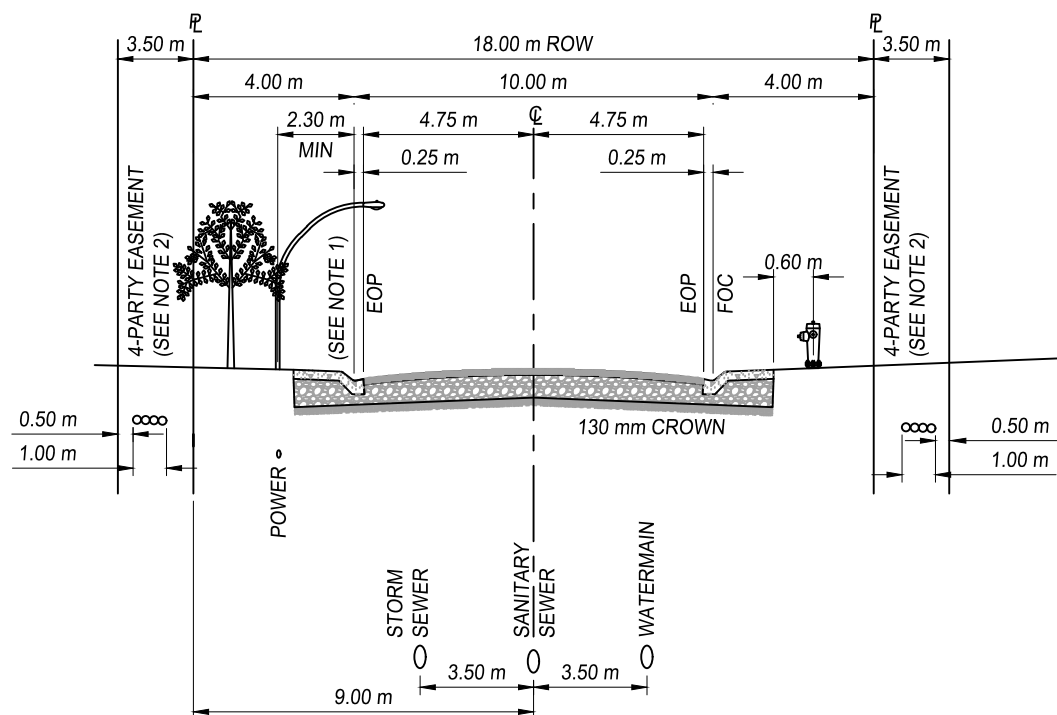
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STANDARD DETAIL #:

2-103



SEPARATE WALK



MONO-WALK

NOTES:

- (1) STRAIGHT FACE CURB REQUIRED WHERE LOTS ARE ACCESSED BY REAR LANE.
- (2) 4-PARTY TRENCH CONTAINS GAS, POWER, PHONE AND CABLE LINES.
- (3) EOP - EDGE OF PAVEMENT.
- (4) FOC - FACE OF CURB.

URBAN RESIDENTIAL LOCAL ROADWAY

REVISION DATE

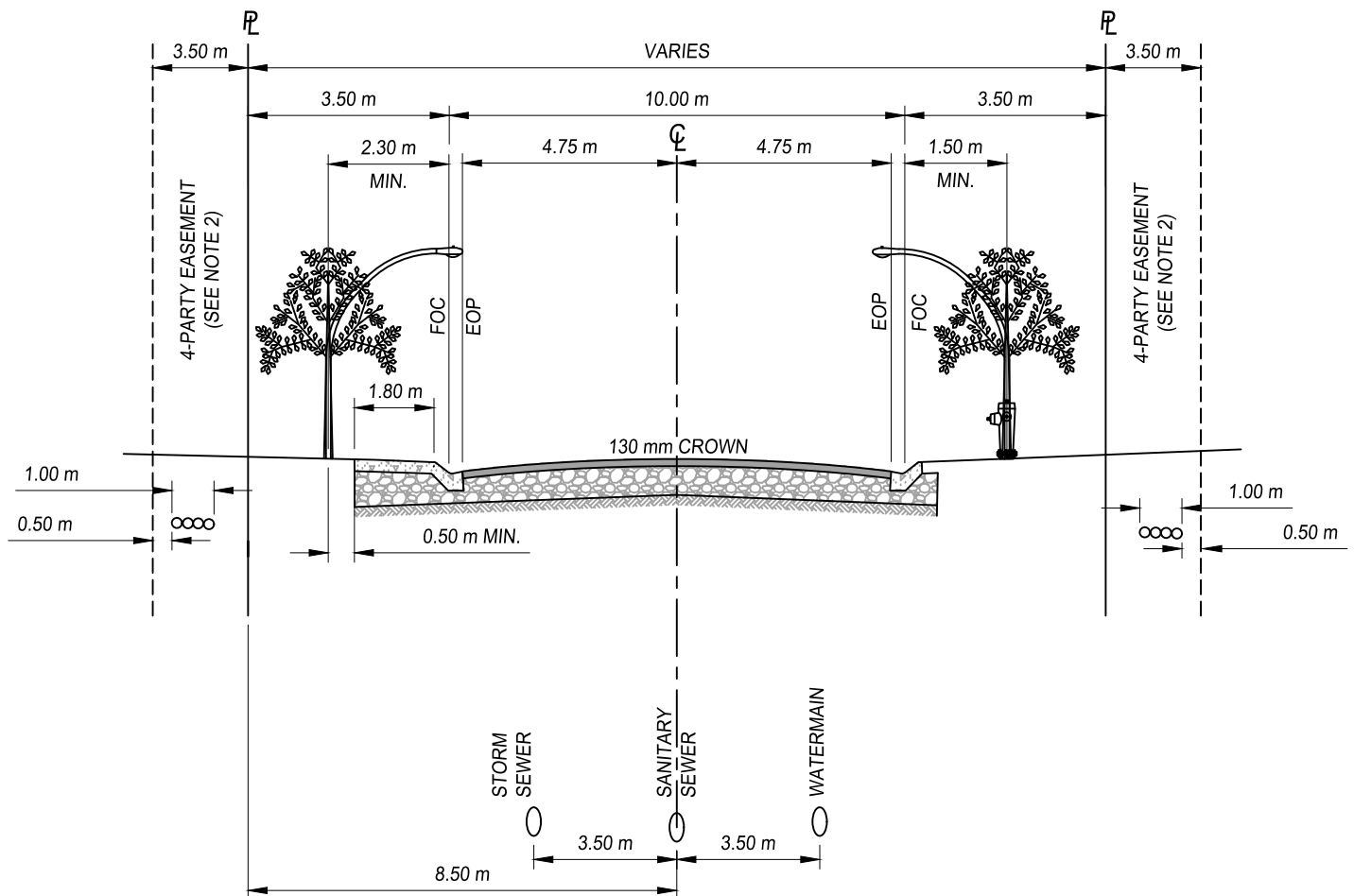
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STANDARD DETAIL #:

4-100



NOTES:

- (1) STRAIGHT FACE CURB / MONOWALK REQUIRED WHERE LOTS ARE ACCESSED BY REAR LANE.
- (2) 4-PARTY TRENCH CONTAINS GAS, POWER, PHONE AND CABLE LINES.
- (3) EOP - EDGE OF PAVEMENT.
- (4) FOC - FACE OF CURB.

URBAN RESIDENTIAL LOCAL CUL-DE-SAC

REVISION DATE

2024

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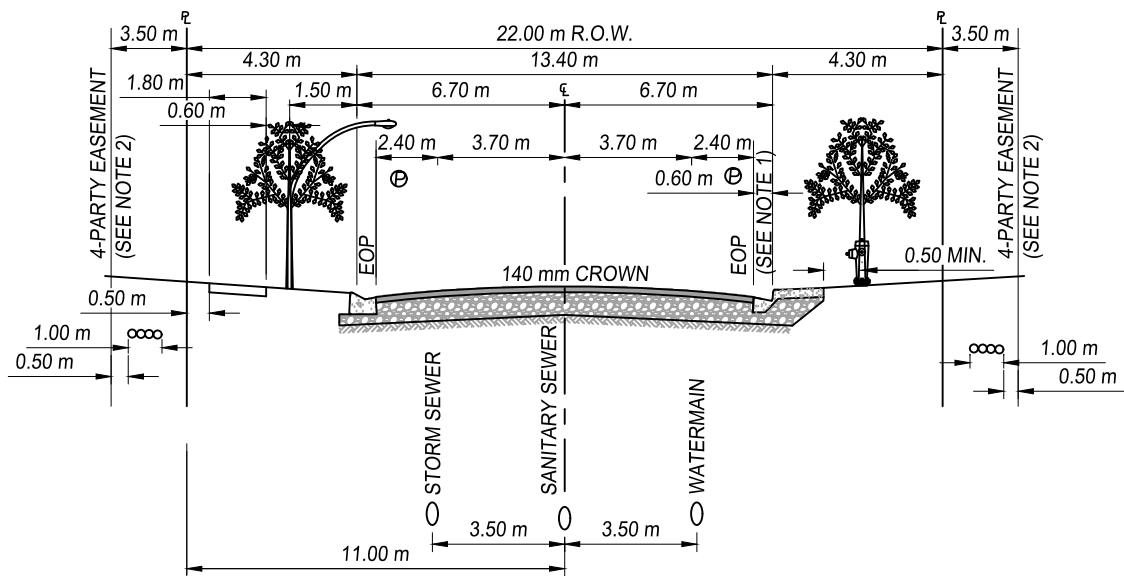
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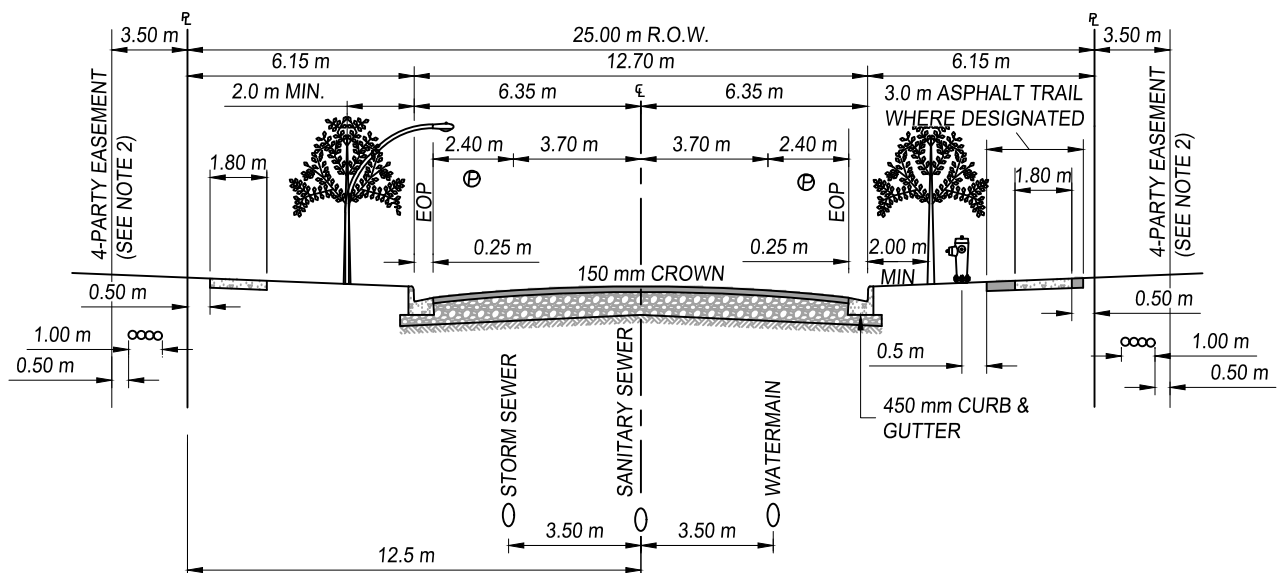
4-101



- (1) 4-PARTY TRENCH CONTAINS GAS, POWER, PHONE AND CABLE LINES.
- (2) EOP - EDGE OF PAVEMENT.
- (3) FOC - FACE OF CURB.



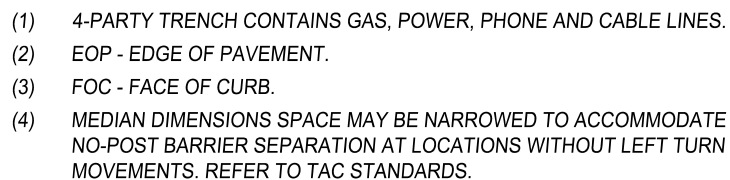
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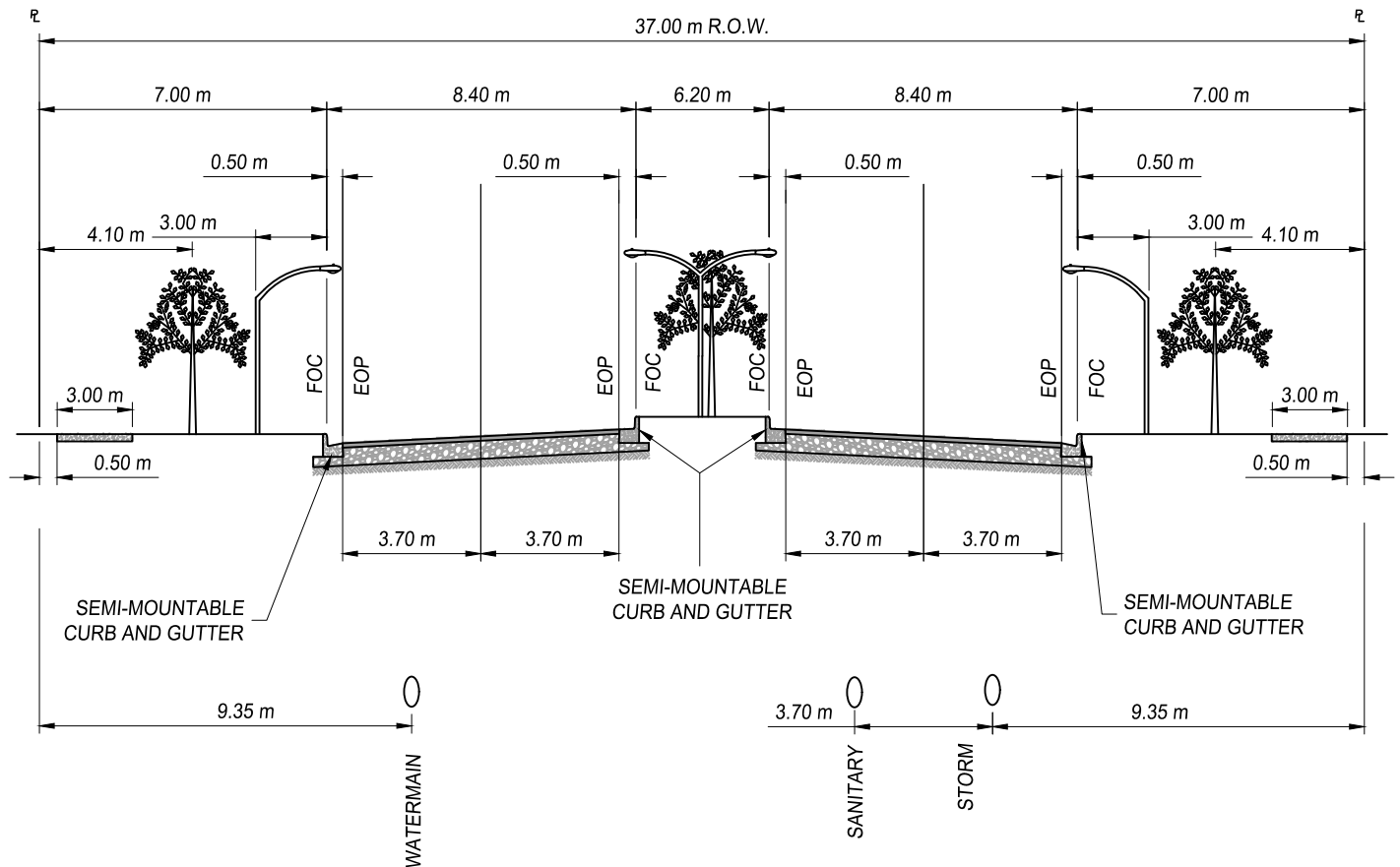
MAJOR

NOTES:

- (1) STRAIGHT FACE CURB REQUIRED WHERE LOTS ARE ACCESSED BY REAR LANE. CARRIAGEWAY MEASUREMENT OF 13.4 m REFLECTS ROLLED FACE CURB AND GUTTER.
- (2) 4-PARTY TRENCH CONTAINS GAS, POWER, PHONE AND CABLE LINES.
- (3) EOP - EDGE OF PAVEMENT.



STANDARD DETAIL #:
4-104



NOTES:

- (1) 4-PARTY TRENCH CONTAINS GAS, POWER, PHONE AND CABLE LINES.
- (2) EOP - EDGE OF PAVEMENT.
- (3) FOC - FACE OF CURB.
- (4) MEDIAN DIMENSIONS SPACE MAY BE NARROWED TO ACCOMMODATE NO-POST BARRIER SEPARATION AT LOCATIONS WITHOUT LEFT TURN MOVEMENTS. REFER TO TAC STANDARDS.

URBAN DIVIDED ARTERIAL ROADWAY (NO BERM)

REVISION DATE

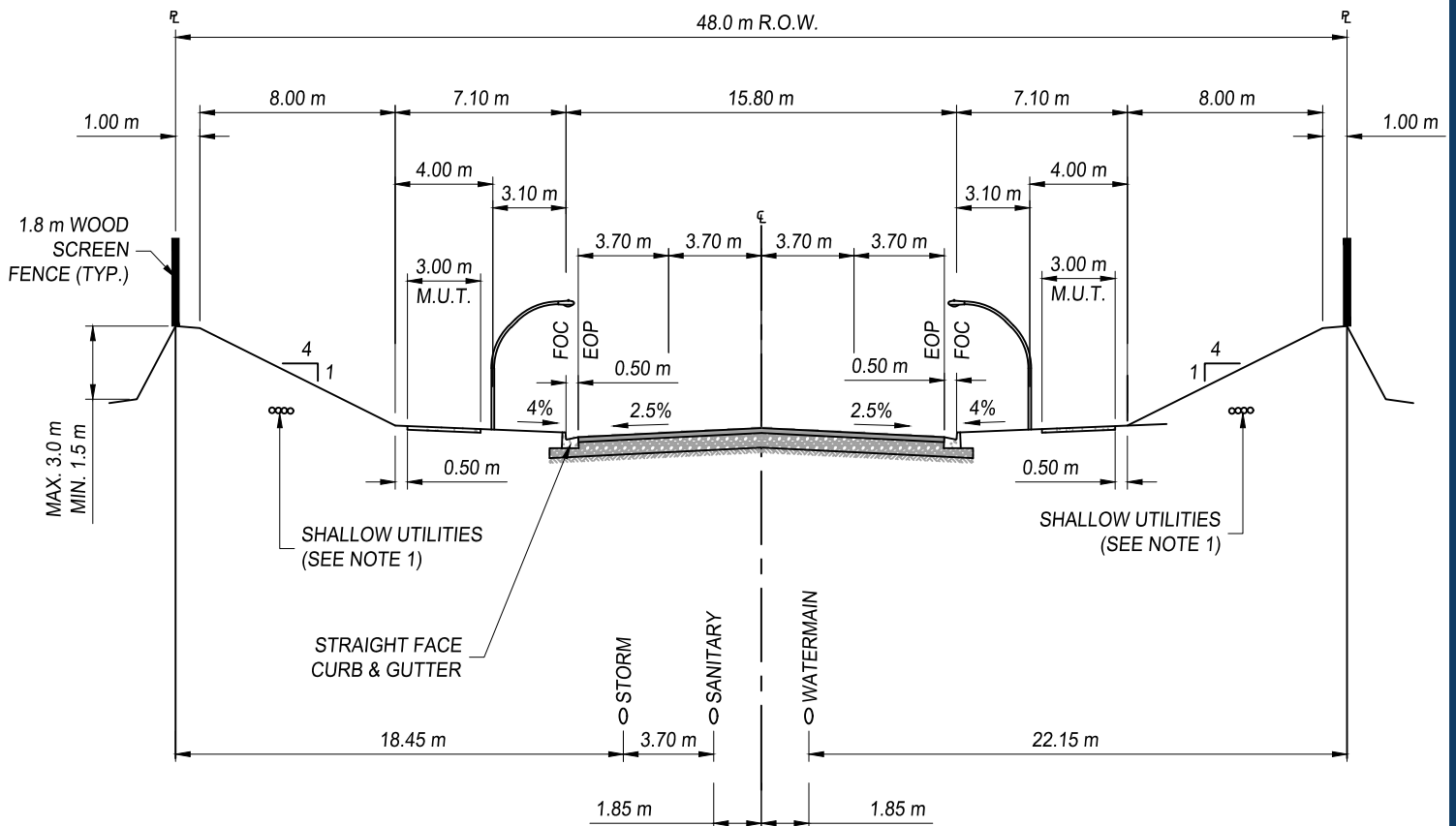
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STANDARD DETAIL #:

4-105



NOTES:

- (1) 4-PARTY TRENCH CONTAINS GAS, POWER, PHONE, AND CABLE LINES.
- (2) FOC - FACE OF CURB.
- (3) EOP - EDGE OF PAVEMENT.

URBAN UNDIVIDED ARTERIAL ROADWAY (BERMED)

REVISION DATE

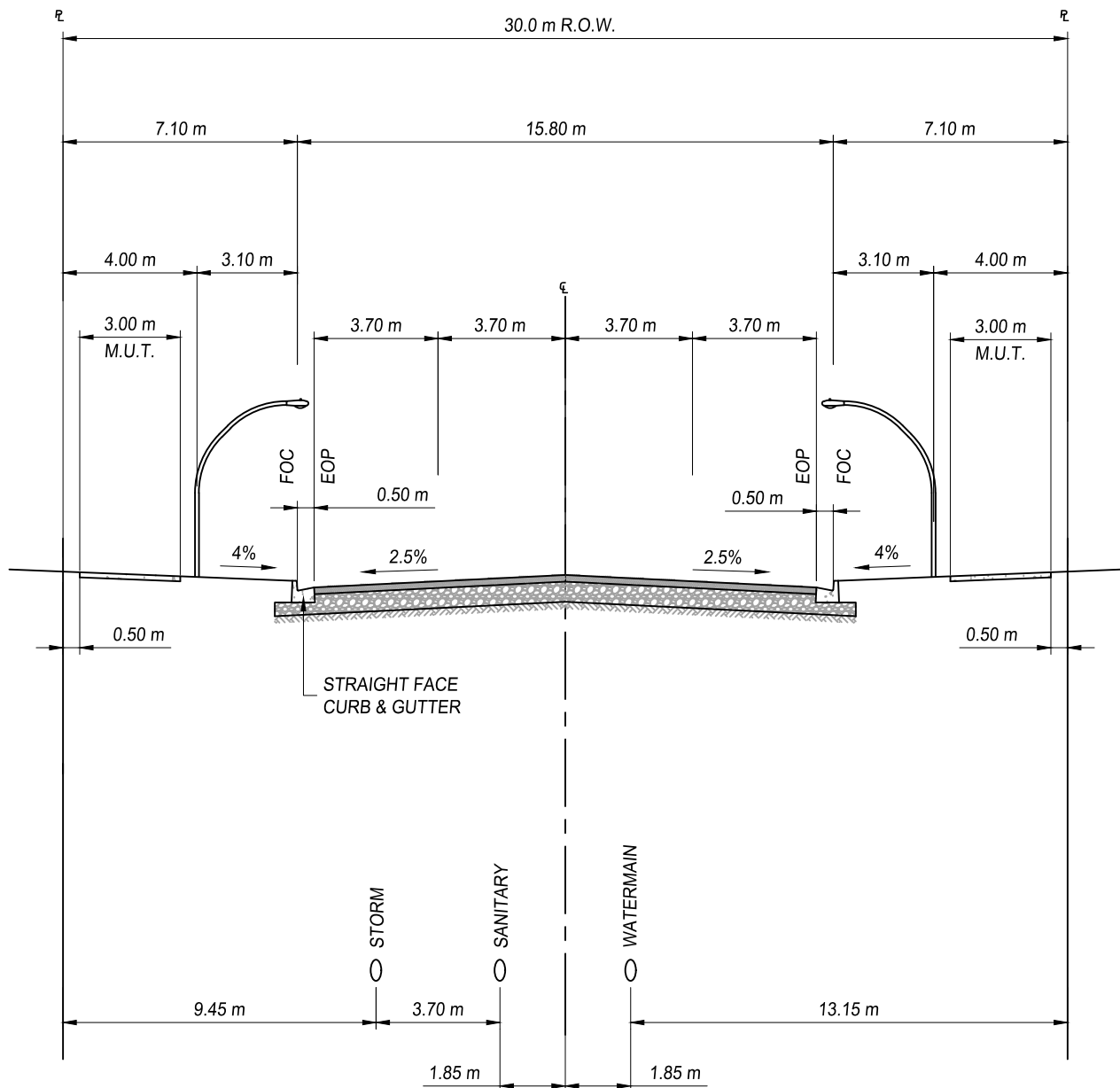
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STANDARD DETAIL #:

4-106



NOTES:

- (1) FOC - FACE OF CURB.
- (2) EOP - EDGE OF PAVEMENT.
- (3) CO-ORDINATE WITH THE APPLICABLE MUNICIPAL DEPARTMENT FOR SHALLOW UTILITY LINE ASSIGNMENTS.

URBAN UNDIVIDED ARTERIAL ROADWAY (NO BERM)

REVISION DATE

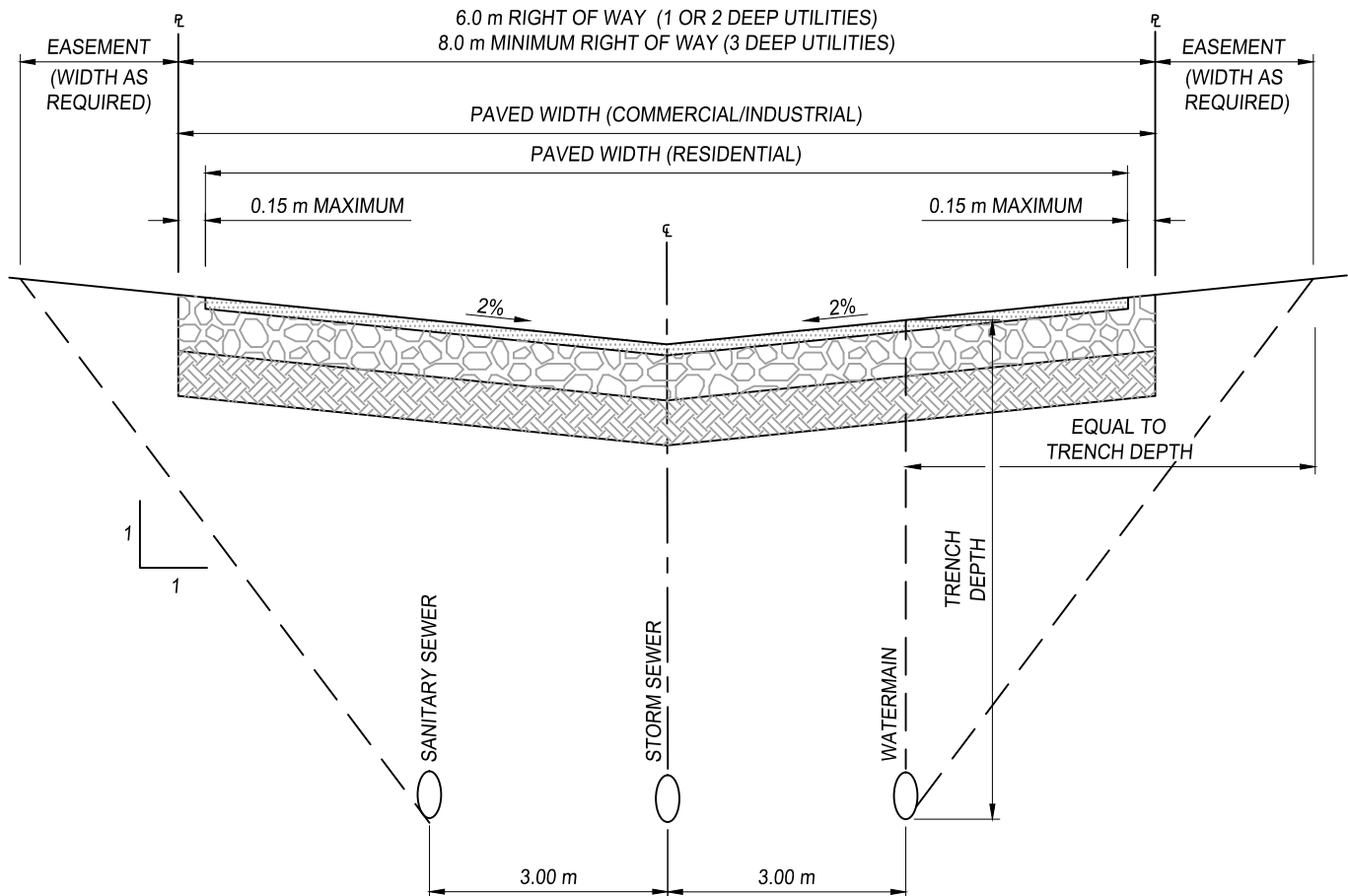
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STANDARD DETAIL #:

4-107



NOTES:

- (1) PROVIDE FULL DEPTH ASPHALT PAVEMENT STRUCTURE TO ADJACENT HARD SURFACED PARKING AREAS.
- (2) WATER AND SANITARY SERVICING IN ALLEYS REQUIRES MUNICIPALITY APPROVAL.
- (3) EASEMENT WIDTH TO VARY BASED ON DEPTH OF THE DEEPEST MAIN.
- (4) TYPICAL CROSS SECTION FOR NEW LANE CONSTRUCTION. EXISTING ALLEYS MAY VARY DUE TO EXISTING RIGHT-OF-WAY CONSTRAINTS.
- (5) 1:1 SIDESLOPE SHOWN IS TO BE USED AS A GUIDELINE FOR ESTABLISHING EASEMENT WIDTH REQUIREMENTS TO PROVIDE A MINIMUM SETBACK FOR REAR YARD BUILDINGS.
- (6) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT, OR AS PER GEOTECHNICAL RECOMMENDATIONS, WHICHEVER IS MORE STRINGENT.

ALLEY CROSS SECTION

REVISION DATE

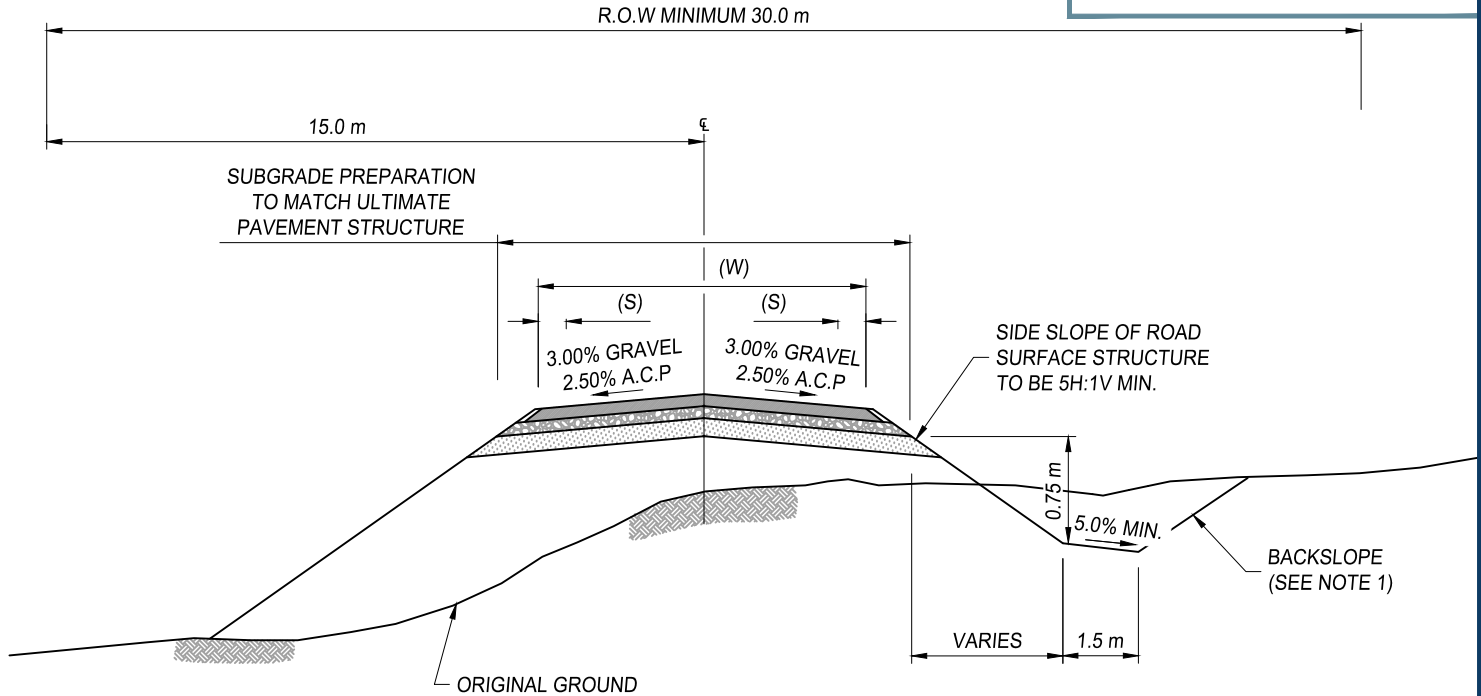
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STANDARD DETAIL #:

4-108



FILL SLOPE TABLE

DEPTH OF FILL	SLOPE (H:V)
0 - 1.5 m	4 : 1
1.5 - 3.5 m	3 : 1
3.5 - 4.5 m	2.5 : 1
> 4.5 m	2 : 1

ROAD CLASSIFICATION	ROADWAY	SHOULDER (S)	TOTAL STRUCTURE WIDTH (W)
RESIDENTIAL LOCAL	7.0 m	0.5 m	8.0 m
RESIDENTIAL COLLECTOR	7.0 m	1.0 m	9.0 m
COMMERCIAL / INDUSTRIAL LOCAL	7.0 m	1.0 m	9.0 m
COMMERCIAL / INDUSTRIAL COLLECTOR	7.0 m	1.5 m	10.0 m

NOTES:

- (1) ALL BACK SLOPES 3H:1V UNLESS SUPPORTED BY GEOTECHNICAL DESIGN.
- (2) SLOPES STEEPER THAN 3H:1V REQUIRE 1 m SHOULDER WIDENING & GUARD RAIL INSTALLATION.
- (3) FILL SLOPES GREATER THAN 3.5 m AND / OR STEEPER THAN 3H:1V REQUIRE GEOTECHNICAL DESIGN.
- (4) VEGETATION AND EROSION PROTECTION REQUIRED ON ALL EXPOSED SLOPES.
- (5) MINIMUM LANE WIDTH IS 3.5 m FOR RURAL ROADS.

RURAL ROAD CROSS SECTION - TYPICAL

REVISION DATE

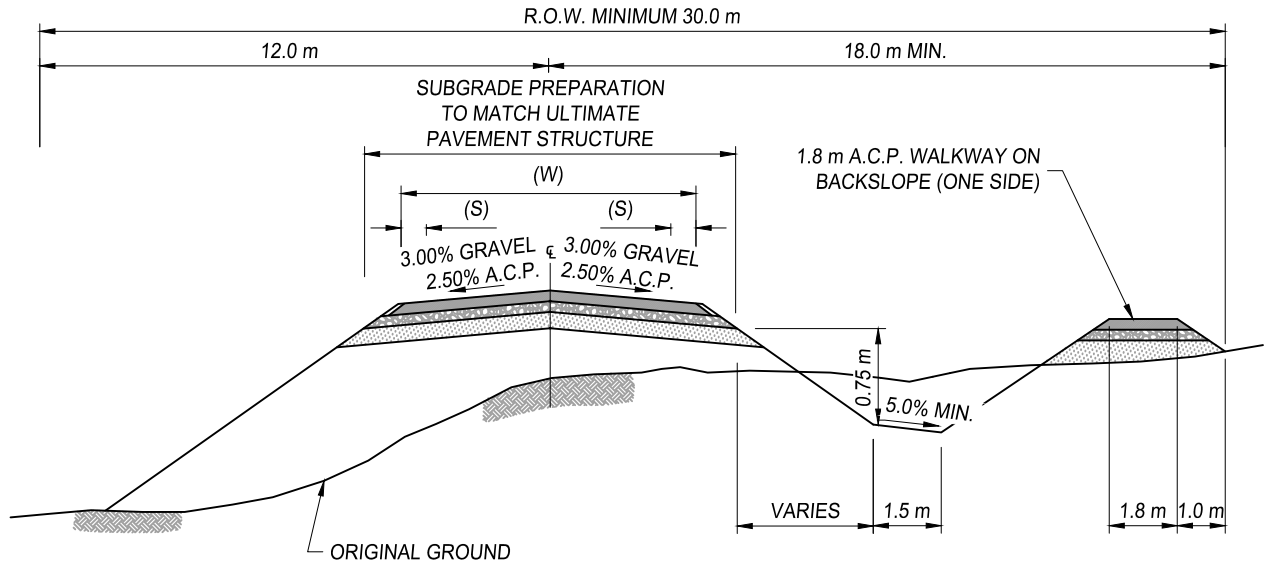
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STANDARD DETAIL #:

4-150



FILL SLOPE TABLE

DEPTH OF FILL	SLOPE (H:V)
0 - 1.5 m	4:1
1.5 - 3.5 m	3:1
3.5 - 4.5 m	2.5:1
> 4.5 m	2:1

ROAD CLASSIFICATION	ROADWAY	SHOULDER (S)	TOTAL STRUCTURE WIDTH (W)
RESIDENTIAL LOCAL	7.0 m	0.5 m	8.0 m
RESIDENTIAL COLLECTOR	7.0 m	1.0 m	9.0 m
COMMERCIAL / INDUSTRIAL LOCAL	7.0 m	1.0 m	9.0 m
COMMERCIAL / INDUSTRIAL COLLECTOR	7.0 m	1.5 m	10.0 m

NOTES:

- (1) ALL BACK SLOPES 3H:1V UNLESS SUPPORTED BY GEOTECHNICAL DESIGN.
- (2) SLOPES STEEPER THAN 3H:1V REQUIRE 1 m SHOULDER WIDENING & GUARD RAIL INSTALLATION.
- (3) FILL SLOPES GREATER THAN 3.5 m AND / OR STEEPER THAN 3H:1V REQUIRE GEOTECHNICAL DESIGN.
- (4) VEGETATION AND EROSION PROTECTION REQUIRED ON ALL EXPOSED SLOPES.

RURAL ROAD CROSS SECTION - WALKWAY ON BACKSLOPE

REVISION DATE

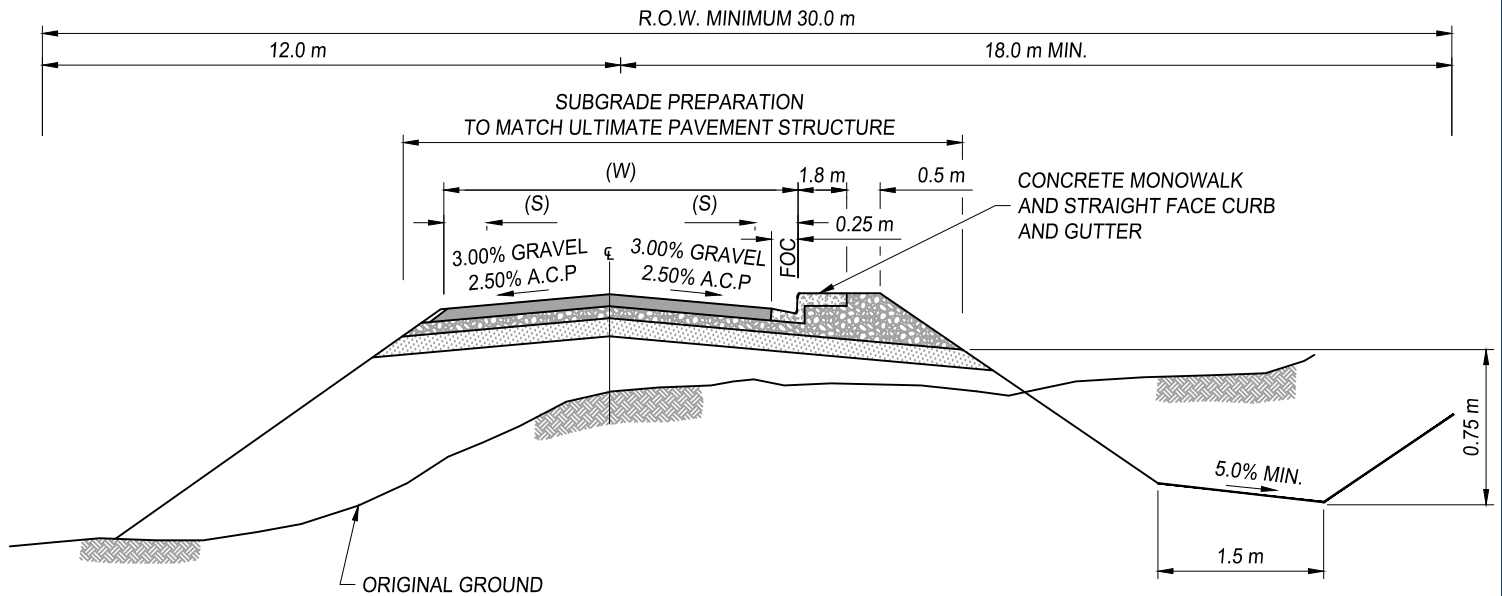
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STANDARD DETAIL #:

4-151



FILL SLOPE TABLE

DEPTH OF FILL	SLOPE (H:V)
0 - 1.5 m	4 : 1
1.5 - 3.5 m	3 : 1
3.5 - 4.5 m	2.5 : 1
> 4.5 m	2 : 1

ROAD CLASSIFICATION	ROADWAY	SHOULDER (S)	TOTAL STRUCTURE WIDTH (W)
RESIDENTIAL LOCAL	7.0 m	0.5 m	8.0 m
RESIDENTIAL COLLECTOR	7.0 m	1.0 m	9.0 m
COMMERCIAL / INDUSTRIAL LOCAL	7.0 m	1.0 m	9.0 m
COMMERCIAL / INDUSTRIAL COLLECTOR	7.0 m	1.5 m	10.0 m

NOTES:

- (1) ALL BACK SLOPES 3H:1V UNLESS SUPPORTED BY GEOTECHNICAL DESIGN.
- (2) SLOPES STEEPER THAN 3H:1V REQUIRE 1 m SHOULDER WIDENING & GUARD RAIL INSTALLATION.
- (3) FILL SLOPES GREATER THAN 3.5 m AND / OR STEEPER THAN 3H:1V REQUIRE GEOTECHNICAL DESIGN.
- (4) VEGETATION AND EROSION PROTECTION REQUIRED ON ALL EXPOSED SLOPES.
- (5) INSTALL CATCH BASINS AS REQUIRED PER ROAD DRAINAGE DESIGN, AND DISCHARGE TO DITCH SYSTEM OR LOCAL STORM SEWER COLLECTION SYSTEM AS APPLICABLE.

RURAL ROAD CROSS SECTION - CONCRETE CURB AND SIDEWALK

REVISION DATE

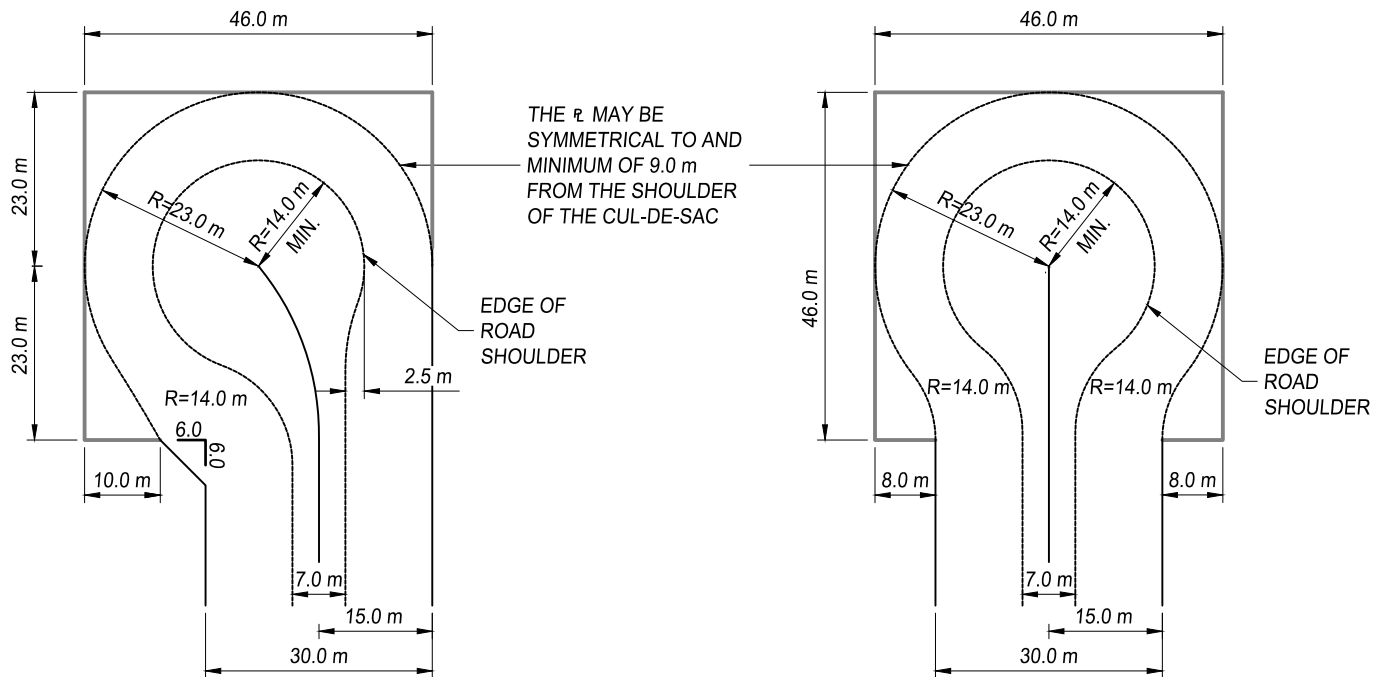
2024

REV.

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STANDARD DETAIL #:

4-152



NOTES:

- (1) THE MINIMUM CROWN SLOPE WITHIN THE CUL-DE-SAC SHALL BE 4.0%.
- (2) RIGHT-OF-WAY REQUIREMENTS MAY VARY DEPENDING ON FILL OR BACKSLOPE REQUIREMENTS.
- (3) DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.

RURAL RESIDENTIAL CUL-DE-SAC

REVISION DATE

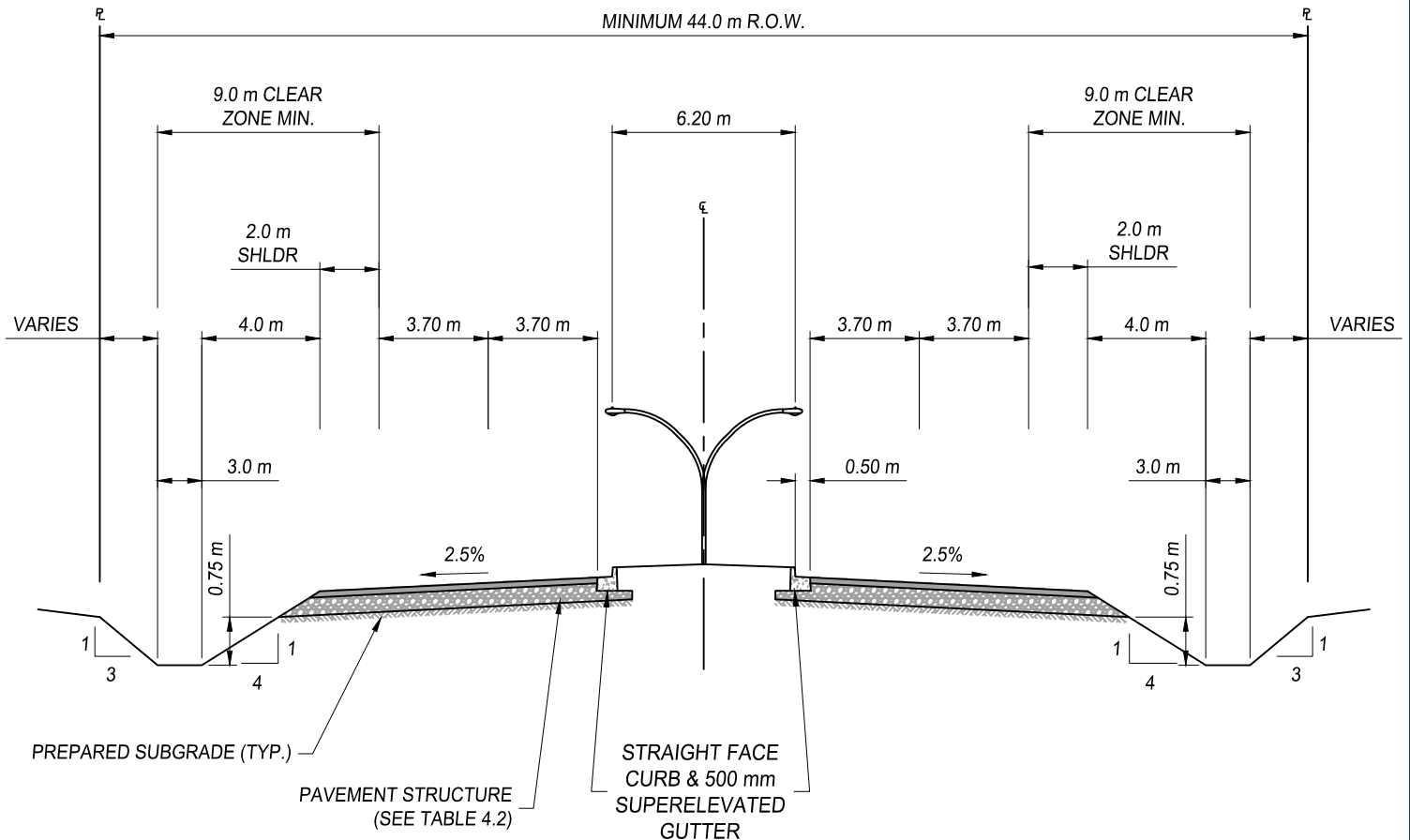
2024

REV.

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STANDARD DETAIL #:

4-153



NOTES:

- (1) FOC - FACE OR CURB.
- (2) EOP - EDGE OF PAVEMENT.
- (3) MEDIAN MAY BE NARROWED TO ACCOMMODATE NO-POST BARRIER SEPARATION AT LOCATIONS WITHOUT LEFT TURN MOVEMENTS. REFER TO TAC STANDARDS.
- (4) ADDITIONAL RIGHT-OF-WAY MAY BE REQUIRED SUBJECT TO MULTI-USE TRAIL REQUIREMENTS, UTILITIES, AND RELATIVE GRADE OF ADJACENT PROPERTIES. CONFIRM MUNICIPAL REQUIREMENTS DURING DESIGN.
- (5) CROSS SECTION AS SHOWN WILL ACCOMMODATE SINGLE 3.5 m LEFT TURN BAY. IF DOUBLE LEFT TURN BAY IS REQUIRED, WIDEN MEDIAN TO 10.2 m (FOC TO FOC) AND R.O.W. TO MINIMUM 47.0 m.

RURAL DIVIDED ARTERIAL ROADWAY

REVISION DATE

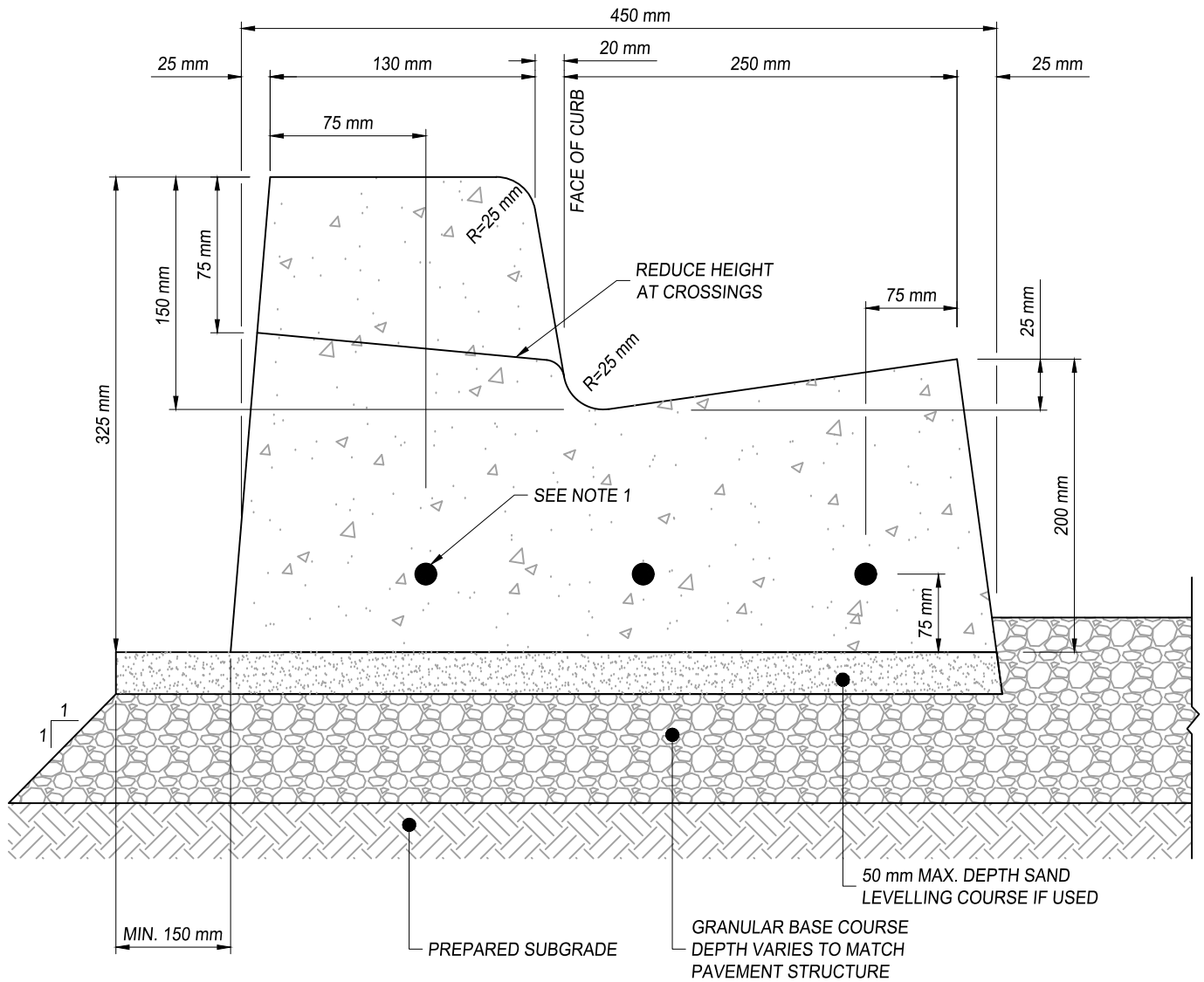
2024

REV.

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STANDARD DETAIL #:

4-154



NOTES:

- (1) 3-10M REINFORCING BARS AT ALL COMMERCIAL, INDUSTRIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES.
- (2) 250 mm GUTTER FOR USE ON LOCAL AND COLLECTOR ROADS.

STRAIGHT FACE CURB AND GUTTER

REVISION DATE

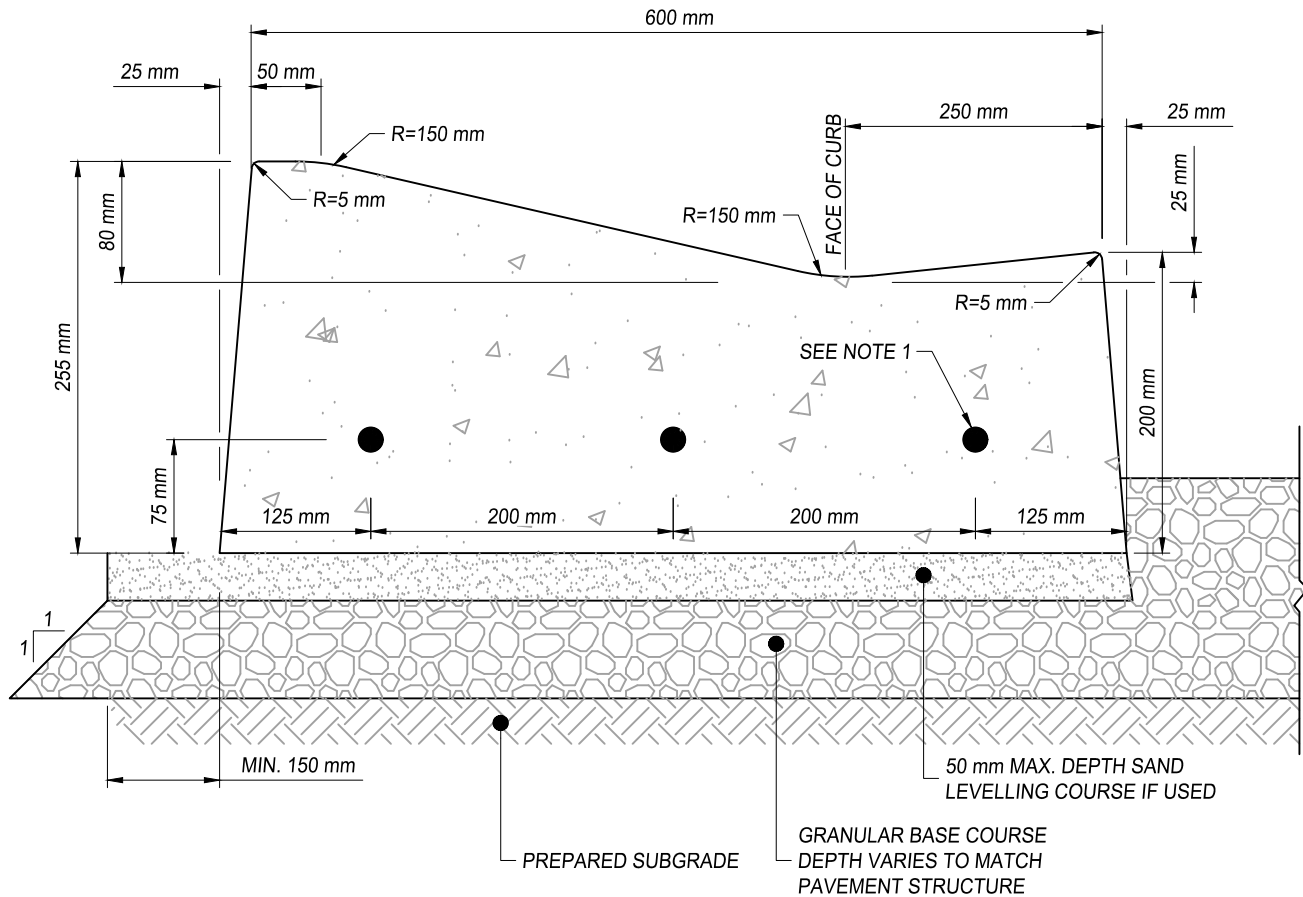
2024

REV.

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STANDARD DETAIL #:

4-200



NOTES:

- (1) 3-10M REINFORCEMENT AT ALL COMMERCIAL, INDUSTRIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES.
- (2) FOR USE ON MINOR RESIDENTIAL COLLECTOR AND RESIDENTIAL LOCAL ROADWAYS WHERE SPECIFIED.

ROLLED FACE CURB AND GUTTER

REVISION DATE

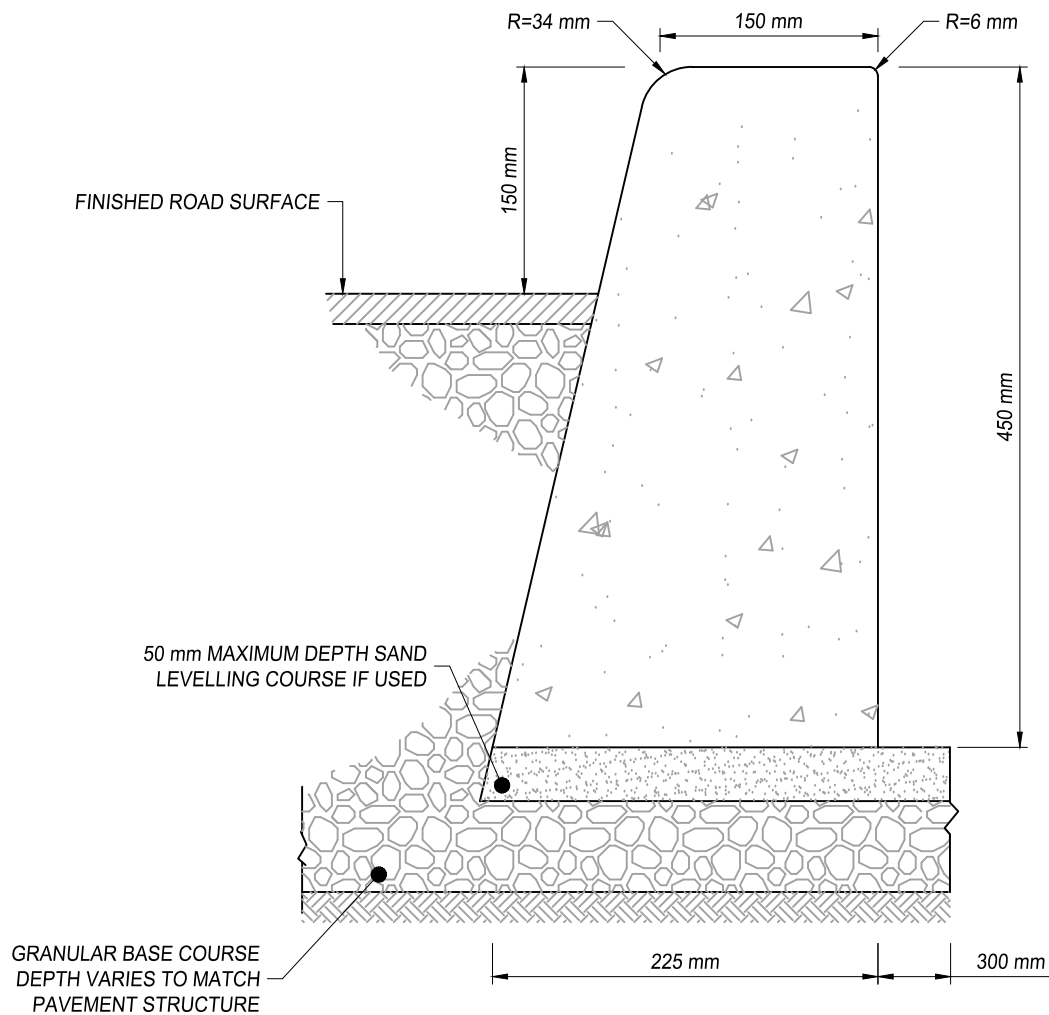
2024

REV.

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STANDARD DETAIL #:

4-201



NOTE:

- (1) FOR USE ONLY AT THE APPROVAL OF THE MUNICIPALITY IN INSTANCES WITHOUT GUTTER DRAINAGE.

STANDARD BARRIER CURB

REVISION DATE

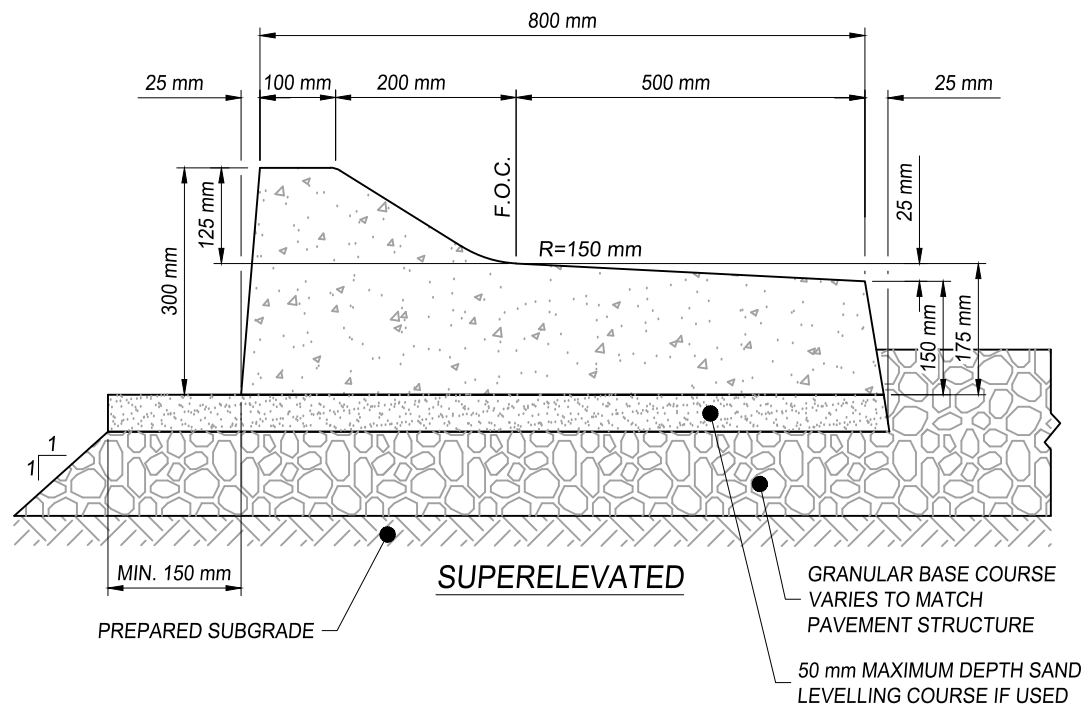
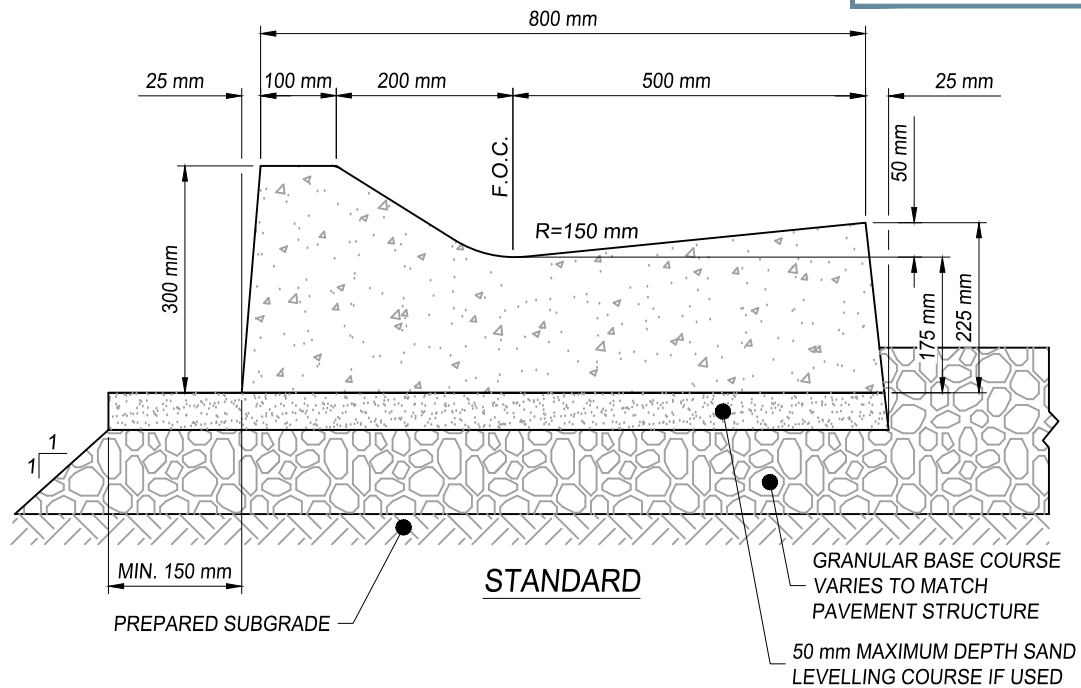
2024

REV.

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STANDARD DETAIL #:

4-202



NOTE:

- (1) SEMI-MOUNTABLE CURB FOR USE ON ARTERIAL ROADS AS SPECIFIED.

SEMI-MOUNTABLE CURB AND GUTTER

REVISION DATE

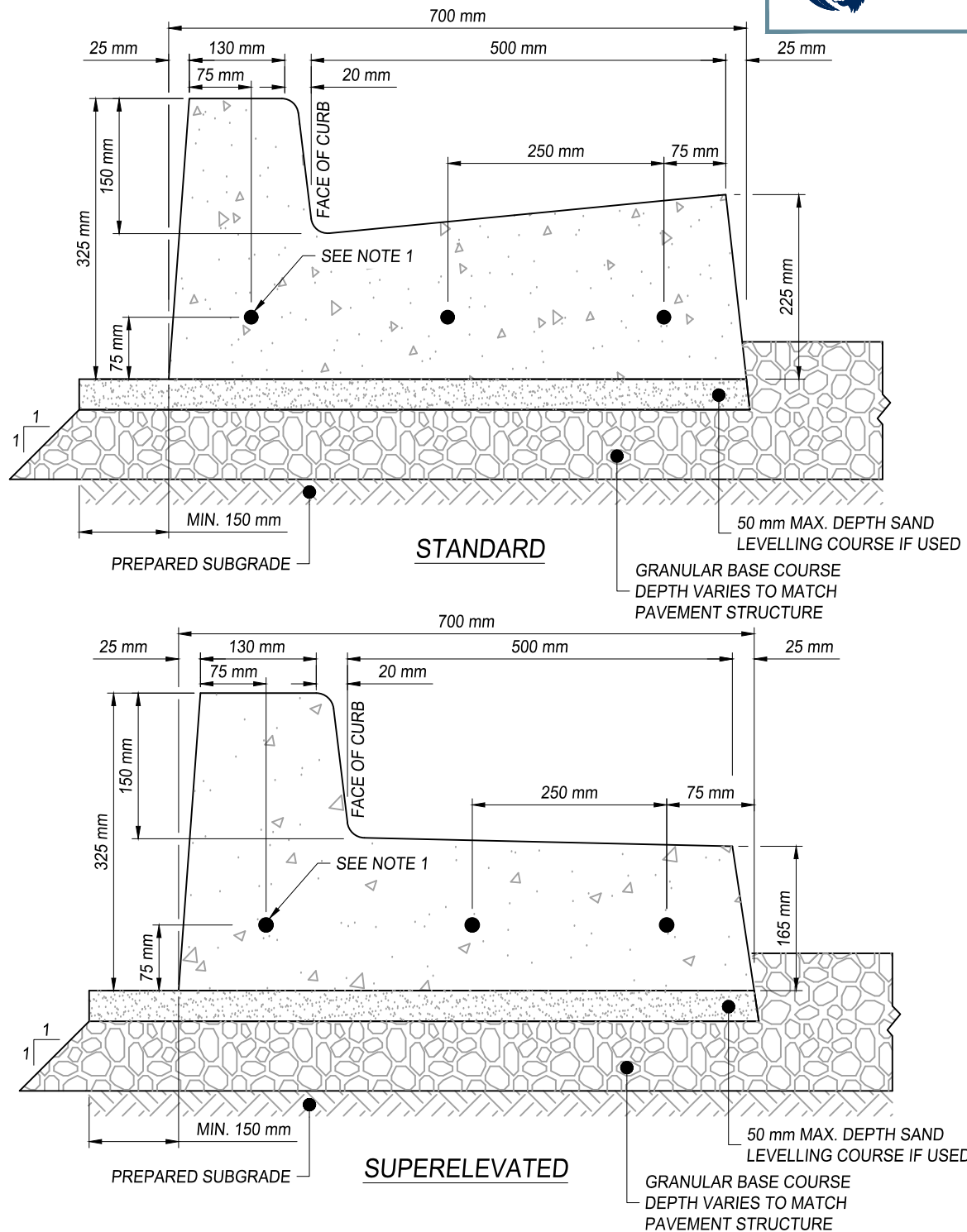
2024

REV.

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STANDARD DETAIL #:

4-203



NOTES:

- (1) 3-10M REINFORCING BARS AT ALL COMMERCIAL, INDUSTRIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES.
- (2) 500 mm GUTTER FOR USE ON ARTERIAL ROADS.

STRAIGHT FACE CURB AND 500 mm GUTTER

REVISION DATE

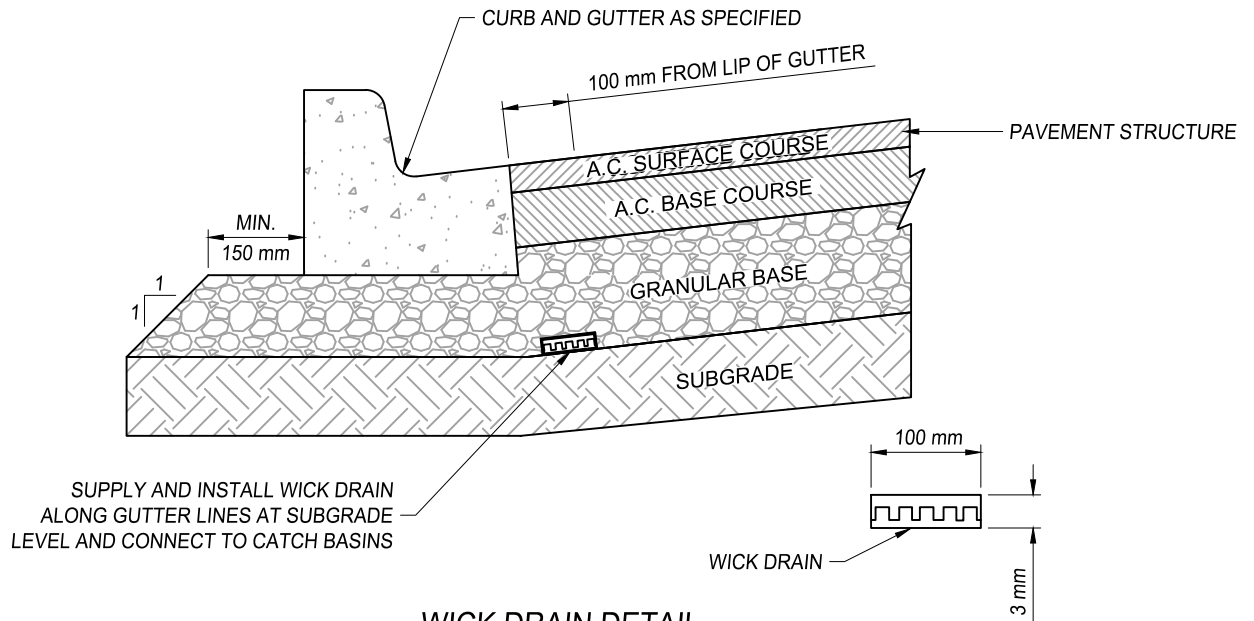
2024

REV.

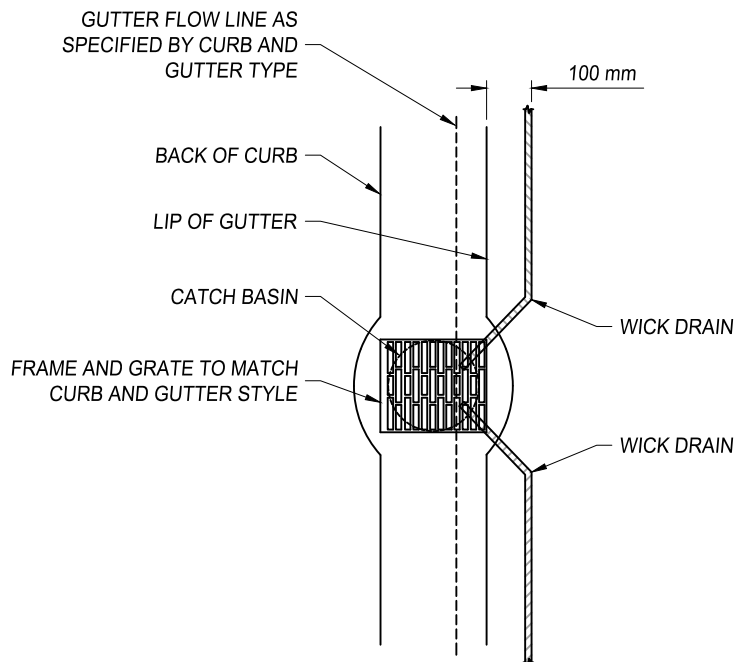
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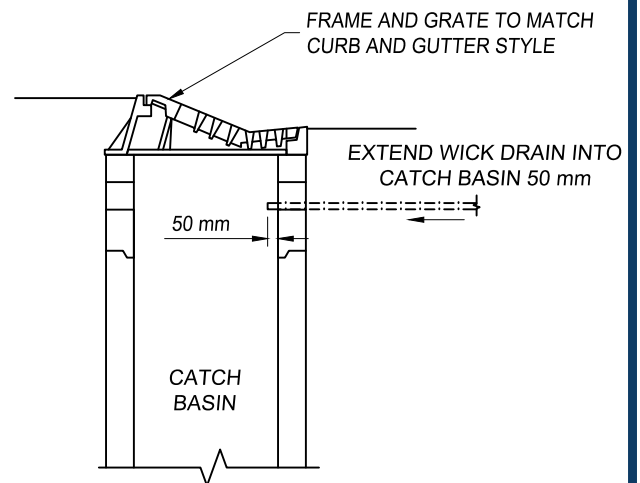
4-204



WICK DRAIN DETAIL



PLAN VIEW



ELEVATION VIEW

WICK DRAIN

REVISION DATE

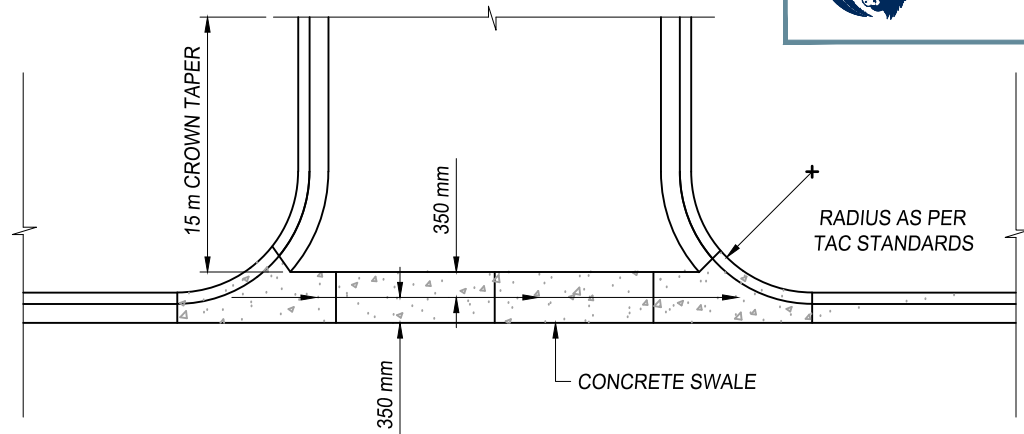
2024

REV.

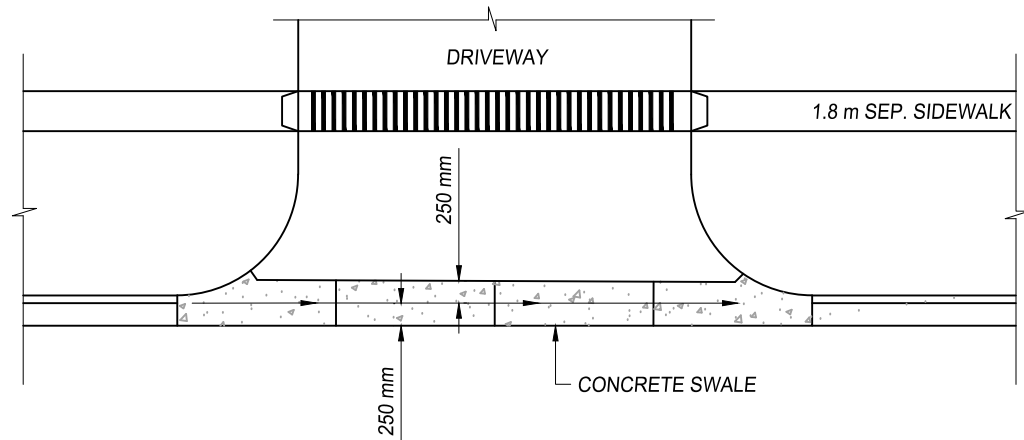
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STANDARD DETAIL #:

4-250



700 mm SWALE (USE AT ROADWAY INTERSECTIONS)



500 mm SWALE (USE AT DRIVEWAYS)

NOTES:

- (1) CROWN OF ROAD TO BE TAPERED STARTING 15 m FROM SWALE EDGE.
- (2) CONTRACTION JOINTS 50 mm DEEP AND 5 mm WIDE TO BE CONSTRUCTED AT 3 m SPACING ALONG SWALE.
- (3) EXPANSION JOINTS TO BE CONSTRUCTED WHERE SWALE SECTIONS ABUT CURB AND GUTTER.
- (4) SWALE TO BE FORMED AND FINISHED SUCH THAT UPSTREAM AND DOWNSTREAM ENDS MATCH GUTTER ELEVATIONS.
- (5) ASPHALT SHALL BE FULL DEPTH AT FACE OF SWALE TAPERED TO DESIGN ROAD DEPTH IN 2 m.
- (6) SEE STANDARD DETAIL NO. 4-301 FOR SWALE CROSS-CROSS SECTION.
- (7) SEE STANDARD DETAIL NO. 4-403 FOR JOINT DETAILS.

CONCRETE SWALE - PLAN

REVISION DATE

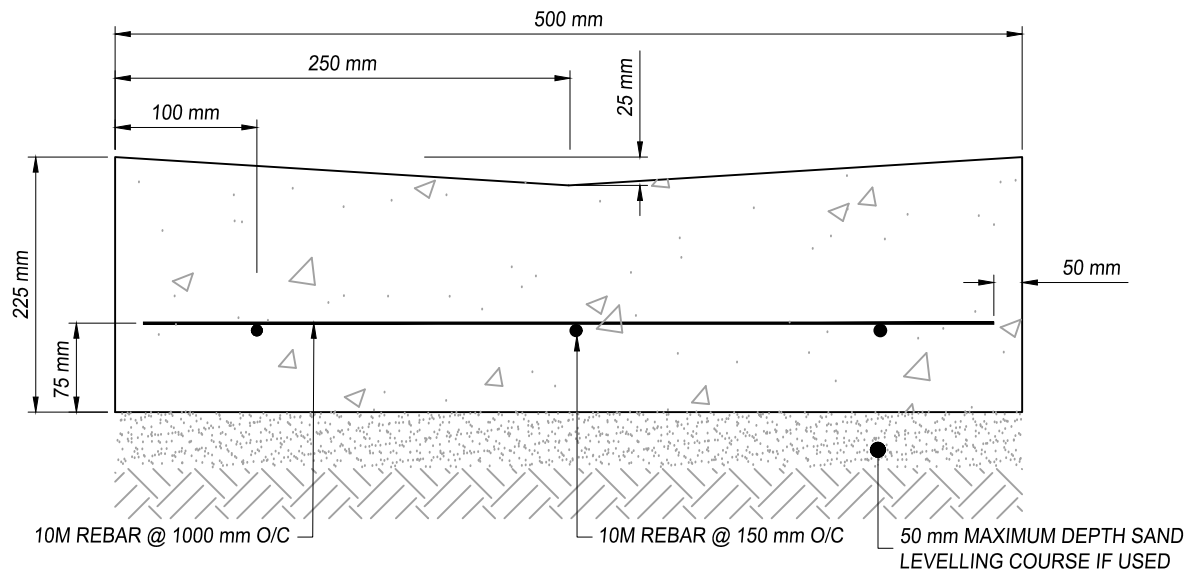
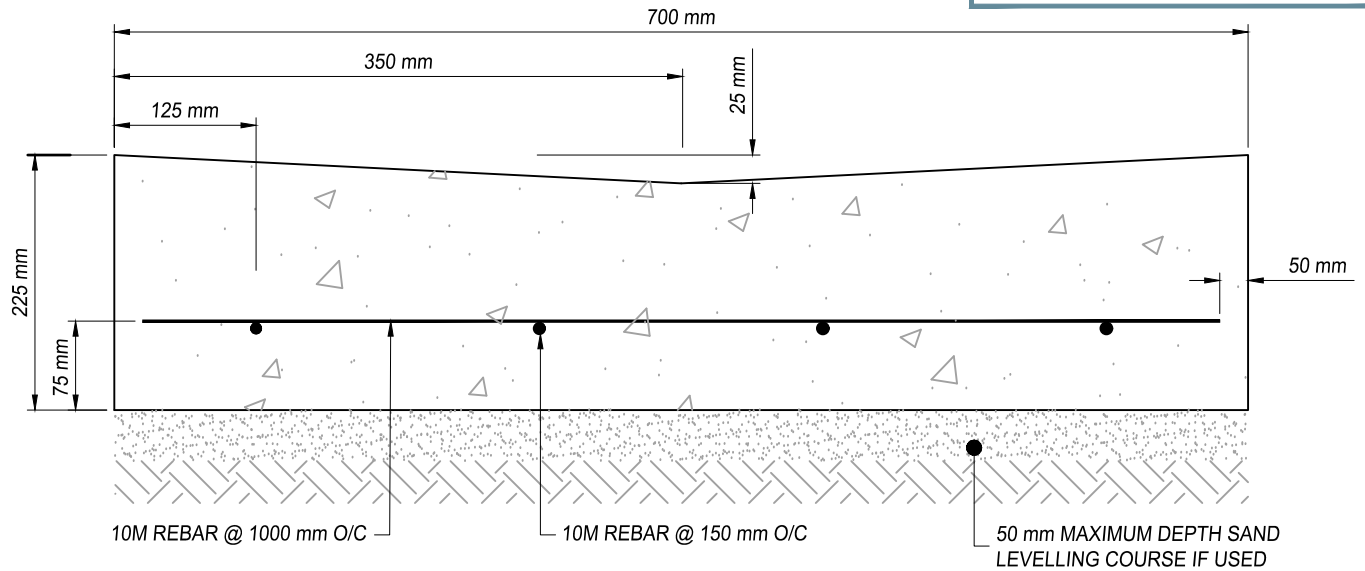
2024

REV.

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STANDARD DETAIL #:

4-300



NOTES:

- (1) ϵ SWALE TO MATCH GUTTER ELEVATION AT UPSTREAM END, LOWER GUTTER LIP TO MEET SWALE EDGE.
- (2) SWALE EDGE TO MATCH GUTTER ELEVATION ON DOWNSTREAM END, LOWER GUTTER LIP TO MATCH ϵ OF SWALE.
- (3) EXPANSION JOINTS TO BE CONSTRUCTED AT ENDS OF SWALE WHERE SWALE ABUTS GUTTERS.
- (4) CONTRACTION JOINTS 50 mm DEEP AND 5 mm WIDE TO BE CONSTRUCTED AT 3 m SPACING ALONG SWALE.

CONCRETE SWALE - CROSS SECTION

REVISION DATE

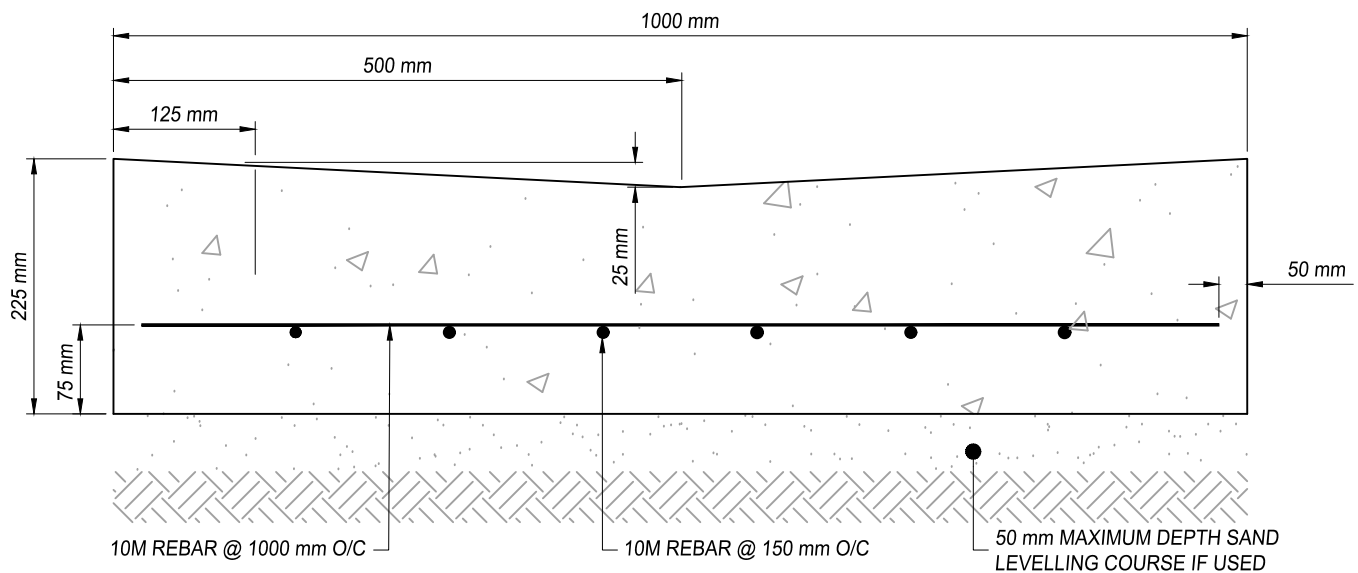
2024

REV.

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STANDARD DETAIL #:

4-301



1000 mm SWALE

NOTES:

- (1) ∇ SWALE TO MATCH GUTTER ELEVATION AT UPSTREAM END, LOWER GUTTER LIP TO MEET SWALE EDGE.
- (2) SWALE EDGE TO MATCH GUTTER ELEVATION ON DOWNSTREAM END, LOWER GUTTER LIP TO MATCH ∇ OF SWALE.
- (3) EXPANSION JOINTS TO BE CONSTRUCTED AT ENDS OF SWALE WHERE SWALE ABUTS GUTTERS.
- (4) CONTRACTION JOINTS 50 mm DEEP AND 5 mm WIDE TO BE CONSTRUCTED AT 3 m SPACING ALONG SWALE.

HIGHWAY CONCRETE SWALE - CROSS SECTION

REVISION DATE

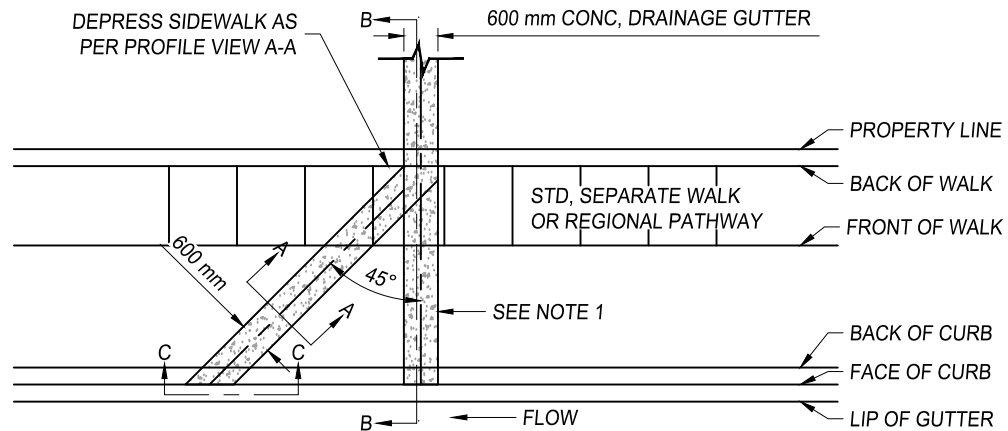
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REV.

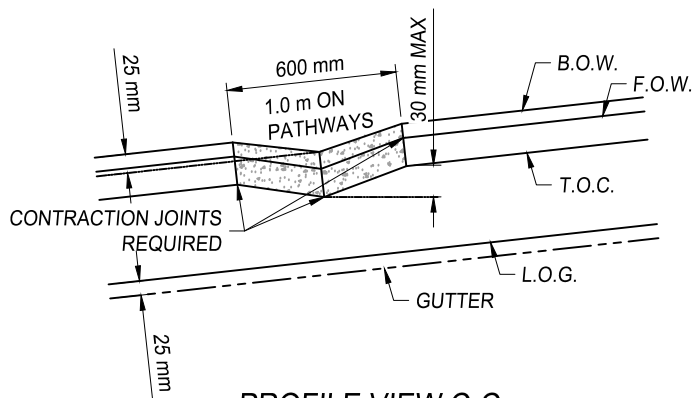
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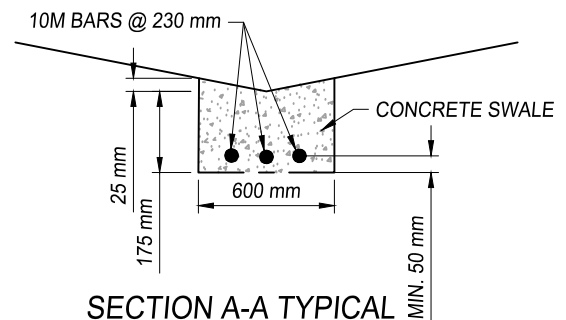
4-302



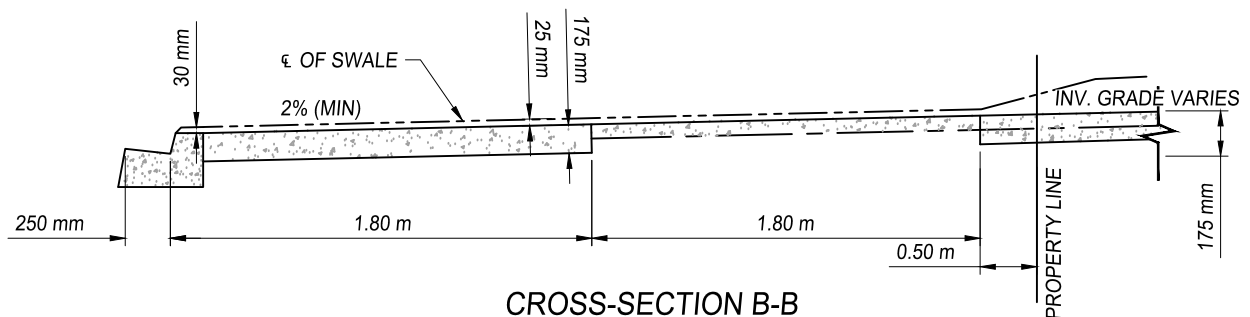
PLAN VIEW



PROFILE VIEW C-C



SECTION A-A TYPICAL



CROSS-SECTION B-B

NOTES:

- (1) ON ROAD WITH GRADE > 3%. THE SWALE MUST BE "OFFSET" TO DIRECT FLOW.
- (2) ALL DIMENSIONS IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

**SIDEWALK & BOULEVARD DRAINAGE CROSSING FOR
SEPARATE SIDEWALK**

REVISION DATE

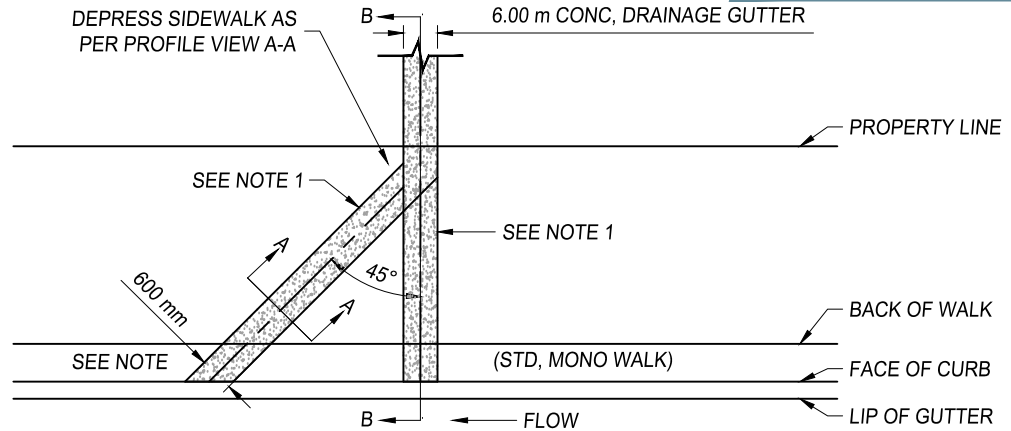
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REV.

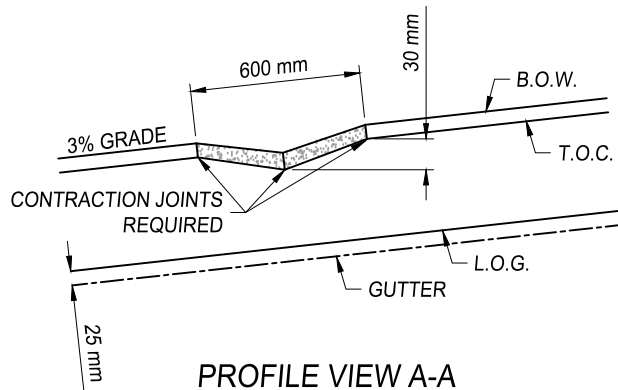
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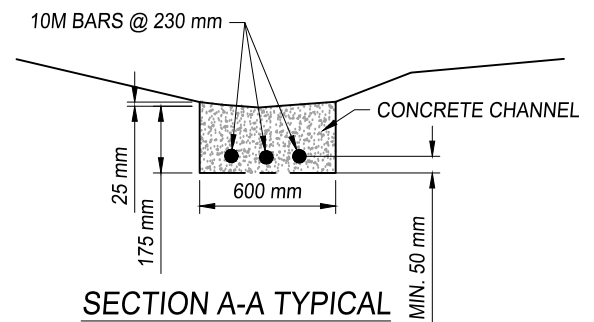
4-303



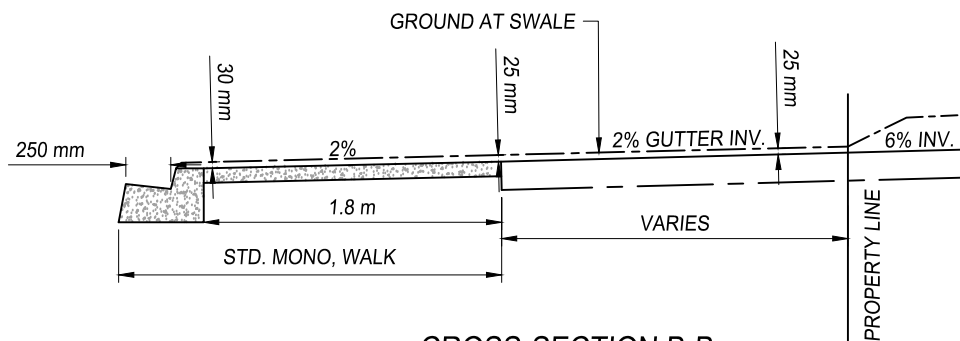
PLAN VIEW



PROFILE VIEW A-A



SECTION A-A TYPICAL



CROSS-SECTION B-B

NOTES:

- (1) ON ROAD WITH GRADE > 3% "ANGLED" SWALE MUST BE "OFFSET" TO DIRECT FLOW.
- (2) ALL DIMENSIONS IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

**SIDEWALK DRAINAGE CROSSING FOR
MONOLITHIC SIDEWALK**

REVISION DATE

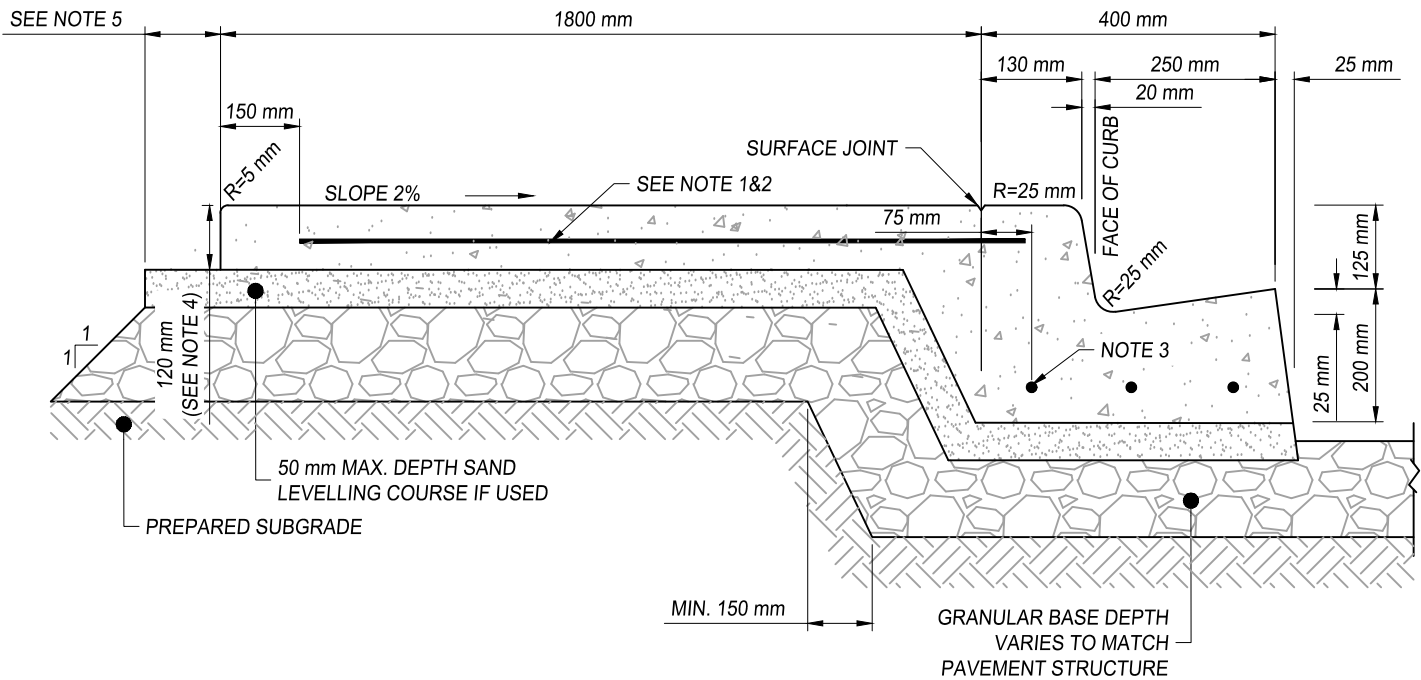
2024

REV.

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STANDARD DETAIL #:

4-304



NOTES:

- (1) 10M TRANSVERSE REINFORCEMENT AT 750 mm O.C. IN ALL SIDEWALKS.
- (2) FOR ALL INDUSTRIAL, COMMERCIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES:
150 X 150 P18/P18 GAUGE WELDED WIRE FABRIC
OR 10M 300 X 300 REINFORCEMENT GRID ALTERNATIVE
- (3) 3-10M REINFORCING BARS AT ALL INDUSTRIAL, COMMERCIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES.
- (4) 175 mm THICK AT COMMERCIAL, INDUSTRIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES.
- (5) COMPACT BACKFILL TO 95% S.P.M.D.D. FOR 150 mm MIN. FROM BACK OF WALK.

STRAIGHT FACE MONOLITHIC CURB, GUTTER,
AND SIDEWALK

REVISION DATE

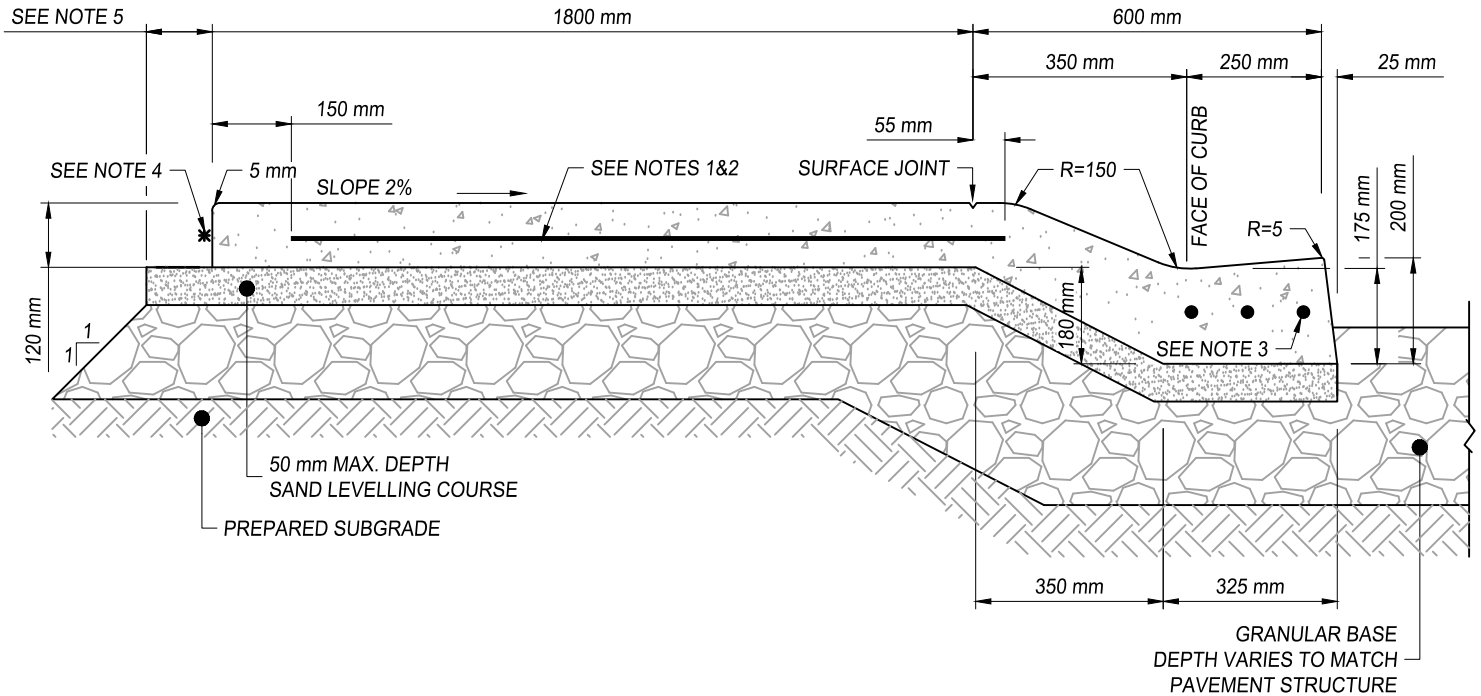
2024

REV.

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STANDARD DETAIL #:

4-400



NOTES:

- (1) 10M TRANSVERSE REINFORCEMENT AT 750 mm O.C. IN ALL SIDEWALKS.
- (2) FOR ALL INDUSTRIAL, COMMERCIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES:
150 X 150 P18/P18 GAUGE WELDED WIRE FABRIC
OR 10M 300 X 300 REINFORCEMENT GRID ALTERNATIVE
- (3) 3-10M REINFORCING BARS AT ALL INDUSTRIAL, COMMERCIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES.
- (4) 175 mm THICK AT COMMERCIAL, INDUSTRIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES.
- (5) COMPACT BACKFILL TO 95% FOR 150 mm MIN. FROM BACK OF WALK.

ROLLED FACE MONOLITHIC CURB, GUTTER,
AND SIDEWALK

REVISION DATE

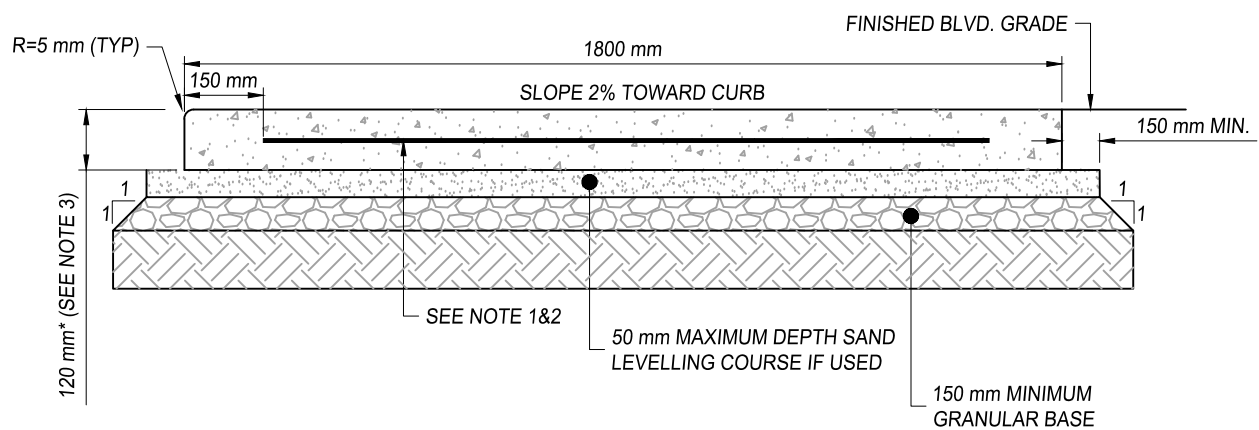
2024

REV.

0

STANDARD DETAIL #:

4-401



NOTES:

- (1) 10M TRANSVERSE REINFORCEMENT AT 750 mm O.C. IN ALL SIDEWALKS.
- (2) FOR ALL INDUSTRIAL, COMMERCIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES:
150 X 150 P18/P18 GAUGE WELDED WIRE FABRIC
OR 10M 300 X 300 REINFORCEMENT GRID ALTERNATIVE
- (3) 175 mm THICK AT COMMERCIAL, INDUSTRIAL, ALLEY AND APARTMENT DRIVEWAY ENTRANCES.
- (4) COMPACT BACKFILL TO 95% FOR 150 mm MIN. FROM BACK OF WALK.

SEPARATE SIDEWALK

REVISION DATE

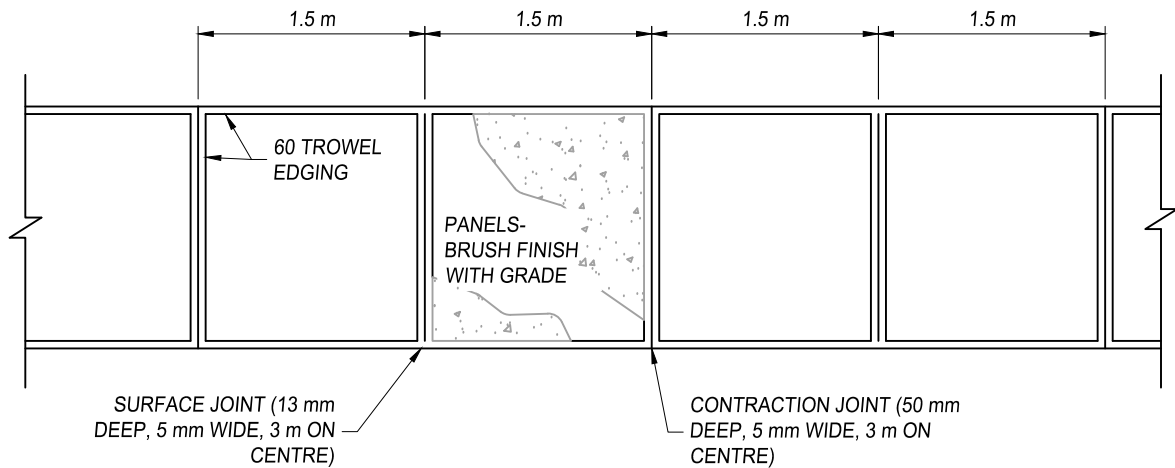
2024

REV.

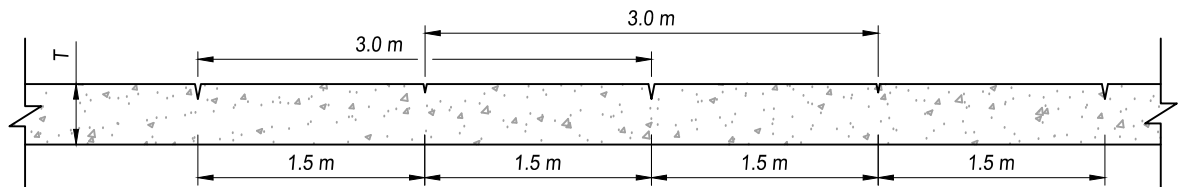
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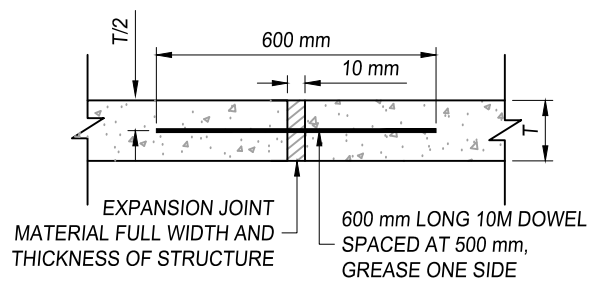
4-402



PLAN



SECTION



EXPANSION JOINT DETAIL

NOTE:

- (1) ASPHALT IMPREGNATED EXPANSION BOARD TO BE PROVIDED WHERE NEW SIDEWALK ABUTS EXISTING CONCRETE STRUCTURES AND EVERY 100 m MINIMUM.

SIDEWALK JOINT AND FINISHING DETAILS

REVISION DATE

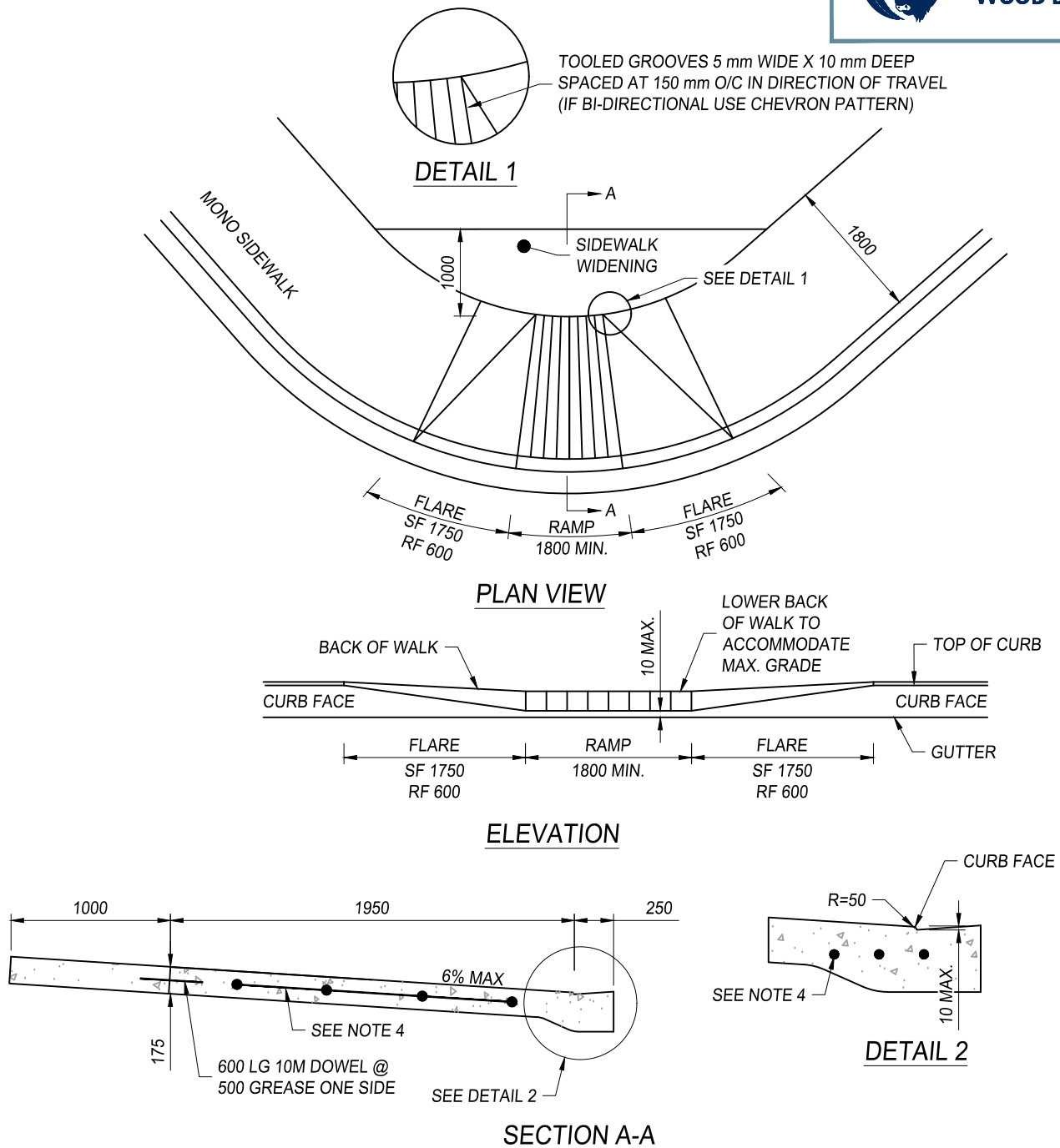
2024

REV.

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STANDARD DETAIL #:

4-403



NOTES:

- (1) MAXIMUM SLOPE ON CURB RAMP AND TAPER TO BE 6%.
- (2) CURB AND GUTTER TO BE POURED MONOLITHICALLY WITH CURB RAMP.
- (3) CENTRE CURB RAMP WITH CENTRE OF PEDESTRIAN CROSSWALK.
- (4) 150 X 150 P18 / P18 GAUGE WIRE MESH OR 10M REBAR ON 300 mm GRID WITH 75 mm COVER (TOP AND SIDE OF SLAB) TO BE PLACED IN SIDEWALK. CURB AND GUTTER SECTION REQUIRES 3-10M.
- (5) DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

CURB RAMP TYPE A (CORNER; MONOWALK)

REVISION DATE

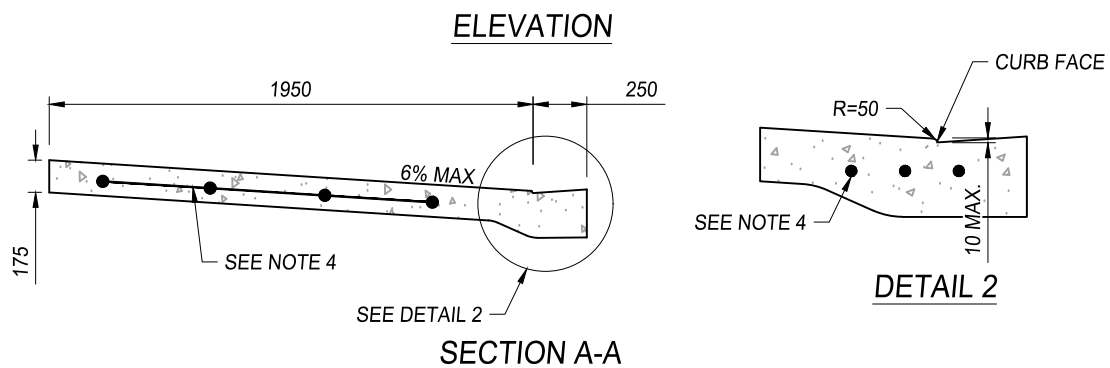
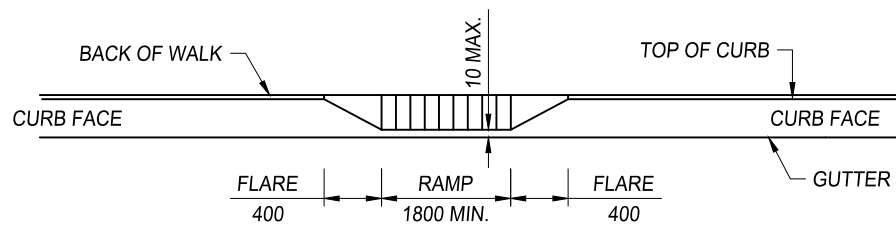
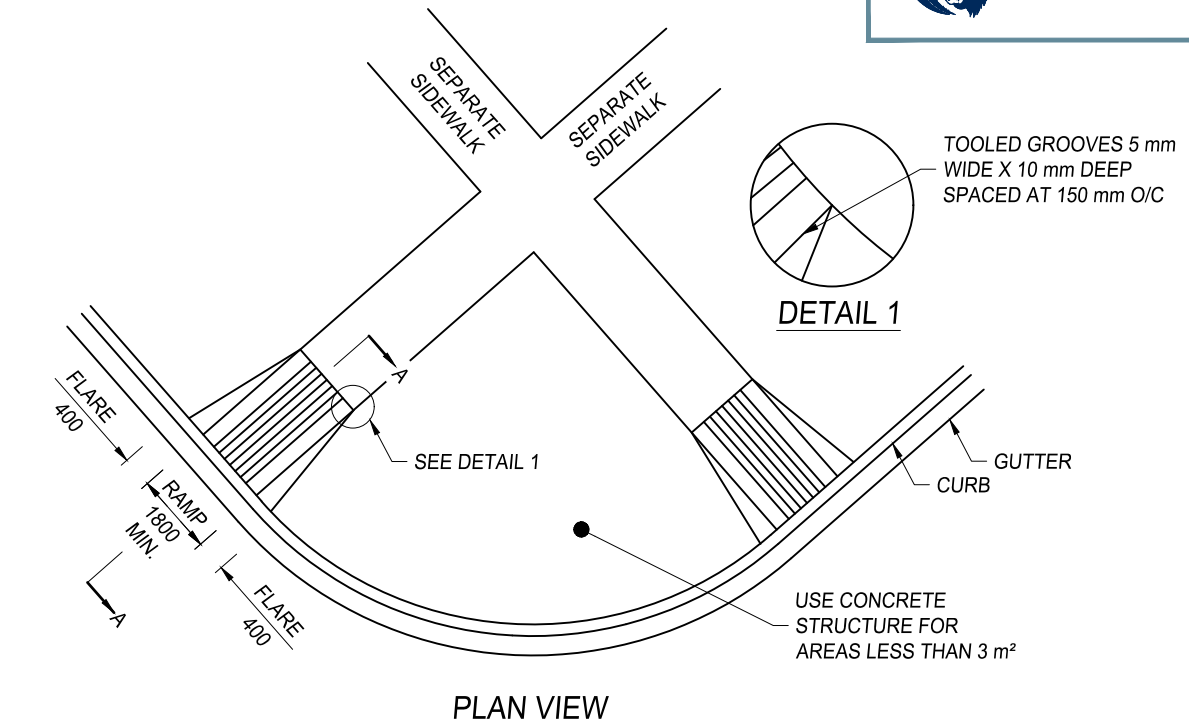
2024

REV.

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STANDARD DETAIL #:

4-404



NOTES:

- (1) MAXIMUM SLOPE ON CURB RAMP AND TAPER TO BE 6%.
- (2) CURB AND GUTTER TO BE POURED MONOLITHICALLY WITH CURB RAMP.
- (3) CENTRE CURB RAMP WITH CENTRE OF PEDESTRIAN CROSSWALK.
- (4) 150 X 150 P18 / P18 GAUGE WIRE MESH OR 10M REBAR ON 300 mm GRID WITH 75 mm COVER (TOP AND SIDE OF SLAB) TO BE PLACED IN SIDEWALK CURB AND GUTTER SECTION REQUIRES 3-10M.
- (5) DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

CURB RAMP TYPE B (CORNER; SEPARATE SIDEWALK)

REVISION DATE

2024

REV.

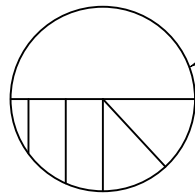
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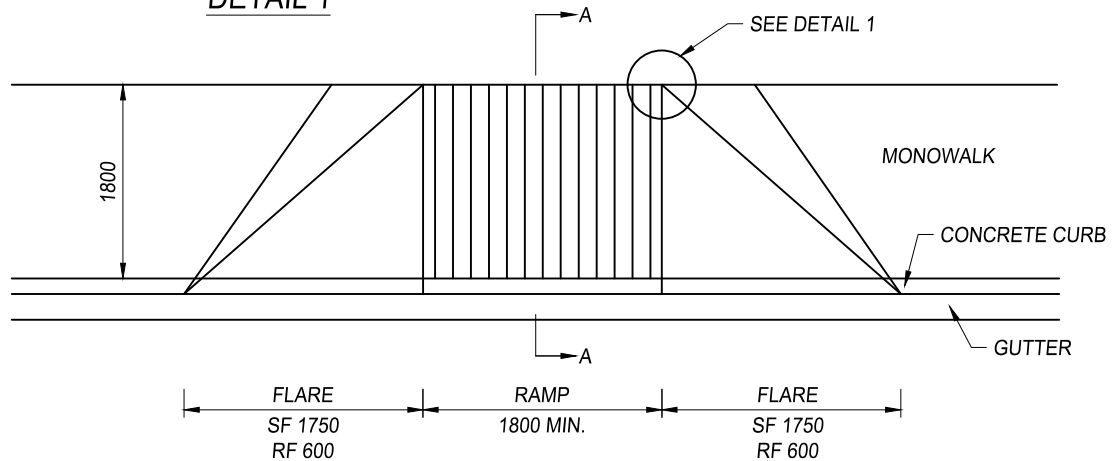
4-405



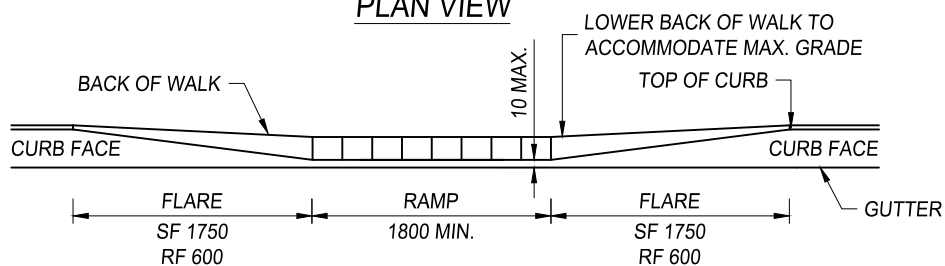
TOOLED GROOVES IN DIRECTION
OF TRAVEL 5 mm WIDE X 10 mm
DEEP SPACED AT 150 mm O/C



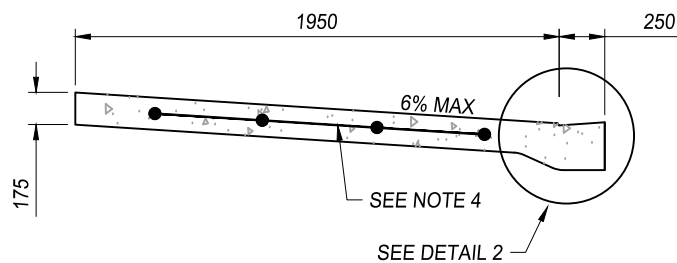
DETAIL 1



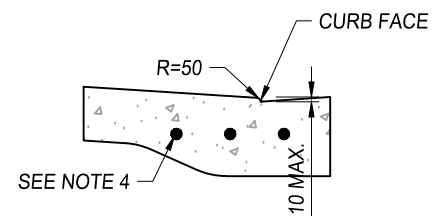
PLAN VIEW



ELEVATION



SECTION A-A



DETAIL 2

NOTES:

- (1) MAXIMUM SLOPE ON CURB RAMP AND TAPER TO BE 6%.
- (2) CURB AND GUTTER TO BE POURED MONOLITHICALLY WITH CURB RAMP.
- (3) CENTRE CURB RAMP WITH CENTRE OF PEDESTRIAN CROSSWALK.
- (4) 150 X 150 P18 / P18 GAUGE WIRE MESH OR 10M REBAR ON 300 mm GRID WITH 75 mm COVER (TOP AND SIDE OF SLAB) TO BE PLACED IN SIDEWALK CURB AND GUTTER SECTION REQUIRES 3-10M.
- (5) DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

CURB RAMP TYPE C (MIDBLOCK; MONOWALK)

REVISION DATE

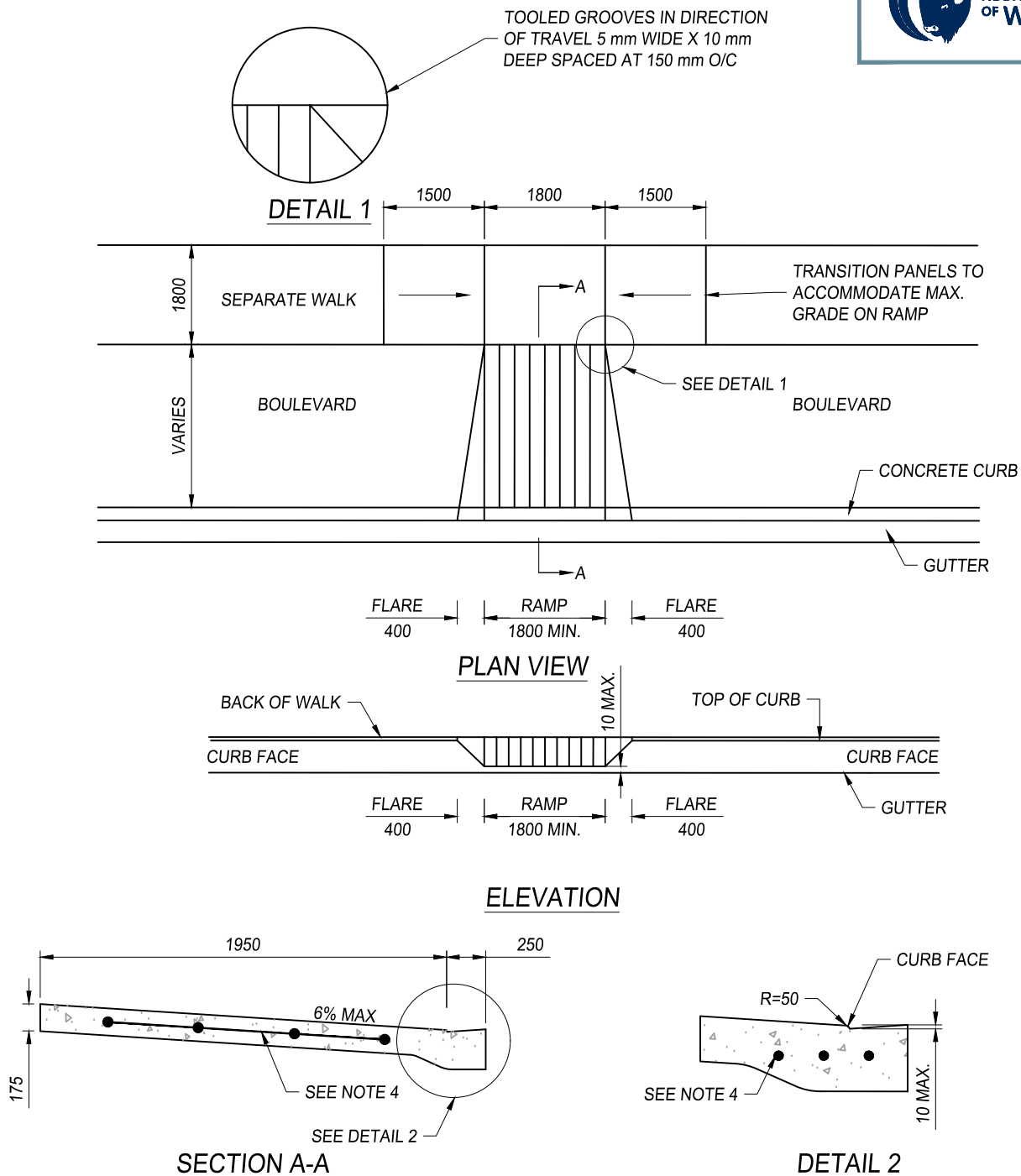
2024

REV.

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STANDARD DETAIL #:

4-406



NOTES:

- (1) MAXIMUM SLOPE ON CURB RAMP AND TAPER TO BE 6%.
- (2) CURB AND GUTTER TO BE POURED MONOLITHICALLY WITH CURB RAMP.
- (3) CENTRE CURB RAMP WITH CENTRE OF PEDESTRIAN CROSSWALK.
- (4) 150 X 150 P18 / P18 GAUGE WIRE MESH OR 10M REBAR ON 300 mm GRID WITH 75 mm COVER (TOP AND SIDE OF SLAB) TO BE PLACED IN SIDEWALK CURB AND GUTTER SECTION REQUIRES 3-10M.
- (5) DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

CURB RAMP TYPE D (MIDBLOCK; SEPARATE SIDEWALK)

REVISION DATE

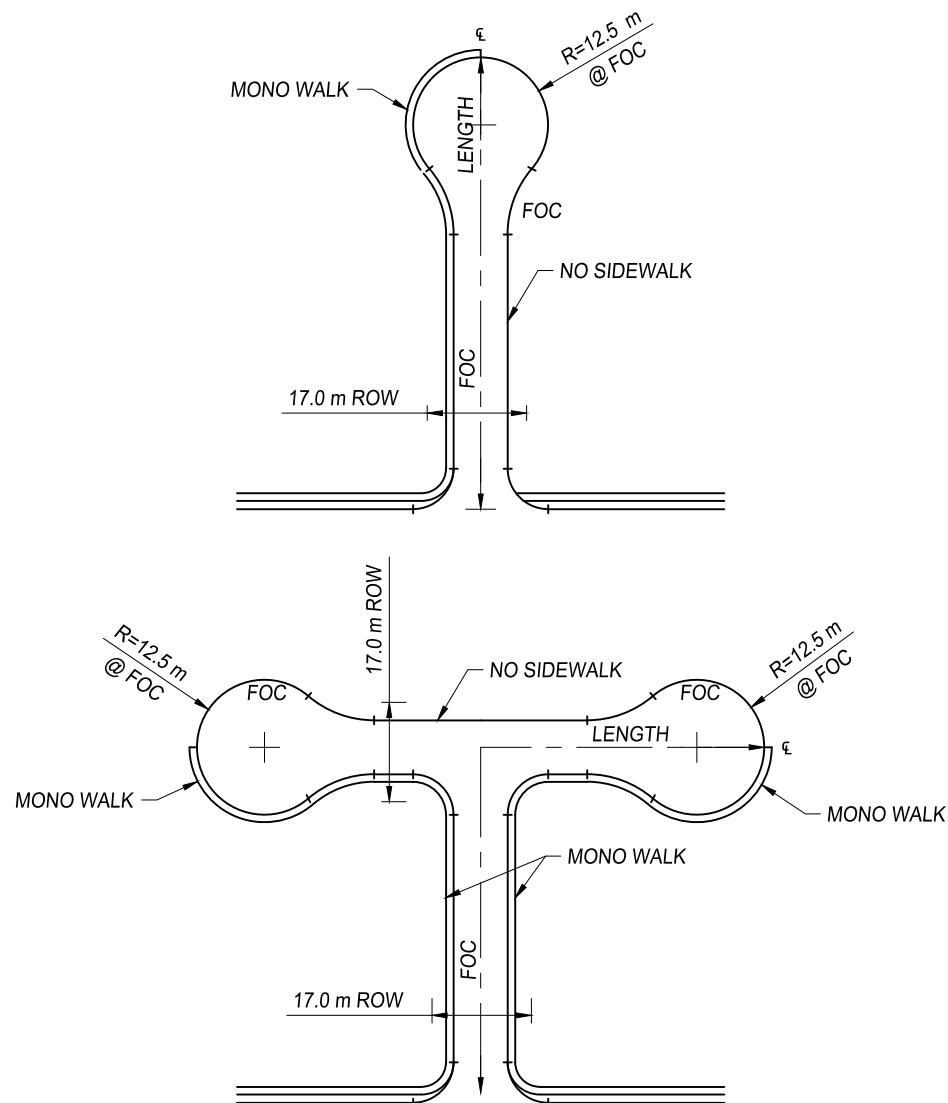
2024

REV.

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STANDARD DETAIL #:

4-407



NOTES:

- (1) WHERE POSSIBLE, PROVIDE PEDESTRIAN CONNECTIVITY FROM TERMINUS OF CUL-DE-SAC TO REGIONAL TRAIL OR WALKWAY NETWORK, VIA A P.U.L.
- (2) ONLY APPLICABLE TO CUL-DE-SACS WITH FEWER THAN 18 LOTS AND LENGTH LESS THAN 120 m. LARGER CUL-DE-SACS REQUIRE SIDEWALK ON BOTH SIDES.
- (3) MAXIMUM CUL-DE-SAC LENGTH IS 300 m.

CUL-DE-SAC SIDEWALK REQUIREMENTS

REVISION DATE

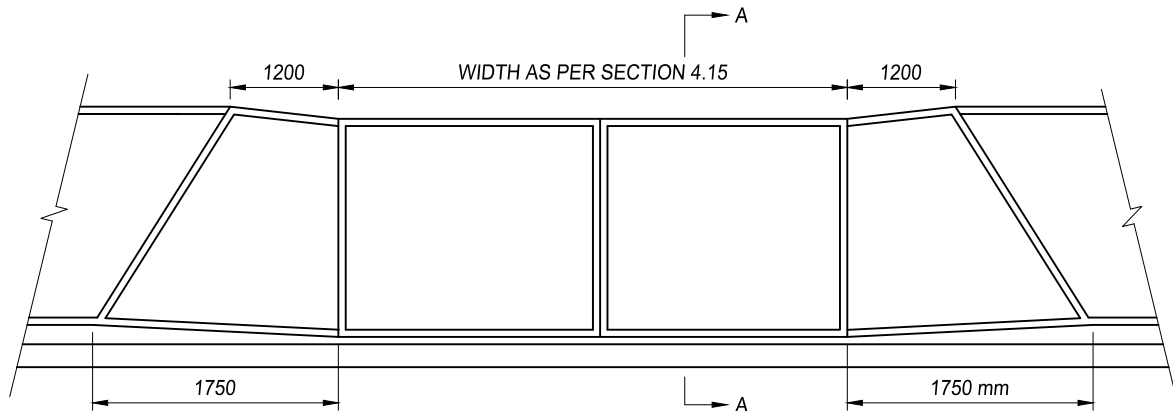
2024

REV.

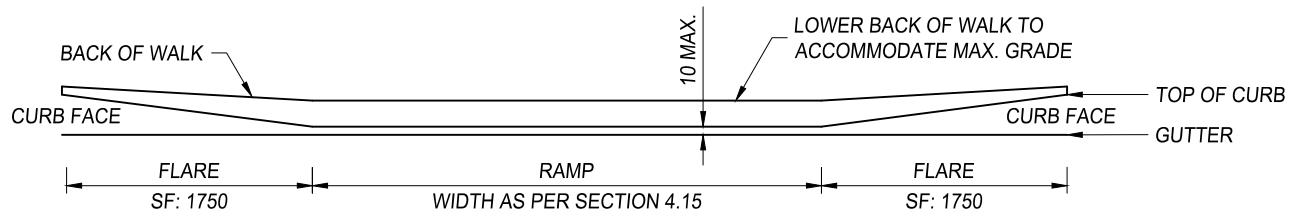
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STANDARD DETAIL #:

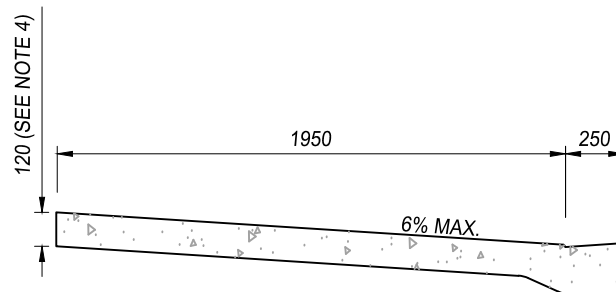
4-408



PLAN



ELEVATION



SECTION A-A

NOTES:

- (1) CONCRETE TO BE TYPE HS, 30 MPa.
- (2) SIMILAR FOR SEPARATE WALKS WITH THE EXCEPTION OF THE FLARES (400 mm).
- (3) DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
- (4) 175 mm THICK AT COMMERCIAL, INDUSTRIAL, ALLEY, AND APARTMENT DRIVEWAY ENTRANCES.

URBAN DRIVEWAY / APPROACH

REVISION DATE

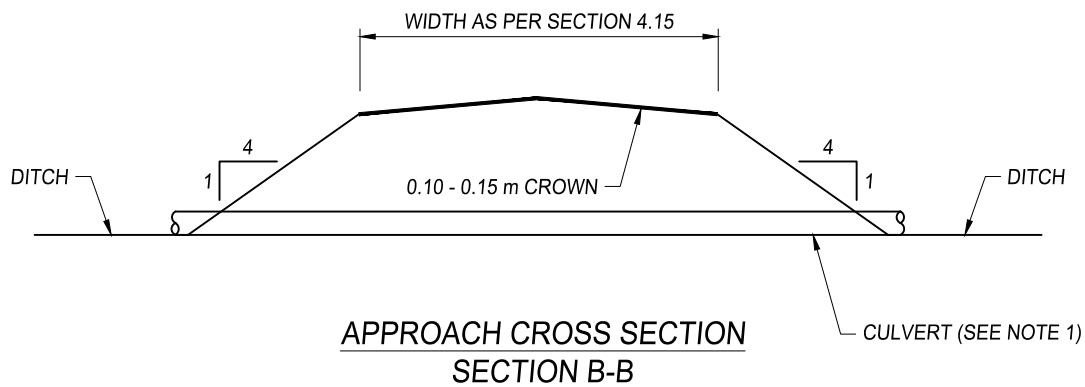
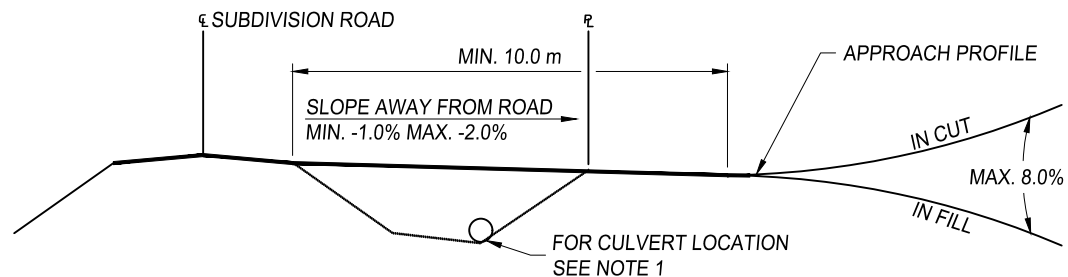
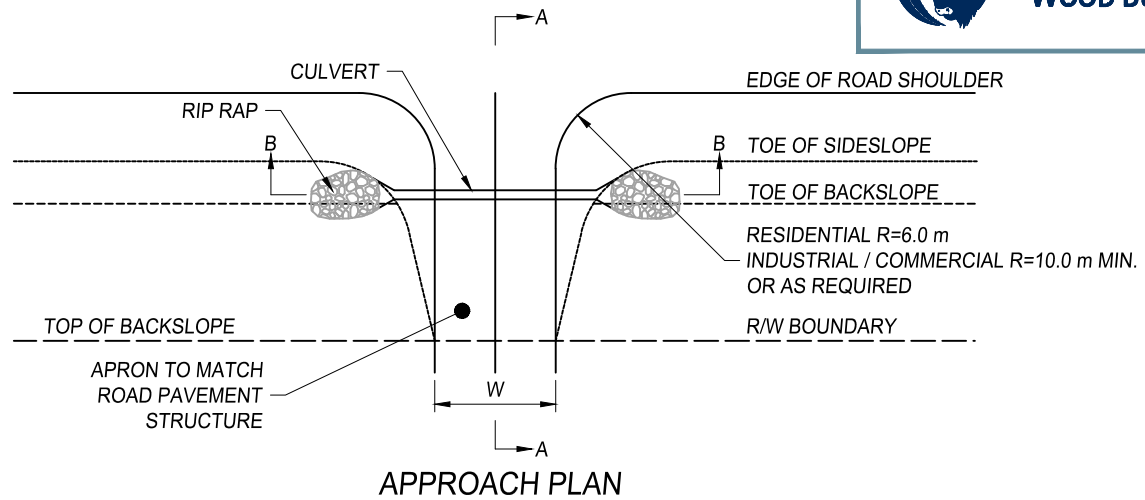
2024

REV.

0

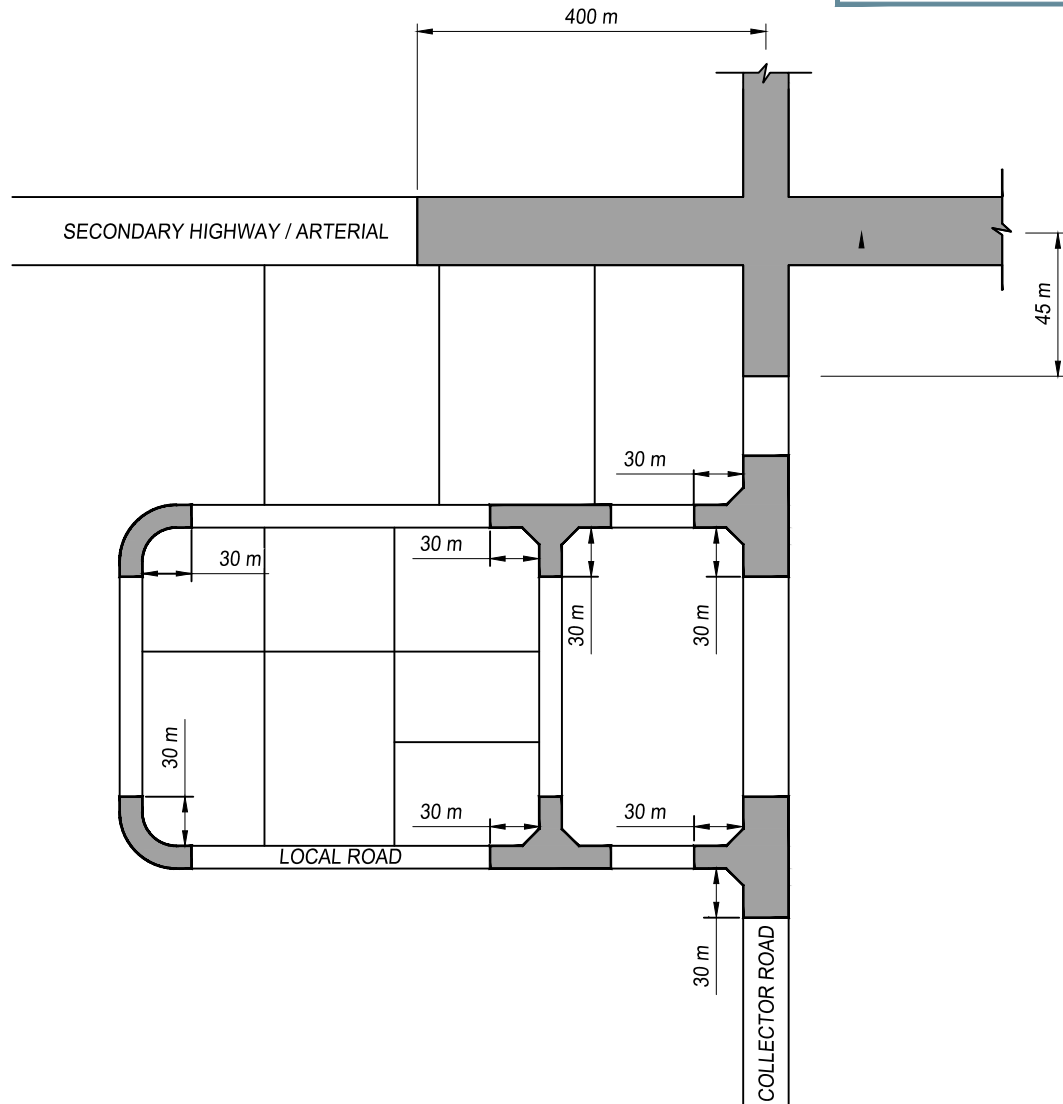
STANDARD DETAIL #:

4-500



NOTES:

- (1) WHEN CULVERTS ARE REQUIRED
 - RESIDENTIAL - 600 mm
 - INDUSTRIAL - 600 mm
 - LENGTH WILL VARY WITH DEPTH OF FILL
 - CULVERT TO BE PLACED AT TOE OF BACKSLOPE
- (2) MIN. APPROACH LENGTH - FROM EDGE OF ROAD SHOULDER TO R/W BOUNDARY.

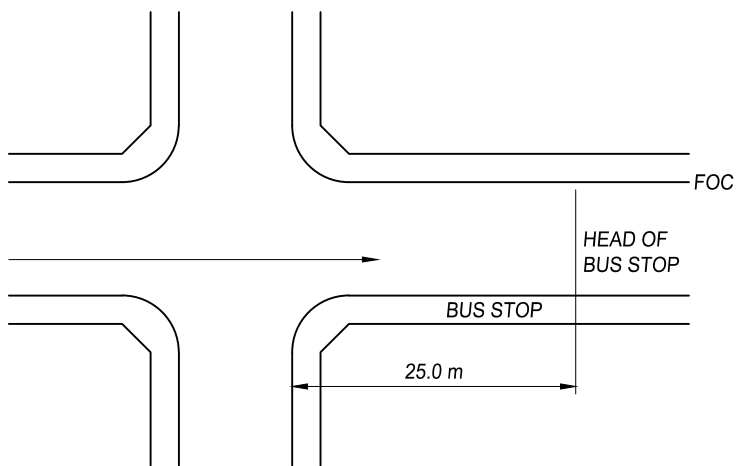


NOTES:

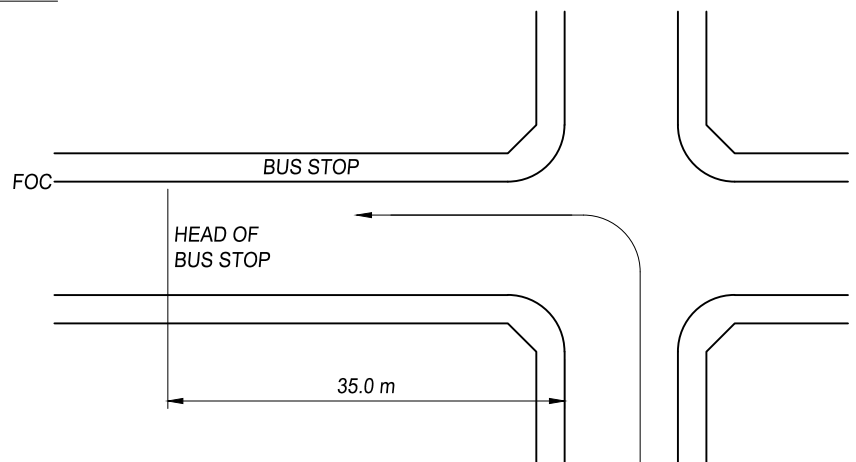
- (1) DIMENSIONS AND HIGHLIGHTING INDICATE WHERE ROAD APPROACHES SHALL NOT BE CONSTRUCTED UNLESS NO REASONABLE ALTERNATIVE EXISTS.
- (2) ALL LOT ACCESS WITHIN SUBDIVISIONS SHALL BE FROM INTERNAL SUBDIVISION ROADS.
- (3) MINIMUM SIGHT DISTANCES AS PER TAC.

RURAL DRIVEWAY / APPROACH LOCATIONS

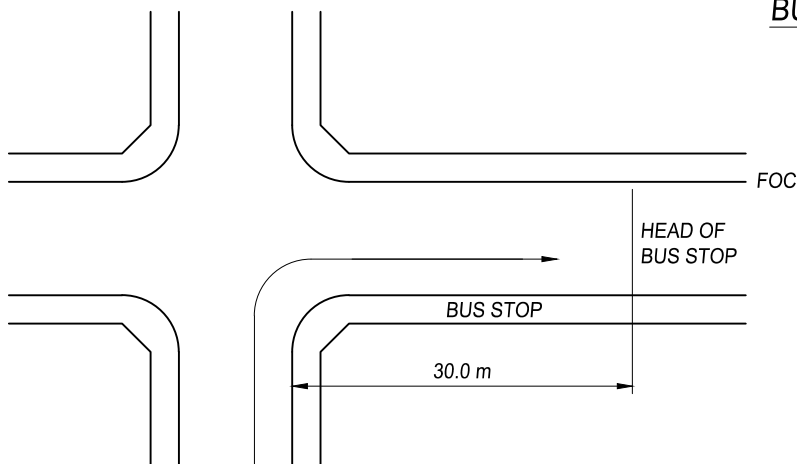
REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	4-551



BUS HEADING STRAIGHT



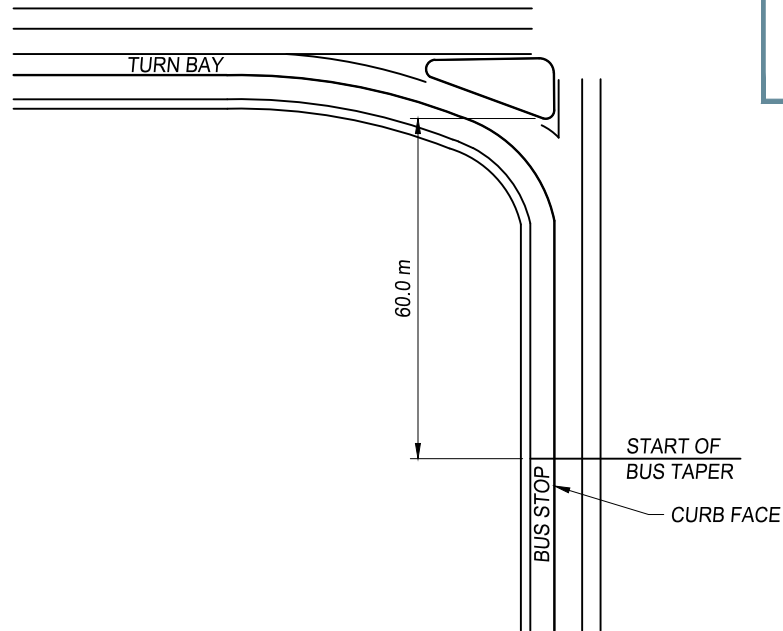
BUS MAKING LEFT HAND TURN



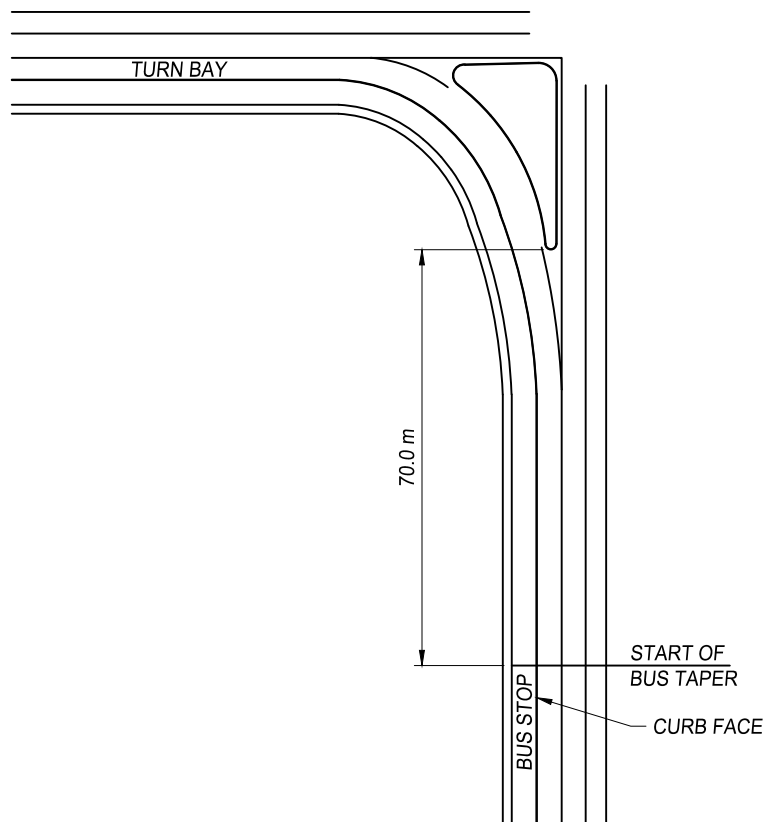
BUS MAKING RIGHT HAND TURN

NOTES:

- (1) FOC - FACE OF CURB.
- (2) STRAIGHT FACE CURB REQUIRED AT ALL BUS STOPS.



HIGH ENTRY ANGLE RIGHT TURN



LOW ENTRY ANGLE RIGHT TURN

LOCATION OF BUS STOP - CHANNELED INTERSECTION

REVISION DATE

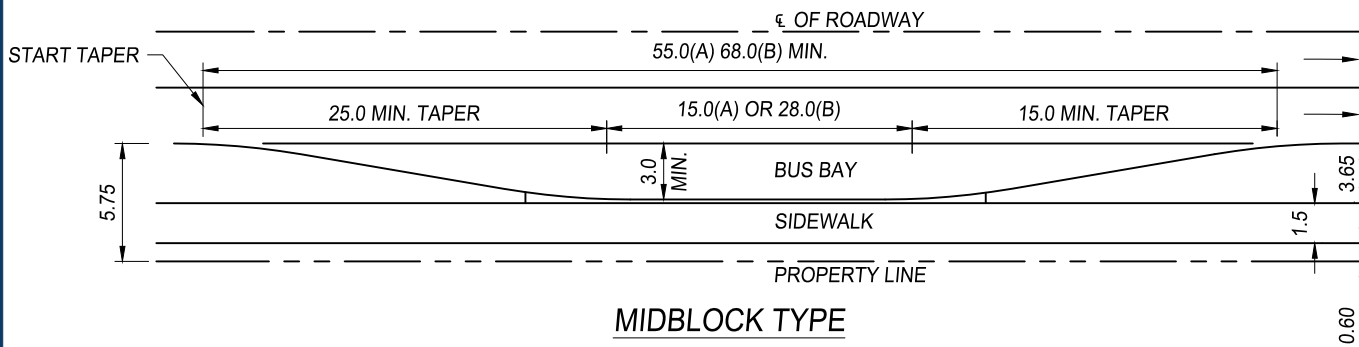
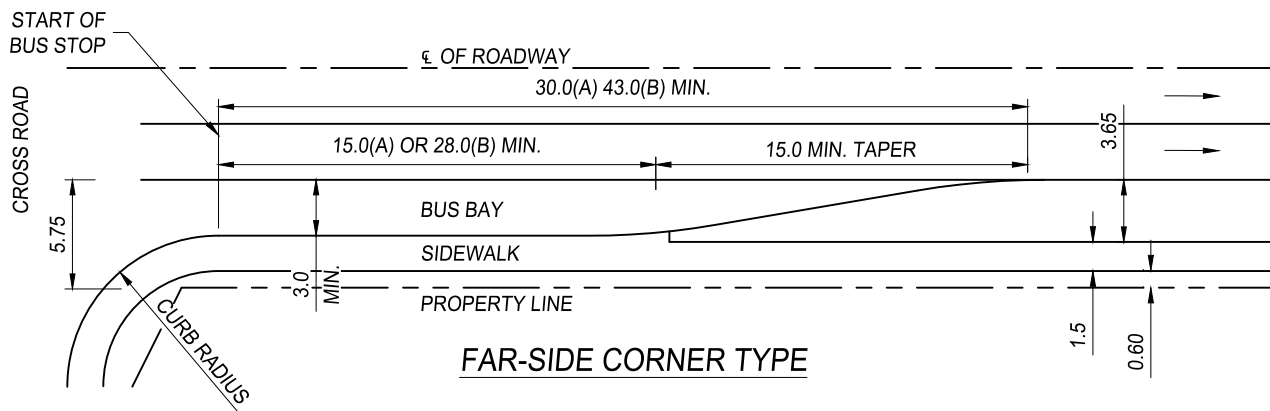
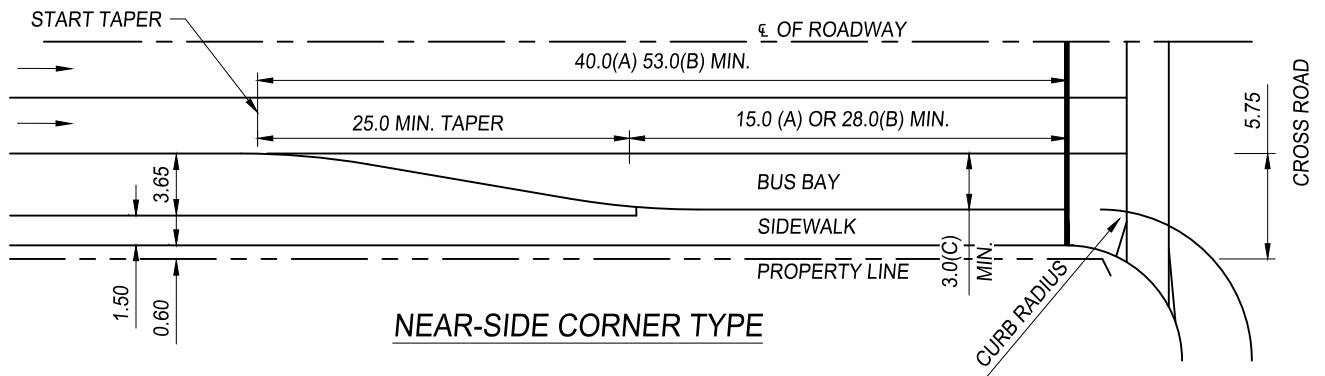
2024

REV.

0

STANDARD DETAIL #:

4-601



NOTES:

- (1) (A) DIMENSIONS TO ACCOMMODATE A SINGLE CITY BUS.
- (2) (B) DIMENSIONS TO ACCOMMODATE TWO CITY BUSES.
- (3) (C) DIMENSIONS INCREASED TO 3.5 m IF USED AS A COMBINATION BUS BAY / RIGHT-TURN BAY.

BUS BAY PULLOUT ON AN ARTERIAL ROADWAY

REVISION DATE

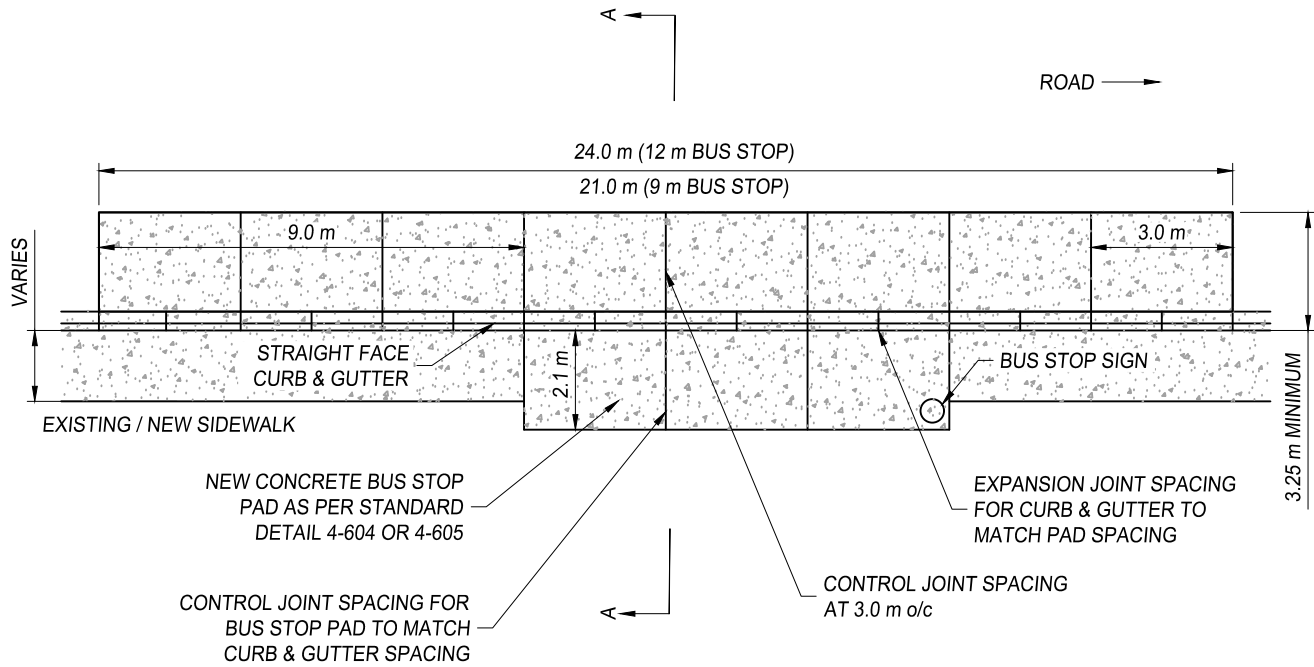
2024

REV.

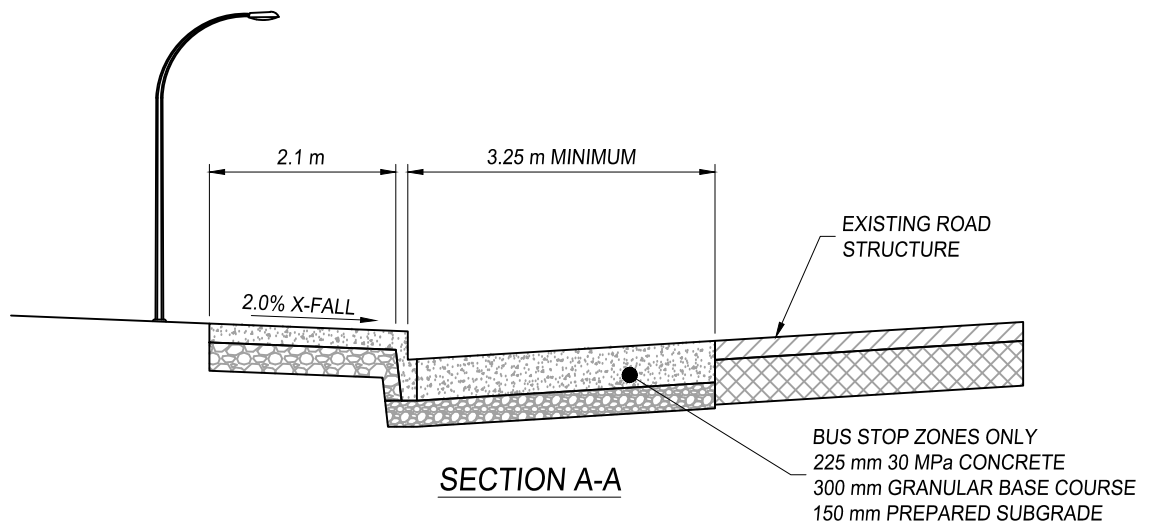
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STANDARD DETAIL #:

4-602



PLAN VIEW



SECTION A-A

CONCRETE BUS STOP PAD - RETROFIT

REVISION DATE

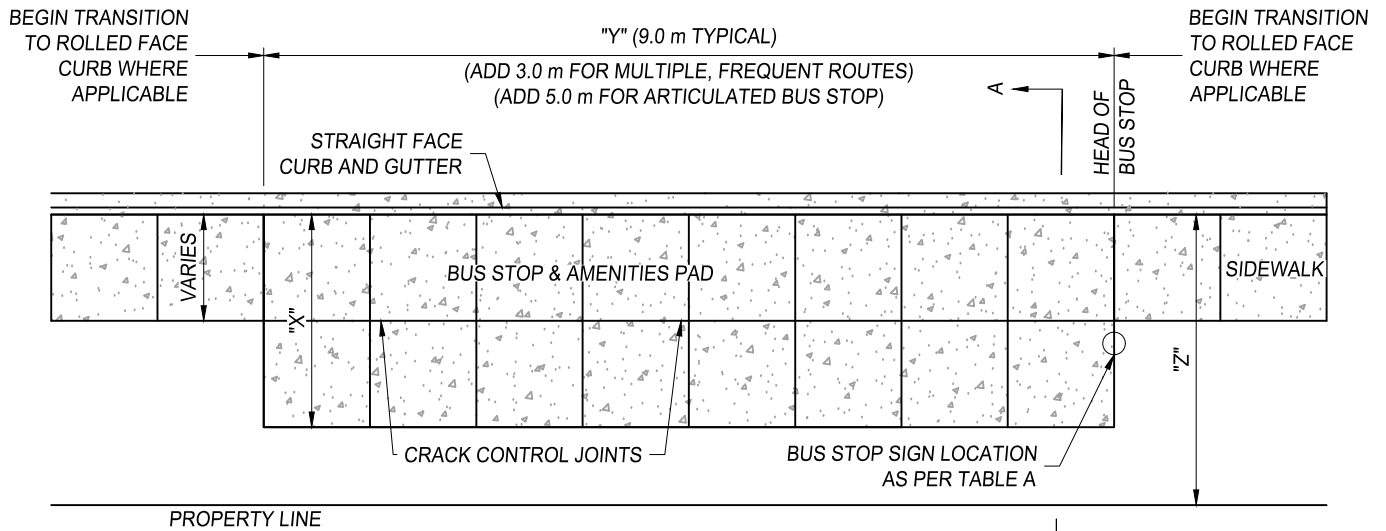
2024

REV.

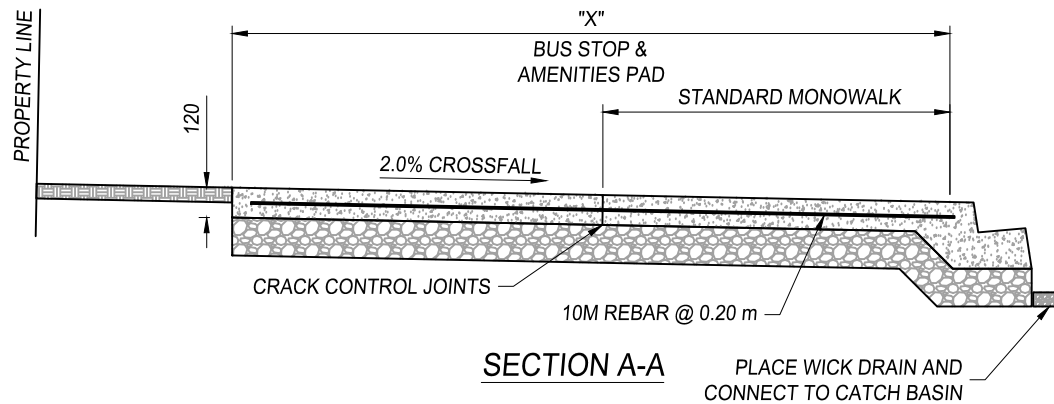
0

STANDARD DETAIL #:

4-603



PLAN VIEW



SECTION A-A

NOTES:

- (1) PROVIDE A BUS STOP AND AMENITIES PAD WITH WIDTH "X" AND LENGTH "Y" IN ACCORDANCE WITH THE DRAWING NOTES AND TABLE A (SEE BELOW). PROVIDE CRACK CONTROL JOINTS THROUGHOUT.
- (2) MAINTAIN MIN. 0.3 m CLEARANCE BETWEEN PROPERTY LINE AND AMENITIES PAD.

TABLE A

CONDITION	DISTANCE "Z" TO PROPERTY LINE	REQUIRED PAD WIDTH "X"	REQUIRED PAD LENGTH "Y"	BUS STOP SIGN LOCATION BEHIND SIDEWALK
OVER-CONSTRAINED	"Z" < 2.8 m	2.1 m	9.0 m	HEAD OF PAD
CONSTRAINED	2.8 m ≤ "Z" < 3.9 m	"Z"-0.3 m (MAX. 3.0 m)	12.0 m	3 m BACK FROM HEAD
NOT CONSTRAINED	"Z" ≥ 3.9 m	"Z"-0.3 m (MAX. 4.1 m)	9.0 m	HEAD OF PAD

BUS STOP & AMENITIES PAD - MONOLITHIC SIDEWALK

REVISION DATE

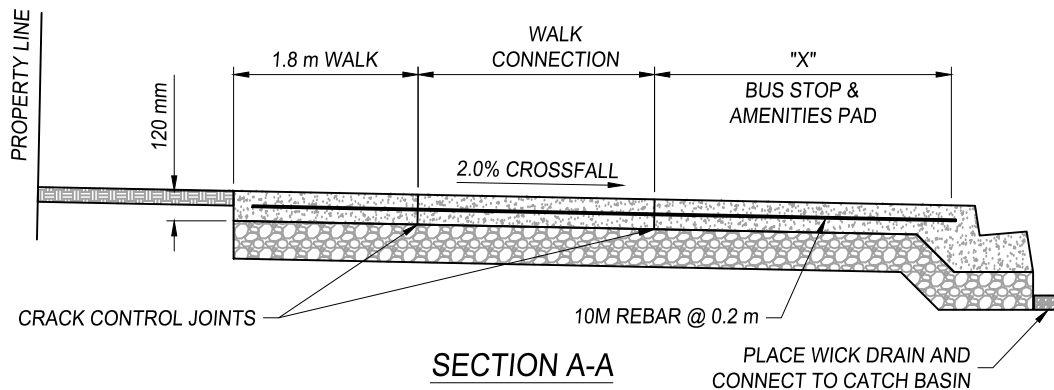
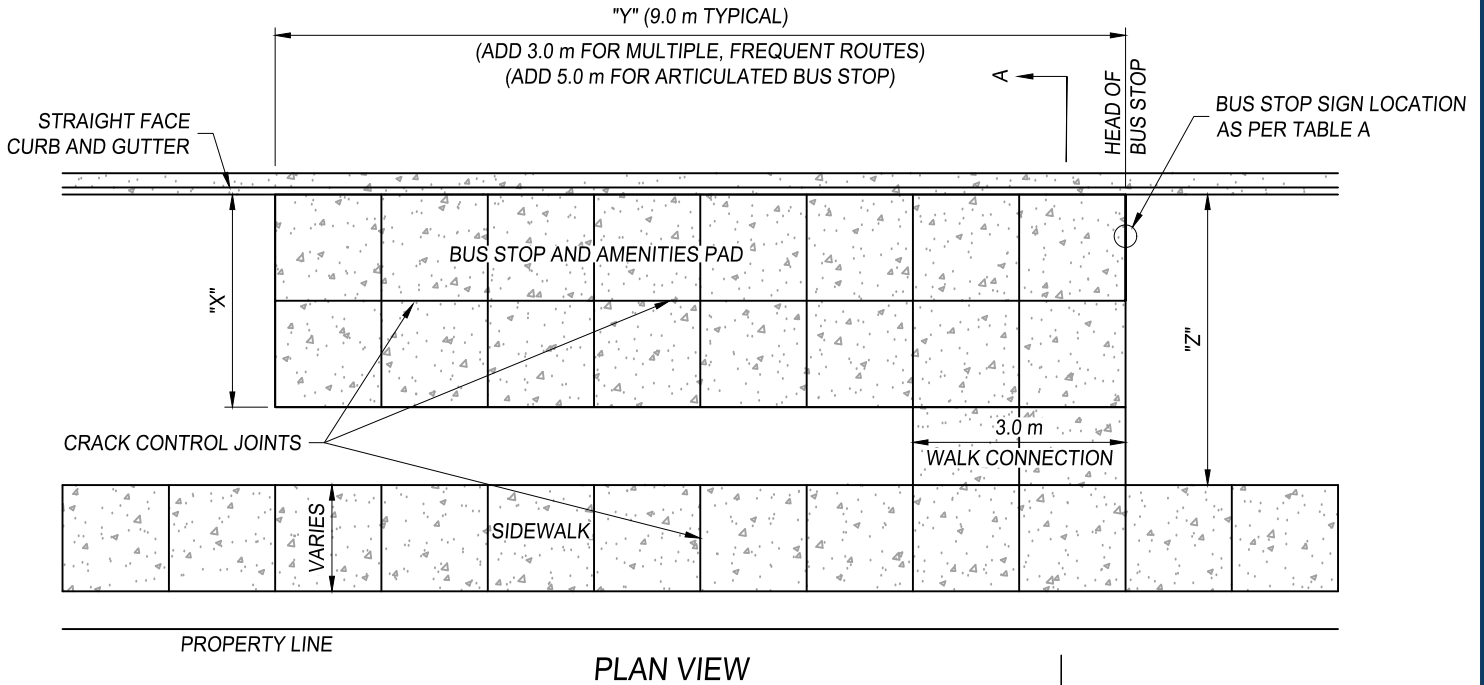
2024

REV.

0

STANDARD DETAIL #:

4-604



NOTES:

- (1) PROVIDE A BUS STOP AND AMENITIES PAD WITH WIDTH "X" AND LENGTH "Y" IN ACCORDANCE WITH THE DRAWING NOTES AND TABLE A (SEE BELOW). PROVIDE CRACK CONTROL JOINTS THROUGHOUT.
- (2) IF REQUIRED PAD WITH "X" IS LESS THAN 1.0 m FROM SIDEWALK, POUR THE CONCRETE PAD TO THE SIDEWALK, OTHERWISE PROVIDE A 3.0 m WIDE WALK CONNECTION AT THE HEAD OF THE PAD.

TABLE A

CONDITION	DISTANCE "Z" TO SEPARATE SIDEWALK	REQUIRED PAD WIDTH "X"	REQUIRED PAD LENGTH "Y"	BUS STOP SIGN LOCATION BEHIND SIDEWALK
OVER-CONSTRAINED	"Z" < 2.25 m	NOT PERMISSIBLE	NOT PERMISSIBLE	NOT PERMISSIBLE
CONSTRAINED	2.25 m <= "Z" < 3.6 m	"X" = "Z"	12.0 m	3 m BACK FROM HEAD
NOT CONSTRAINED	"Z" >= 3.6 m	"X" = "Z" (MAX 4.1 m)	9.0 m	HEAD OF PAD

BUS STOP & AMENITIES PAD - SEPARATE SIDEWALK

REVISION DATE

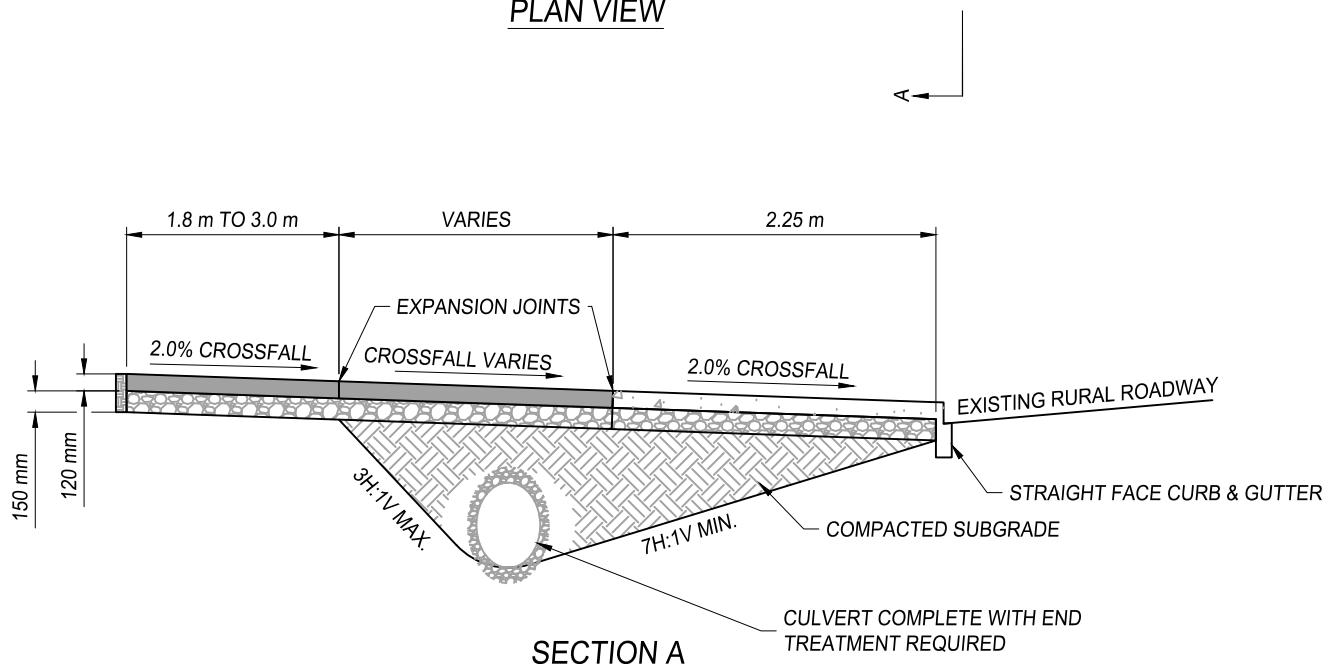
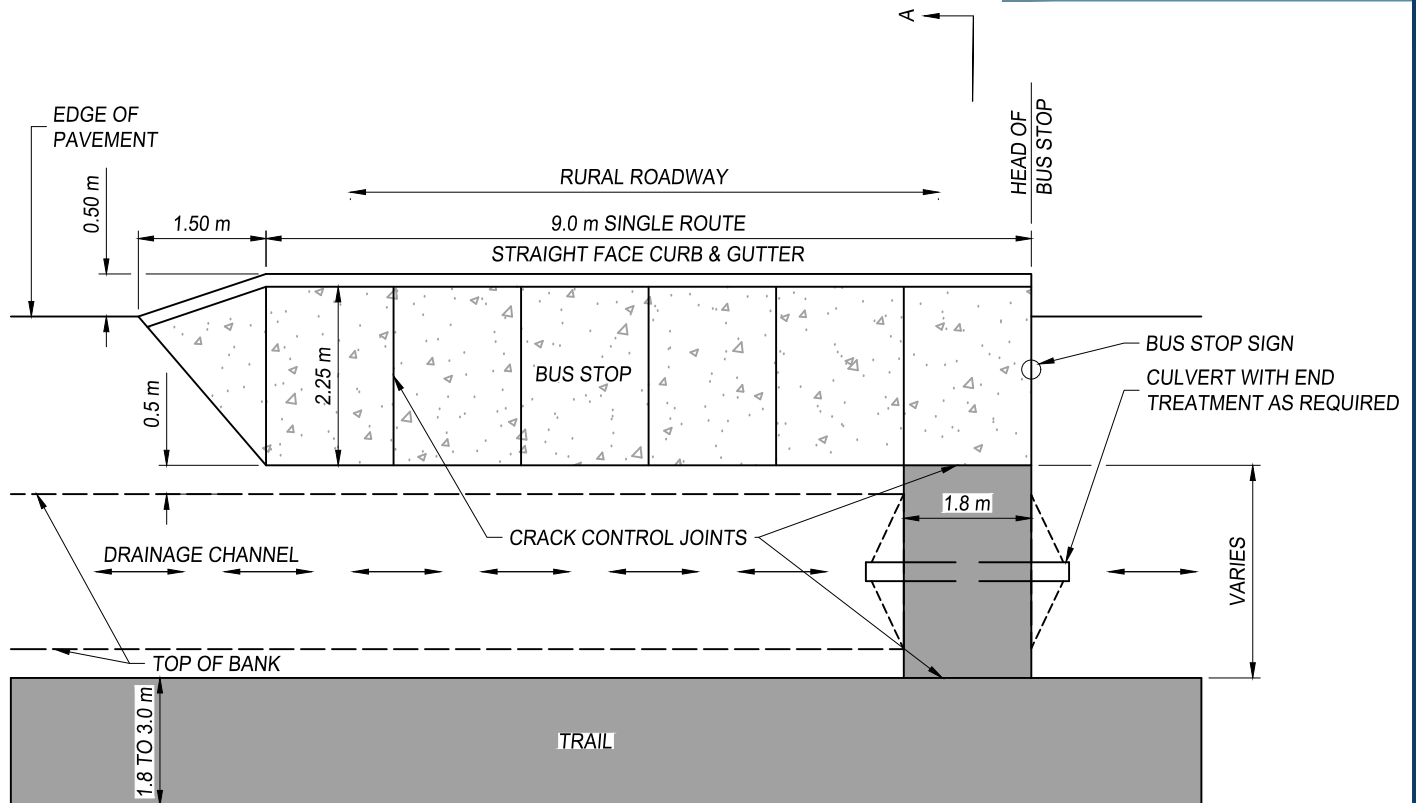
2024

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STANDARD DETAIL #:

4-605



BUS STOP PAD - RURAL ROADWAY

REVISION DATE

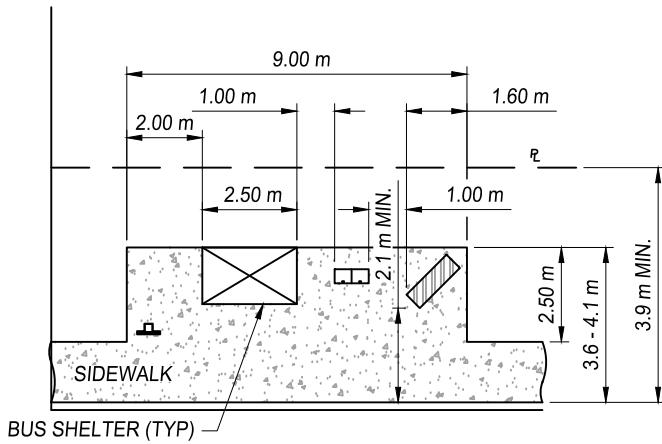
2024

REV.

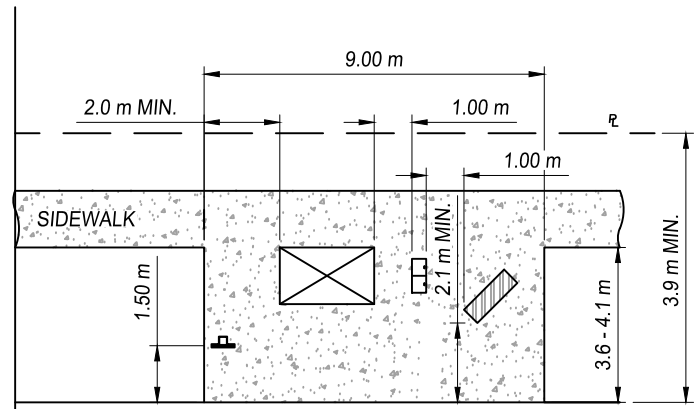
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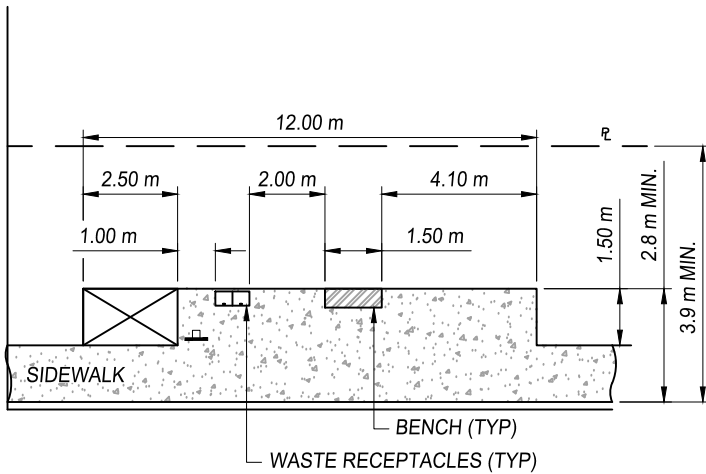
4-606



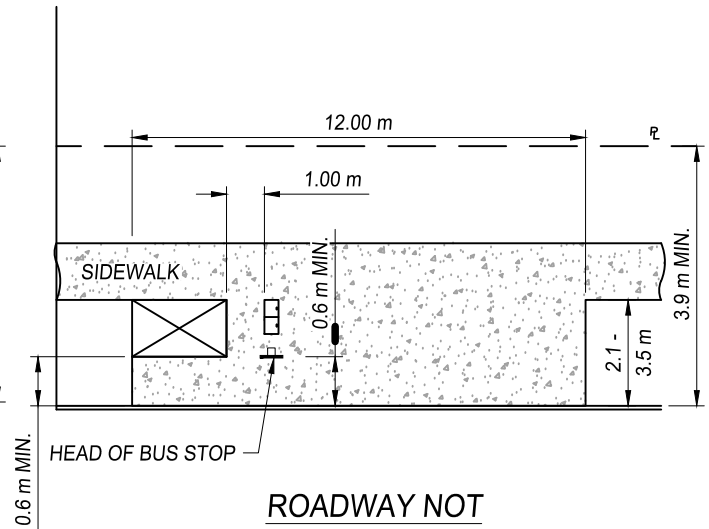
ROADWAY NOT
CONSTRAINED
MONOLITHIC SIDEWALK



ROADWAY NOT
CONSTRAINED
SEPARATE SIDEWALK



ROADWAY NOT
OVER-CONSTRAINED
MONOLITHIC SIDEWALK



ROADWAY NOT
OVER-CONSTRAINED
SEPARATE SIDEWALK

NOTES:

- (1) BENCH ANGLE MAXIMUM OF 45° W.R.T ROAD WAY.
- (2) BENCH CANNOT BLOCK VIEW OF BUS SHELTER.
- (3) BUS PAD MINIMUM 2.1 m WIDE TO BE CONSIDERED FOR A SHELTER.

BUS STOP FURNITURE LAYOUT

REVISION DATE

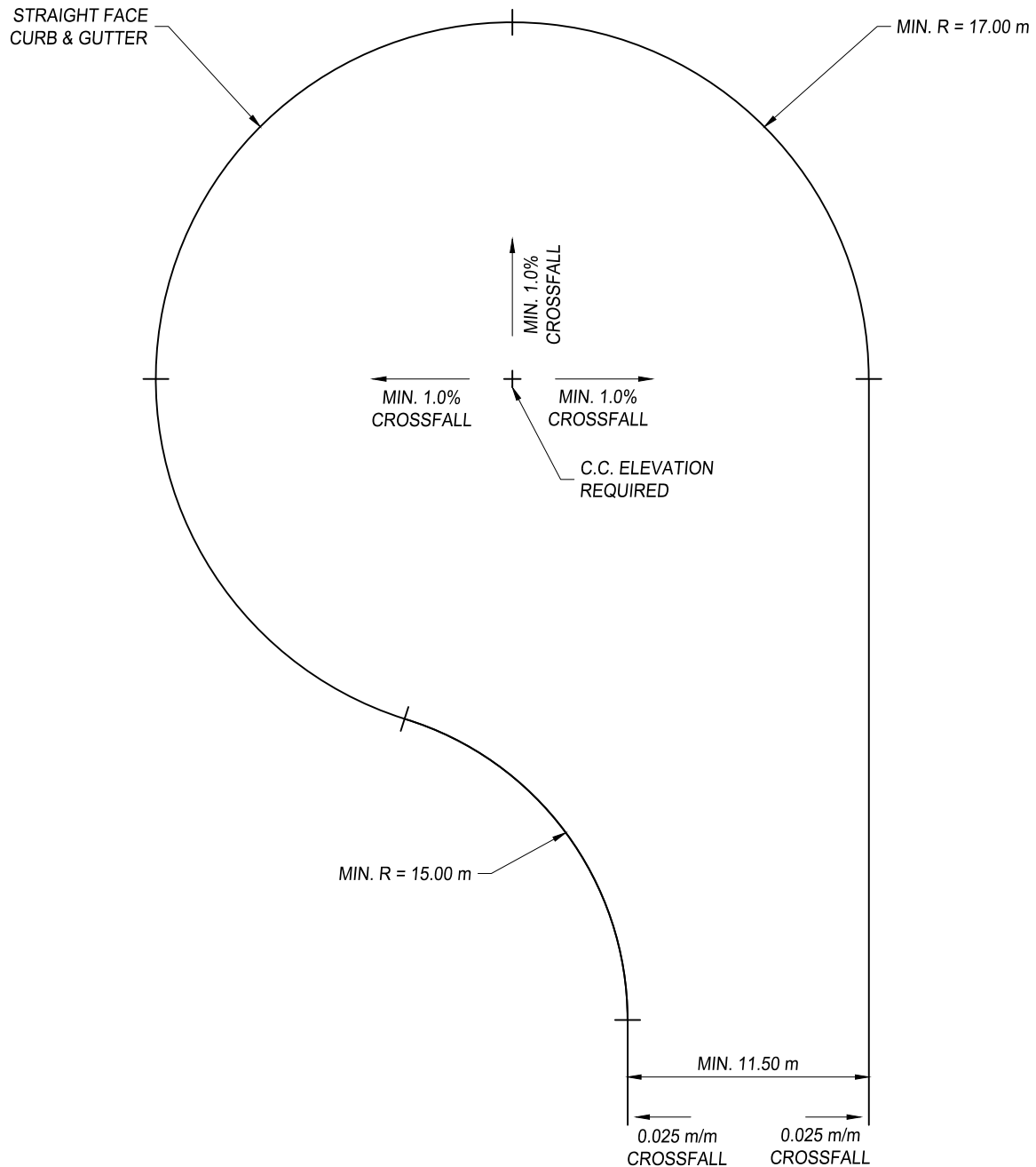
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STANDARD DETAIL #:

4-607



NOTES:

- (1) PROVIDE ELEVATION FOR ALL TICK MARKS SHOWN.
- (2) FOR TEMPORARY TURNAROUND WITH NO CURB AND GUTTER, PLACE MINI BARRIERS OR INSTALL BARRIER POSTS @ 1.5 m ON CENTRE ALONG EDGE OF TURNAROUND.

TRANSIT TURNAROUND

REVISION DATE

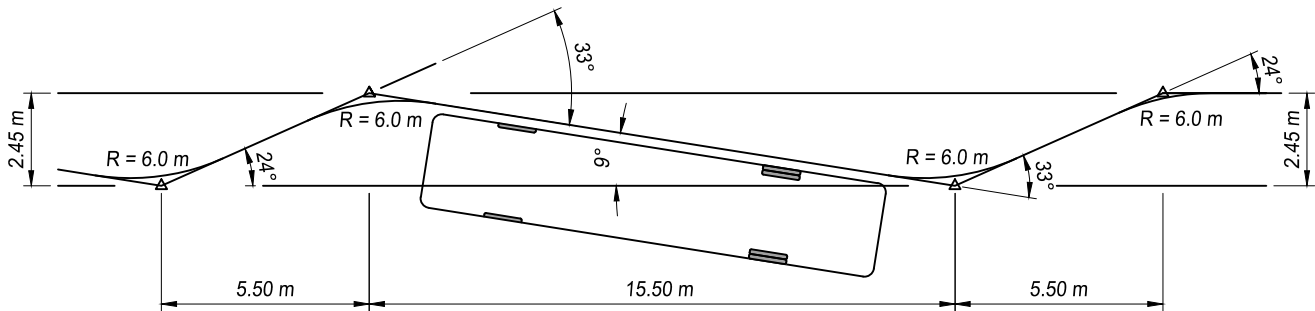
2024

REV.

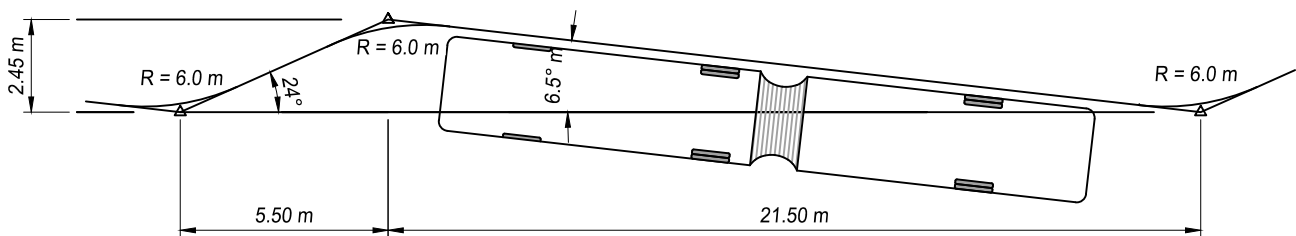
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STANDARD DETAIL #:

4-608



STANDARD (12 m) BUS SAWTOOTH TRANSIT BAY



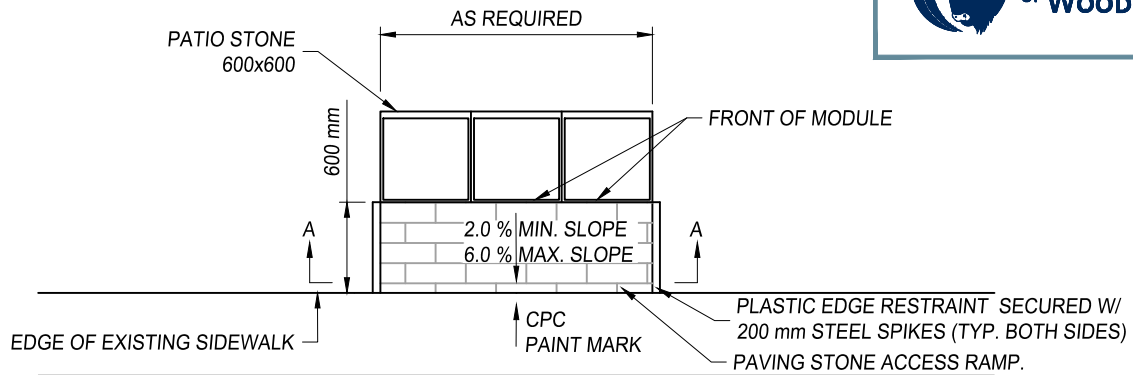
ARTICULATED (18 m) BUS SAWTOOTH TRANSIT BAY

NOTE:

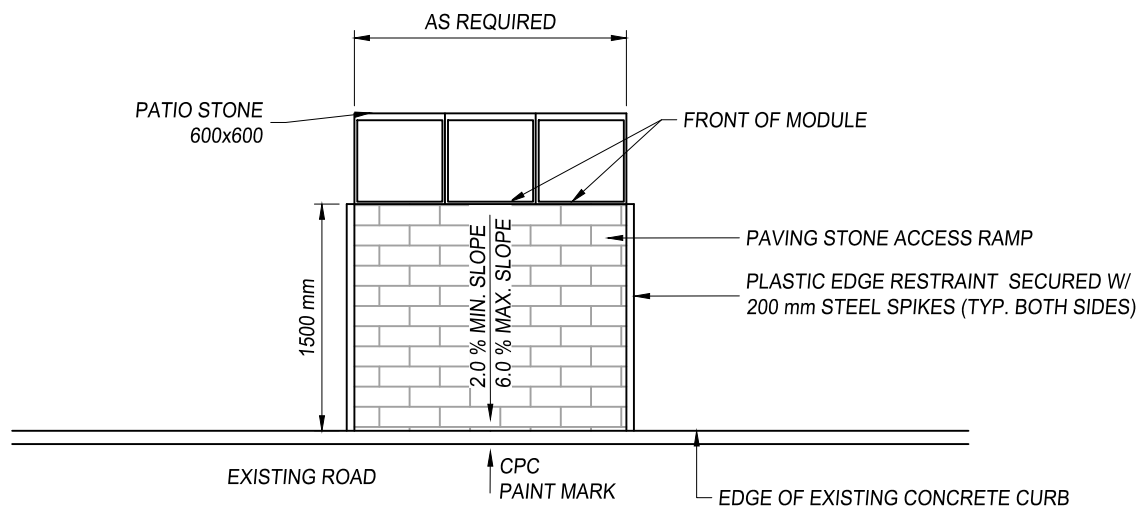
- (1) CROSSWALK WILL BE ACCOMMODATED BY PROVIDING A 4.0 m LENGTH OF STRAIGHT CURB BETWEEN CONSECUTIVE BUS BAYS.

SAWTOOTH TRANSIT BAY AT TRANSIT TERMINAL

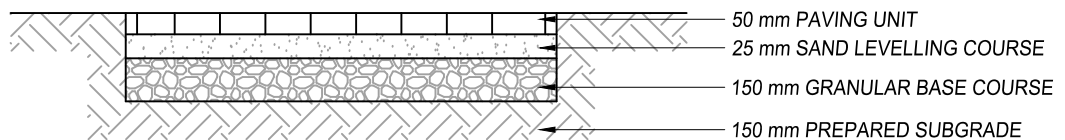
REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	4-609



SIDEWALK LAYOUT



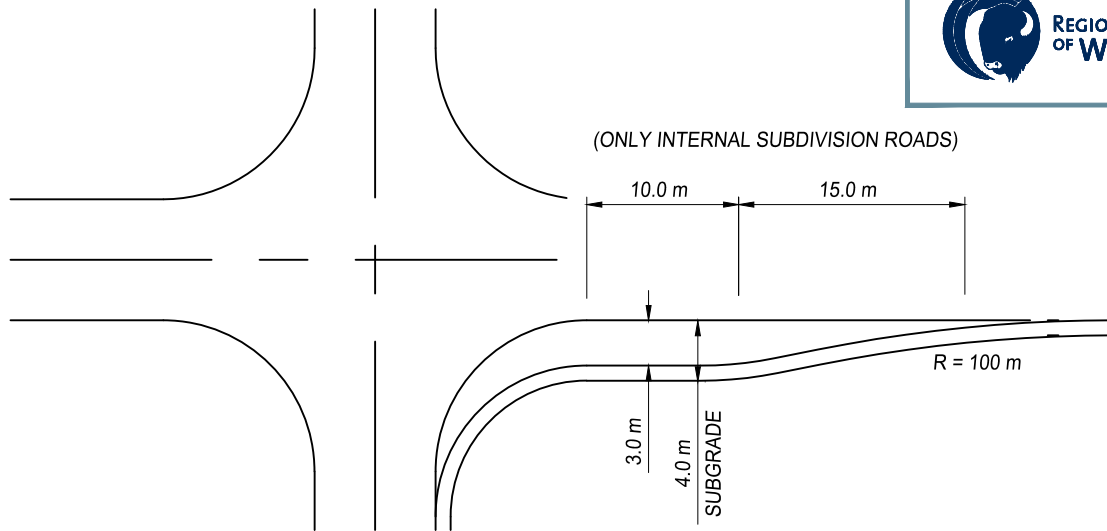
NO SIDEWALK LAYOUT



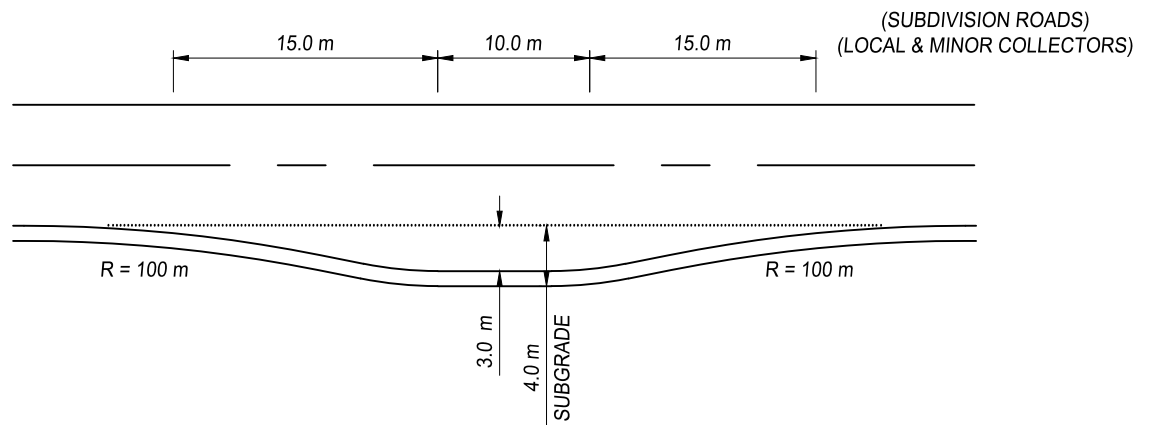
SECTION A

NOTES:

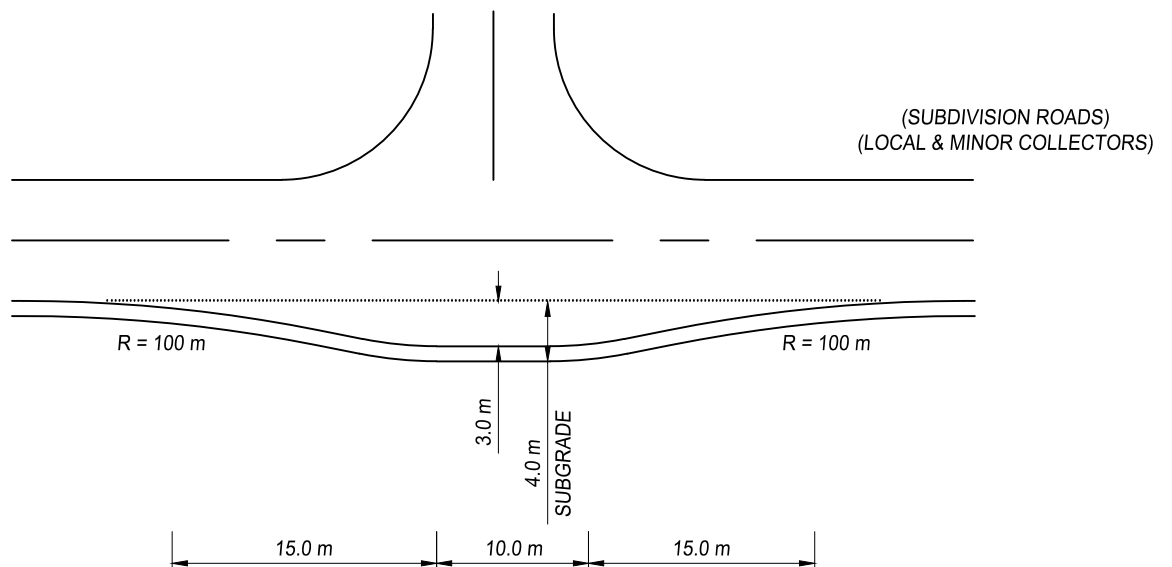
- (1) COORDINATE WITH CANADA POST CORPORATION (CPC) FOR LOCATION AND INSTALLATION REQUIREMENTS.
- (2) MAILBOX LOCATIONS WILL GENERALLY NOT BE ACCEPTED AT LOCATIONS WITHOUT SIDEWALKS.



CORNER LOCATION



MID BLOCK LOCATION



TEE LOCATION

RURAL COMMUNITY MAILBOX PULLOUT - LOCATIONS

REVISION DATE

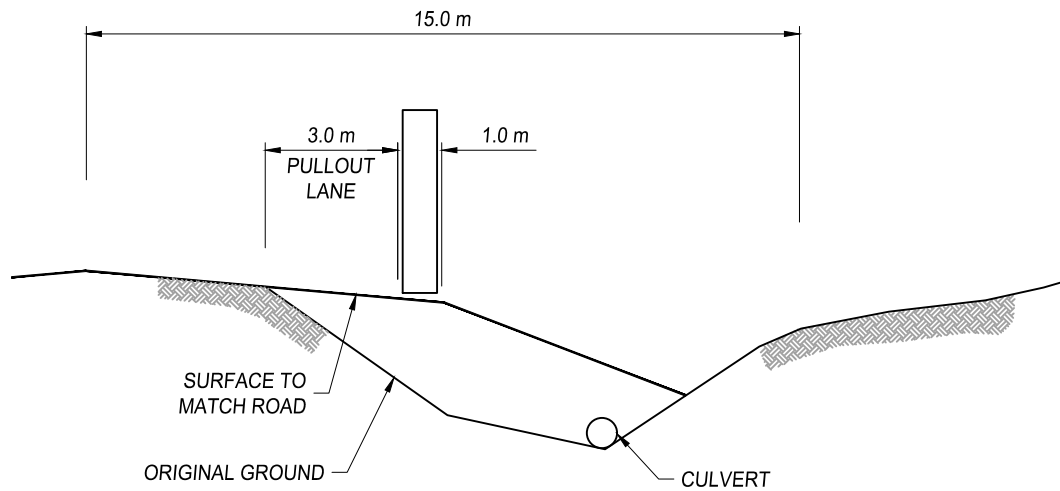
2024

REV.

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STANDARD DETAIL #:

4-750

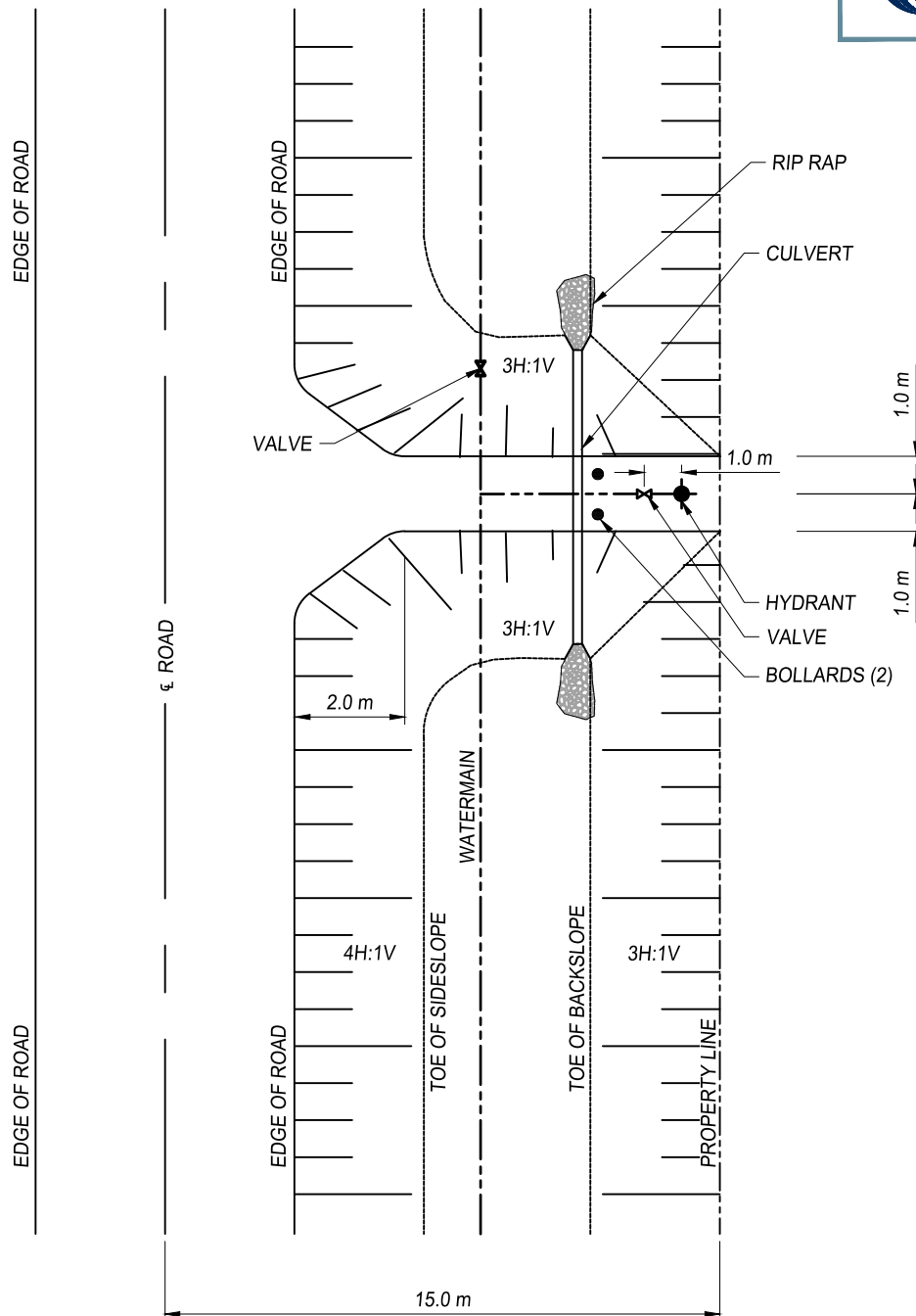


FILL SLOPE TABLE

DEPTH OF FILL	SLOPE (H:V)
0 - 1.5 m	4:1
1.5 m - 3.5 m	3:1
3.5 - 4.5 m	2.5:1
> - 4.5 m	2:1

NOTES:

- (1) ALL BACK SLOPES 3H:1V UNLESS SUPPORTED BY GEOTECHNICAL DESIGN.
- (2) SLOPES STEEPER THAN 3H:1V REQUIRE 1 m SHOULDER WIDENING & GUARD RAIL INSTALLATION.



NOTES:

- (1) WATERMAIN AND HYDRANTS MAY BE LOCATED EITHER SIDE OF ROAD.
- (2) STREET LIGHTS OR UNDERGROUND POWER TO BE OPPOSITE SIDE TO WATERMAIN.

SHOULDER WIDENING AT HYDRANT

REVISION DATE

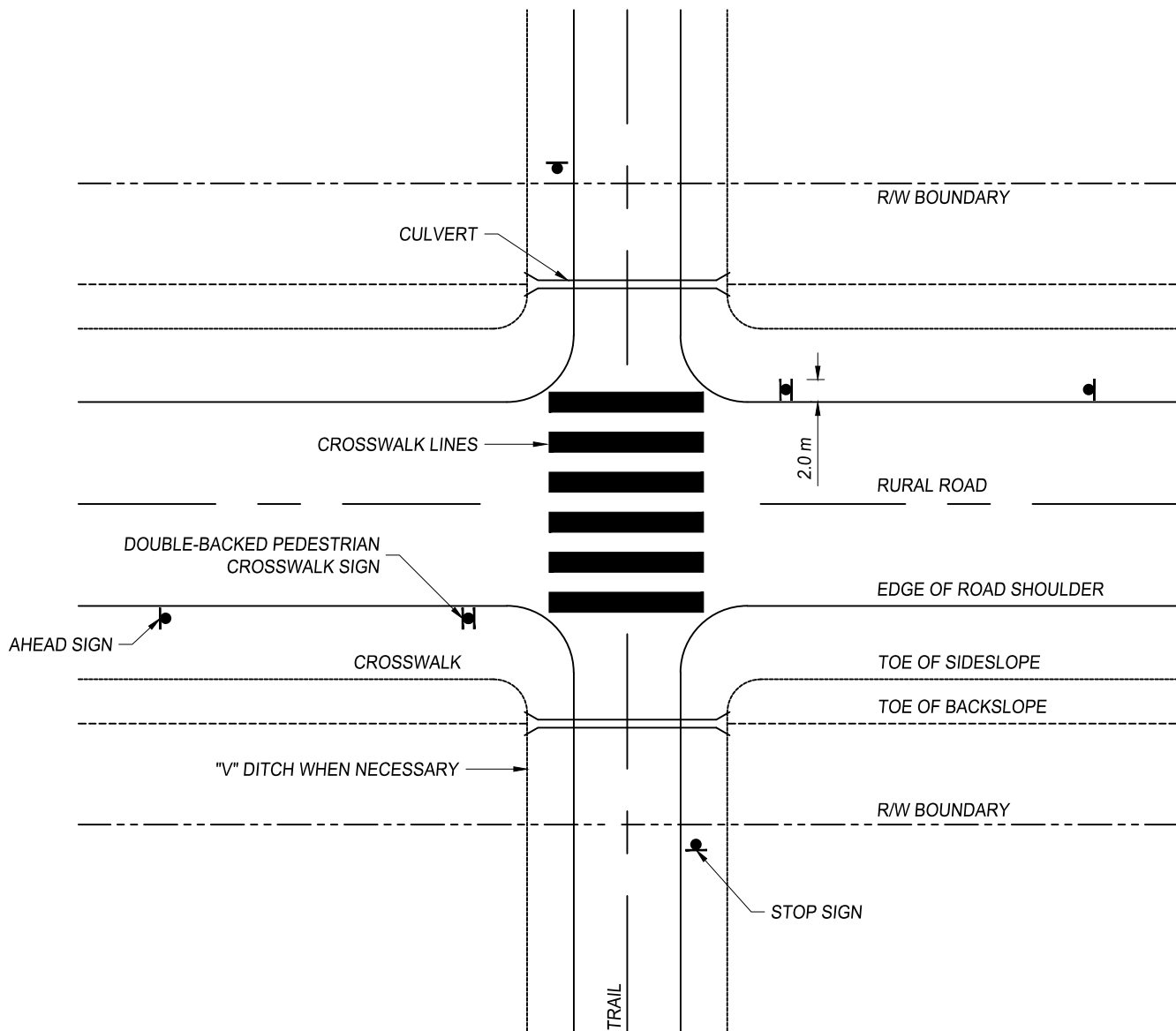
2024

REV.

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STANDARD DETAIL #:

4-800

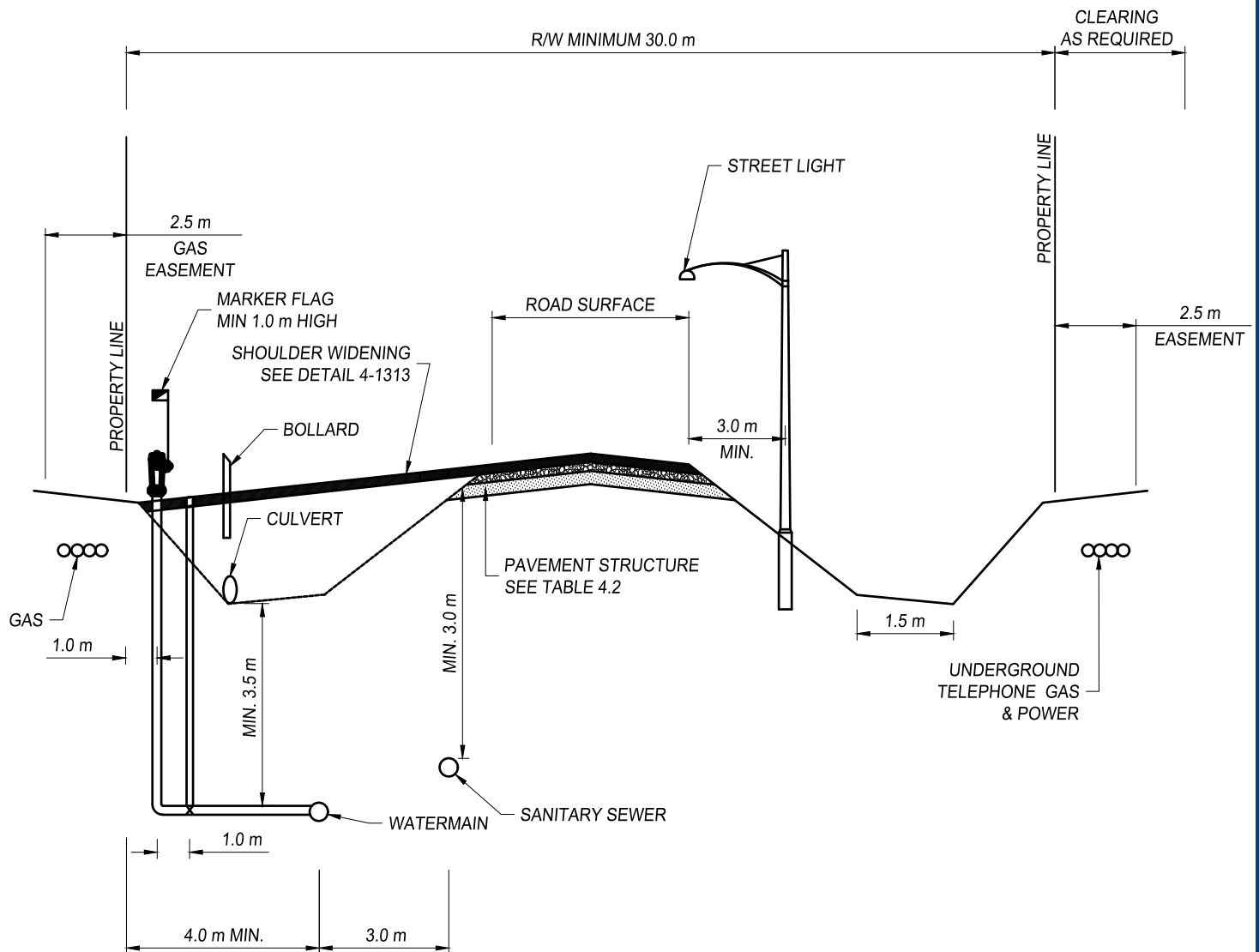


NOTE:

- (1) ALL SIGNAGE TO BE IN ACCORDANCE WITH THE TAC MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA.

RURAL MID-BLOCK TRAIL CROSSING

REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	4-900



NOTES:

- (1) WATERMAIN AND HYDRANT MAY BE LOCATED EITHER SIDE OF ROAD.
- (2) UNDERGROUND POWER OR POWER POLES WITH STREET LIGHTS TO BE OPPOSITE SIDE TO WATERMAIN.
- (3) LUMINAIRES SUPPORTS TO BE OF THE FRANGIBLE BASE, SLIP BASE OR FRANGIBLE COUPLING TYPE.
- (4) AVOID PLACEMENT OF SANITARY MANHOLES IN DITCH INVERT.
- (5) FOR NEW CONSTRUCTION PLACE WATER AND SANITARY MAINS BENEATH THE ROAD STRUCTURE.

TYPICAL RURAL UTILITY LAYOUT

REVISION DATE

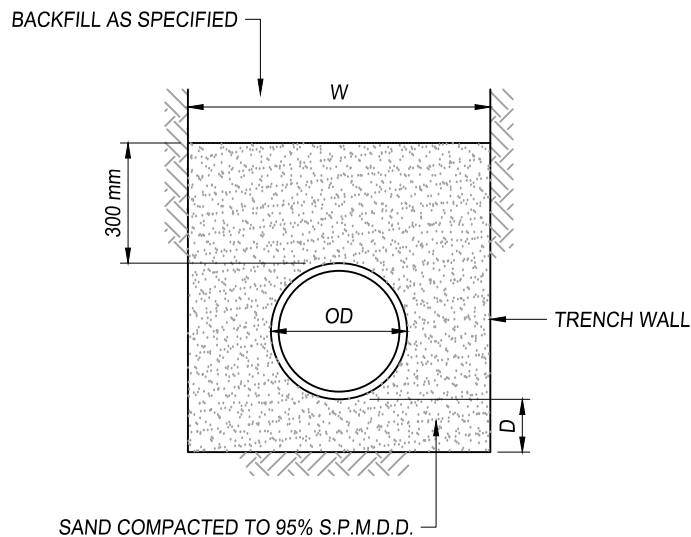
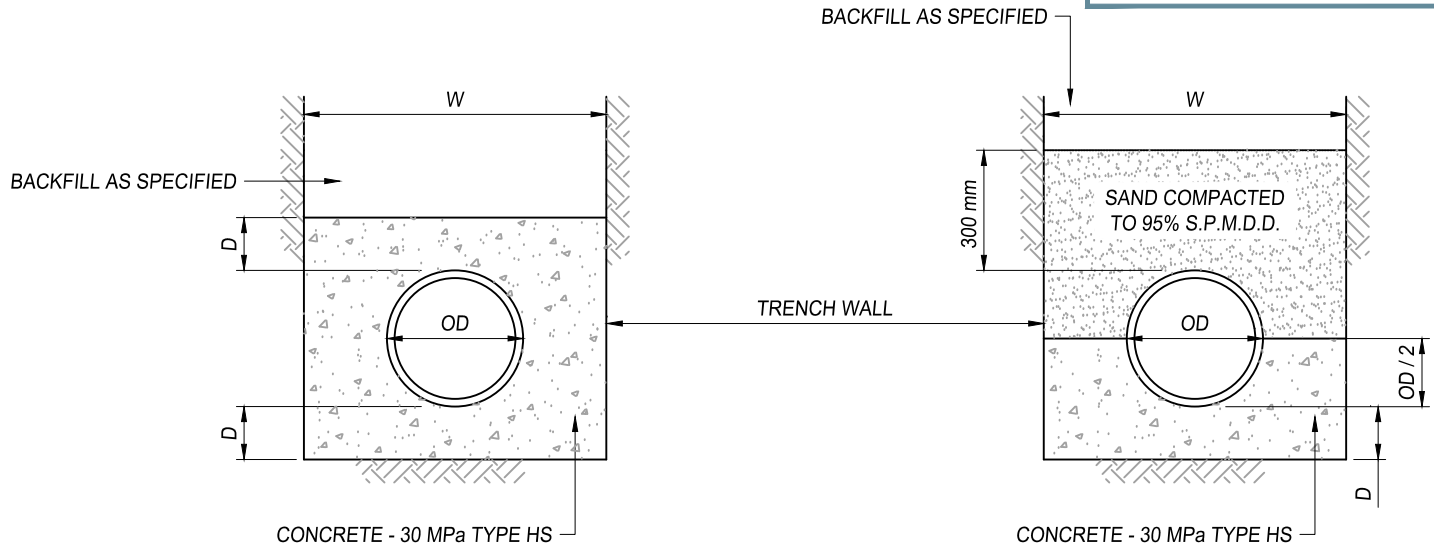
2024

REV.

0

STANDARD DETAIL #:

4-1303



LEGEND:

D = DEPTH OF BEDDING MATERIAL
W = TRENCH WIDTH = 2 X OD (MIN.)
OD = OUTSIDE DIAMETER OF PIPE

PIPE SIZE	D MIN. (mm)
675 mm OR SMALLER	75
750 mm TO 1500 mm	100
1650 mm AND LARGER	150

NOTES:

- (1) ADD 100 mm TO D IN ROCK EXCAVATION.
- (2) IN AREAS WITH HIGH WATER TABLE, CLASS B PIPE ZONE MATERIAL SHALL BE WASHED ROCK, AS PER THE MUNICIPALITY'S STANDARD CONSTRUCTION SPECIFICATIONS, AND SHALL BE WRAPPED IN NON-WOVEN GEOTEXTILE.
- (3) THESE BEDDING TYPES APPLY ONLY WHERE SUITABLE SOIL CONDITIONS EXIST. IN AREAS WITH UNSUITABLE SOIL CONDITIONS, SPECIAL BEDDING AND PIPE FOUNDATION DESIGNS ARE REQUIRED.

PIPE ZONE BEDDING (CLASS A, A-1, B)

REVISION DATE

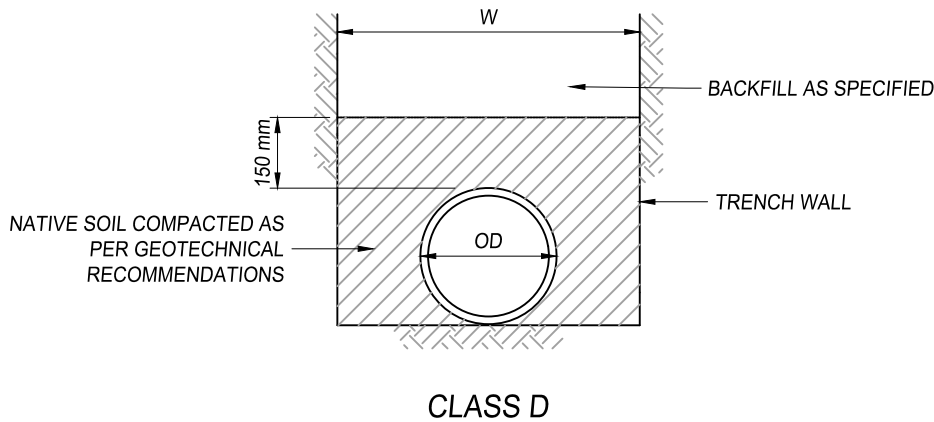
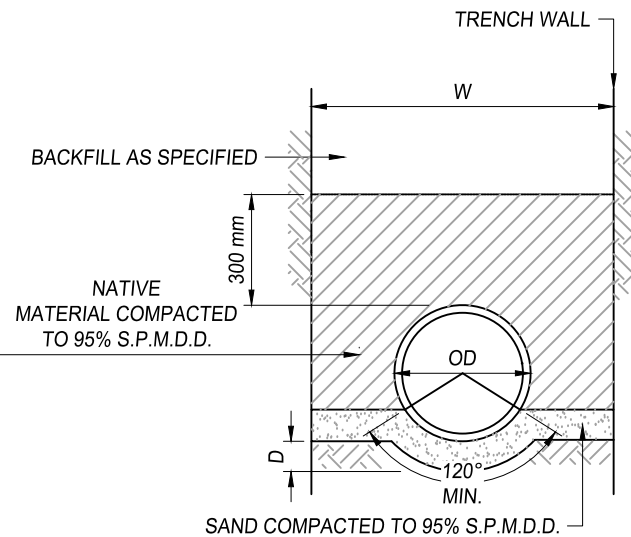
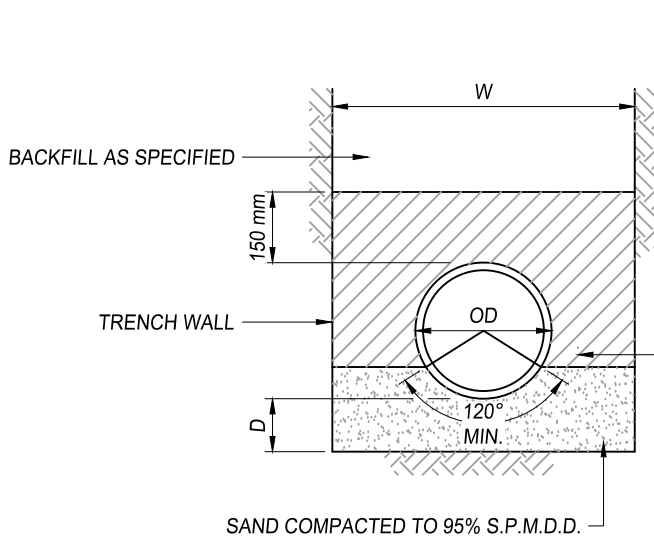
2024

REV.

0

STANDARD DETAIL #:

5-100



LEGEND:

D = DEPTH OF BEDDING MATERIAL
W = TRENCH WIDTH = 2 X OD (MIN.)
OD = OUTSIDE DIAMETER OF PIPE

PIPE SIZE	D MIN. (mm)
675 mm OR SMALLER	75
750 mm TO 1500 mm	100
1650 mm AND LARGER	150

NOTES:

- (1) ADD 100 mm TO D IN ROCK EXCAVATION.
- (2) IN AREAS WITH HIGH WATER TABLE, PIPE ZONE MATERIAL SHALL BE WASHED ROCK, AS PER THE MUNICIPALITY'S STANDARD CONSTRUCTION SPECIFICATIONS, AND SHALL BE WRAPPED IN NON-WOVEN GEOTEXTILE.
- (3) THESE BEDDING TYPES APPLY ONLY WHERE SUITABLE SOIL CONDITIONS EXIST. IN AREAS WITH UNSUITABLE SOIL CONDITIONS, SPECIAL BEDDING AND PIPE FOUNDATION DESIGNS ARE REQUIRED.
- (4) CLASS C-1 MAY BE USED AS AN ALTERNATIVE FOR PIPES 375 mm IN DIAMETER AND SMALLER.

PIPE ZONE BEDDING (CLASS C, C-1, D)

REVISION DATE

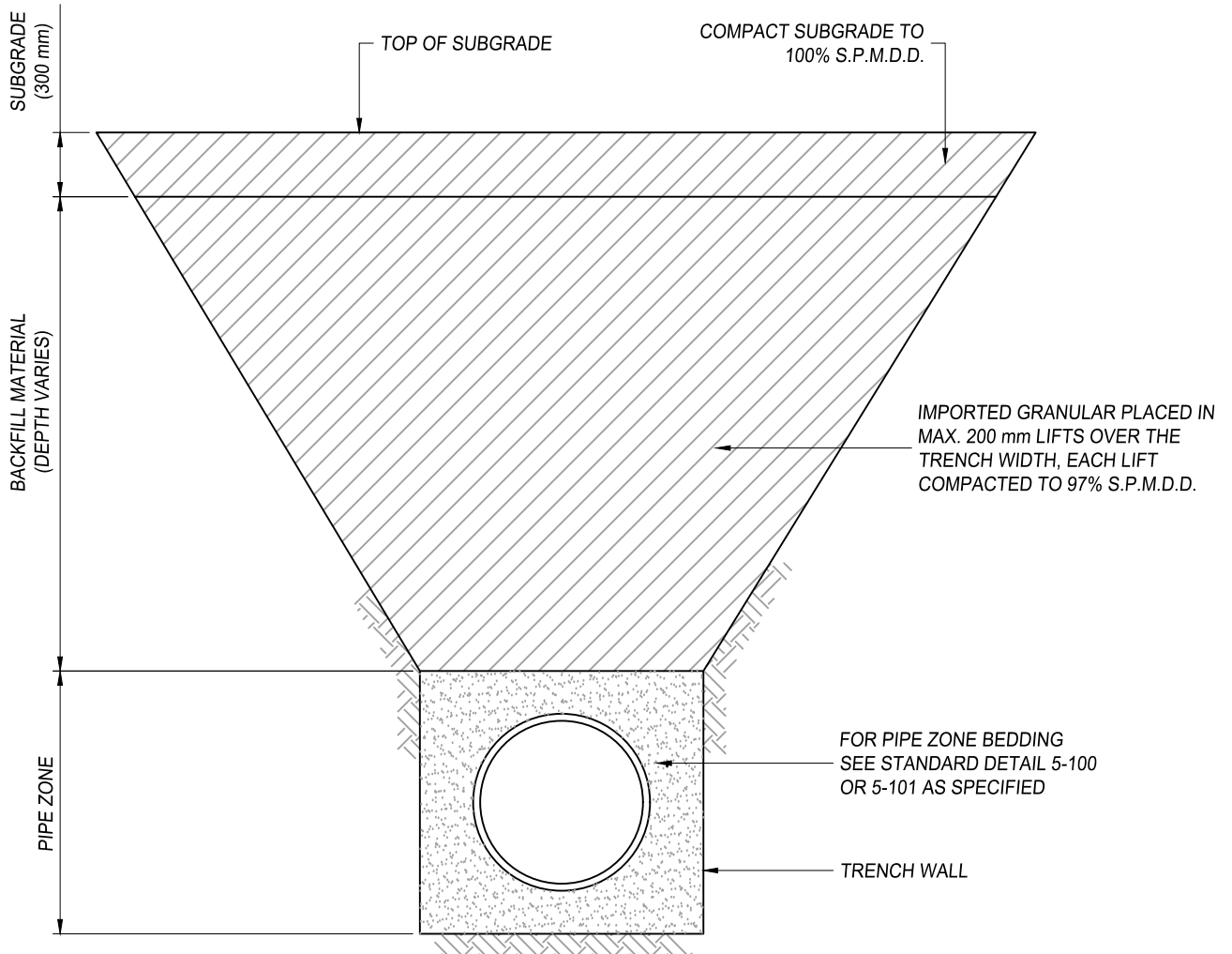
2024

REV.

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STANDARD DETAIL #:

5-101

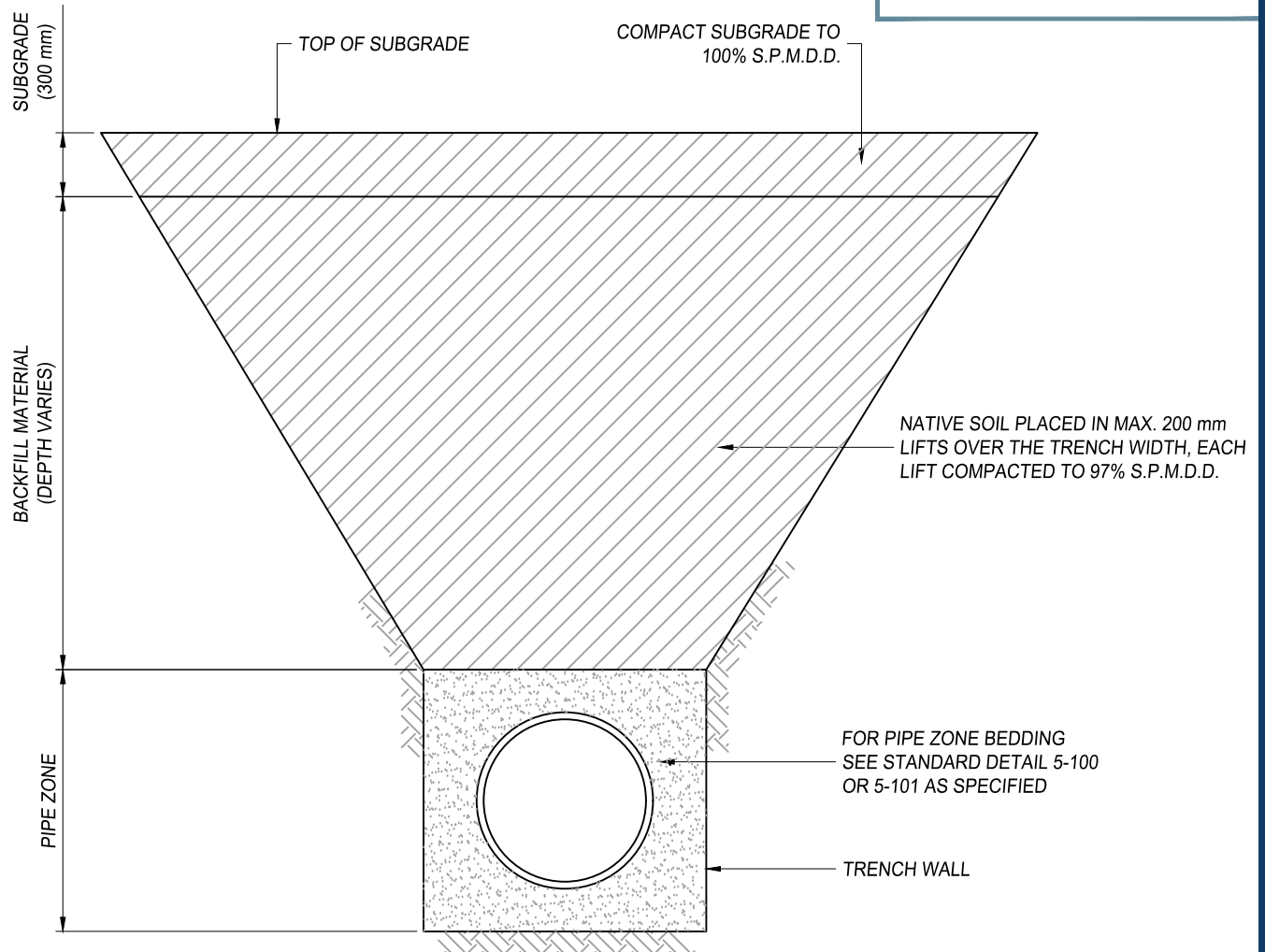


NOTES:

- (1) THIS DETAIL APPLIES TO TRENCH BACKFILL BENEATH ROADWAYS, USING IMPORTED GRANULAR MATERIAL.
- (2) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT, OR AS PER GEOTECHNICAL RECOMMENDATIONS, WHICHEVER IS MORE STRINGENT.
- (3) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.
- (4) FILLCRETE MAY BE REQUIRED AS BACKFILL FOR EXISTING ROADWAYS, AT THE DISCRETION OF THE MUNICIPALITY.

CLASS I TRENCH BACKFILL

REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	5-120



NOTES:

- (1) THIS DETAIL APPLIES TO TRENCH BACKFILL BENEATH ROADWAYS, USING NATIVE SOIL.
- (2) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT, OR AS PER THE GEOTECHNICAL RECOMMENDATIONS, WHICHEVER IS MORE STRINGENT.
- (3) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.
- (4) FILLCRETE MAY BE REQUIRED AS BACKFILL FOR EXISTING ROADWAYS, AT THE DISCRETION OF THE MUNICIPALITY.

CLASS II TRENCH BACKFILL

REVISION DATE

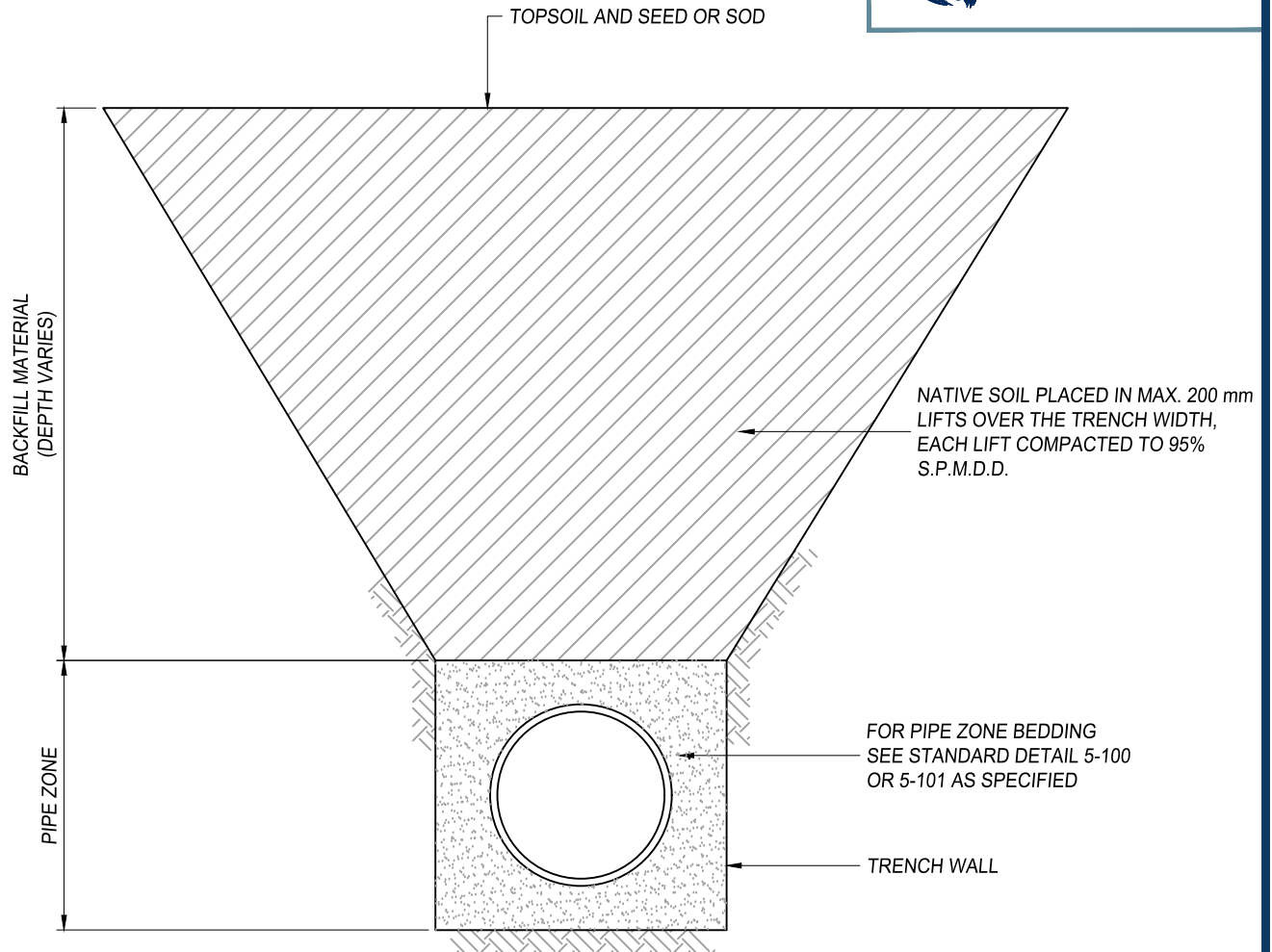
2024

REV.

0

STANDARD DETAIL #:

5-121



NOTES:

- (1) THIS DETAIL APPLIES TO TRENCH BACKFILL BENEATH LANDSCAPED AREAS, USING NATIVE SOIL.
- (2) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT, OR AS PER GEOTECHNICAL RECOMMENDATIONS, WHICHEVER IS MORE STRINGENT.

CLASS III TRENCH BACKFILL

REVISION DATE

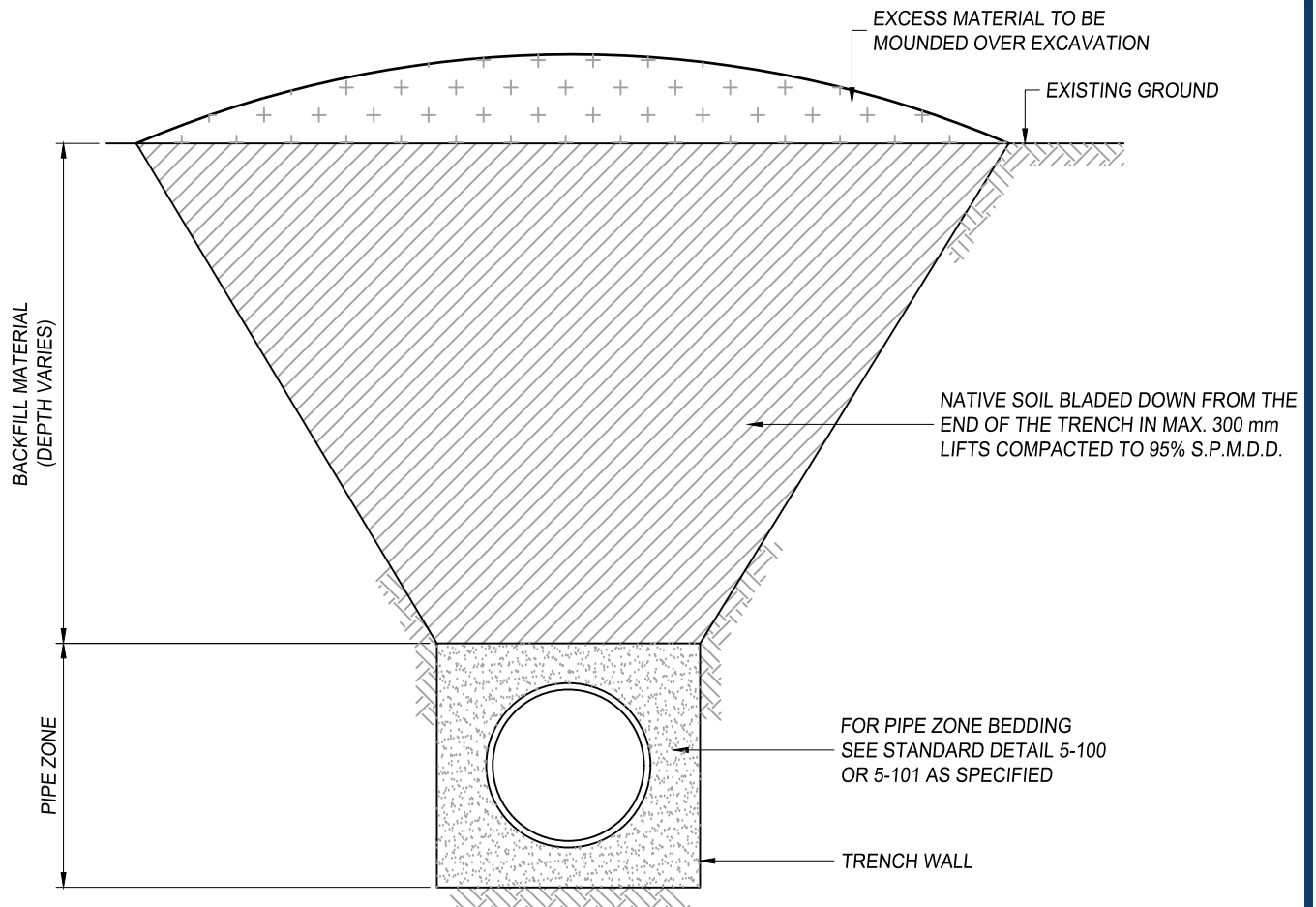
2024

REV.

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STANDARD DETAIL #:

5-122



NOTES:

- (1) THIS DETAIL APPLIES TO TRENCH BACKFILL BENEATH OPEN FIELD AREAS, USING NATIVE SOIL.
- (2) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT, OR AS PER GEOTECHNICAL RECOMMENDATIONS, WHICHEVER IS MORE STRINGENT.
- (3) SURFACE DRAINAGE TO BE RECTIFIED FOR IMMEDIATE AREA TO ENSURE POSITIVE DRAINAGE IS ACHIEVED AROUND THE MOUNDED MATERIAL.

CLASS IV TRENCH BACKFILL

REVISION DATE

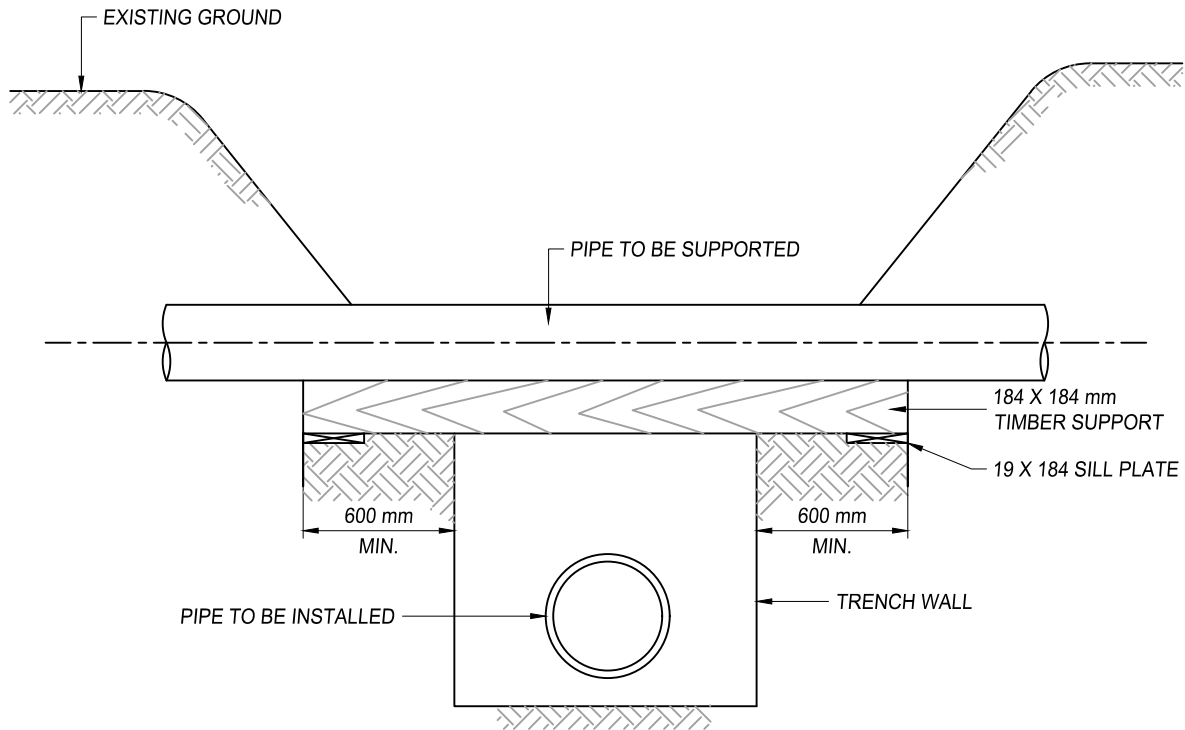
2024

REV.

0

STANDARD DETAIL #:

5-123

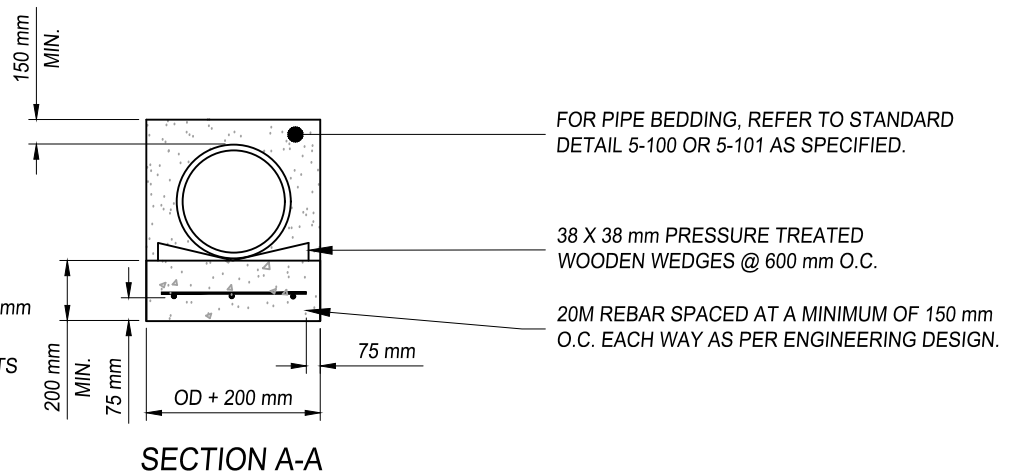
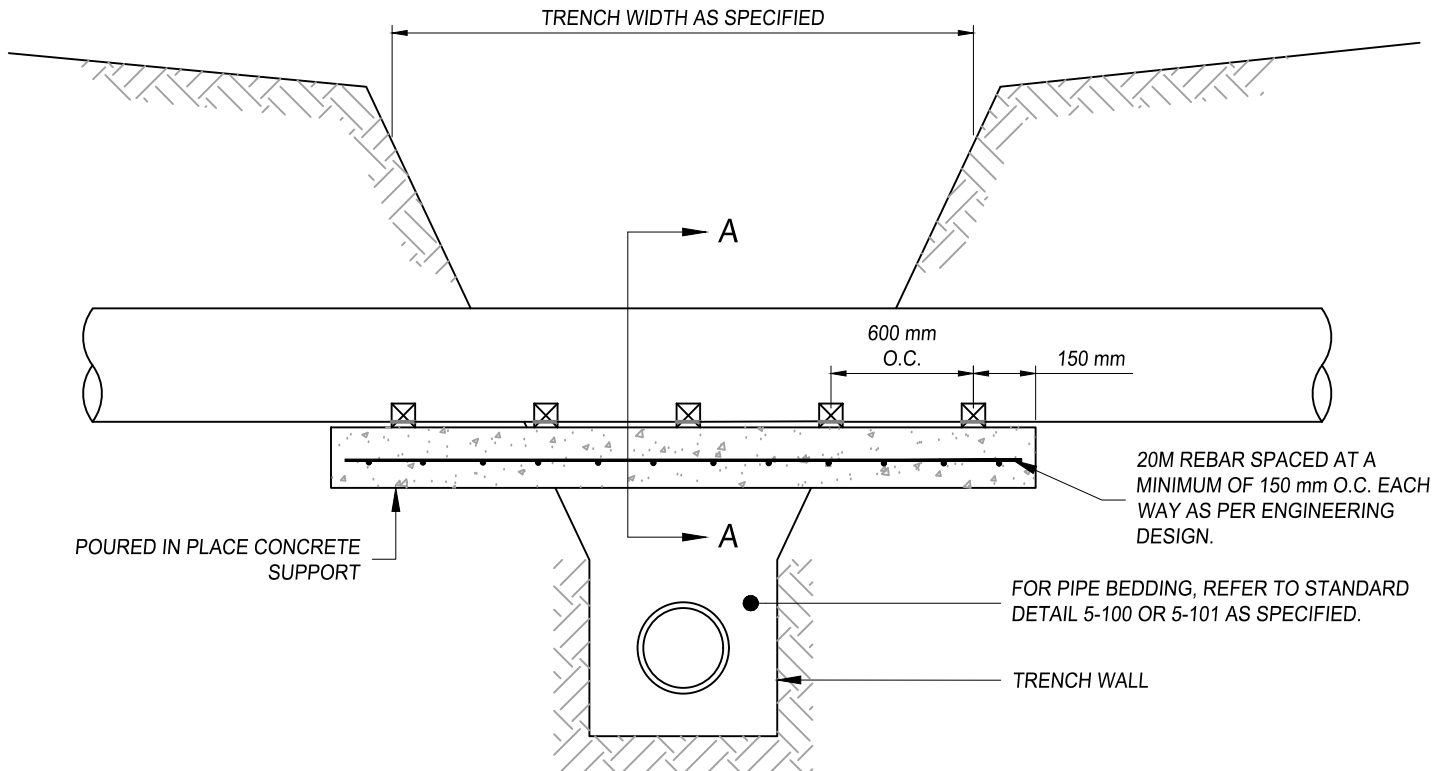


NOTES:

- (1) ALL LUMBER TO BE PRESSURE TREATED.
- (2) FOR PIPE BEDDING, REFER TO STANDARD DETAIL 5-100 OR 5-101 AS SPECIFIED.

TYPE I PIPE SUPPORT

REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	5-130



NOTES:

- (1) CONCRETE SHALL BE 30 MPa, TYPE HS.
- (2) ALL REINFORCEMENT REBAR TO HAVE 75 mm COVER.
- (3) 300 mm DIA CONCRETE COLUMN SUPPORTS SPACED @ 3.5 m O.C. ARE REQUIRED FOR SPANS EXCEEDING 4.5 m.

TYPE II PIPE SUPPORT

REVISION DATE

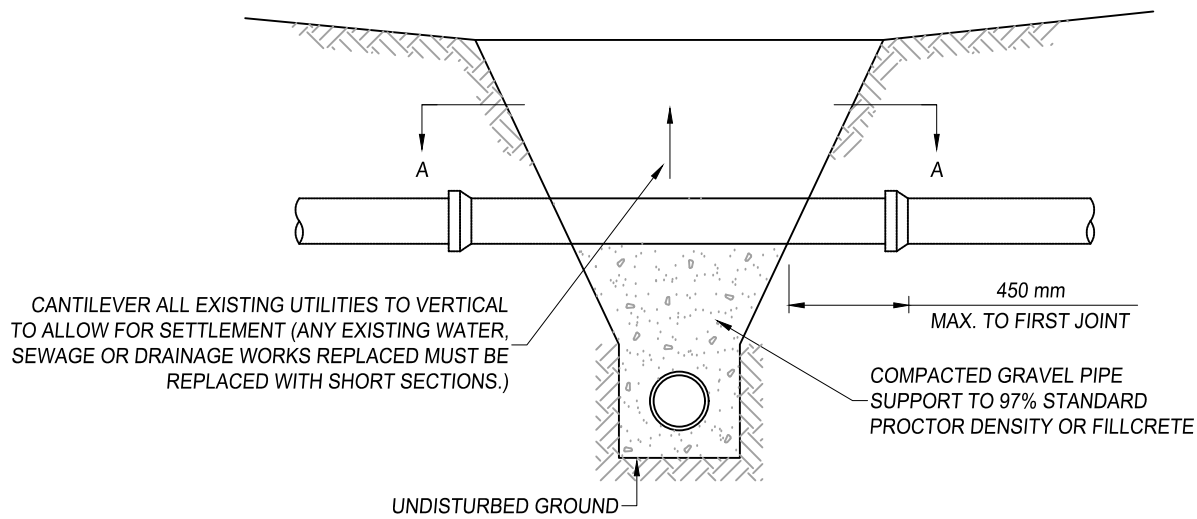
2024

REV.

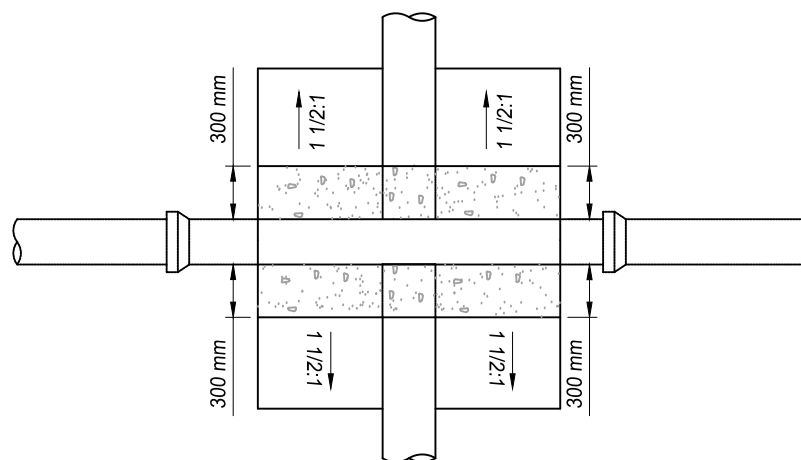
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STANDARD DETAIL #:

5-131



SECTION



SECTION A-A

TYPE III PIPE SUPPORT

REVISION DATE

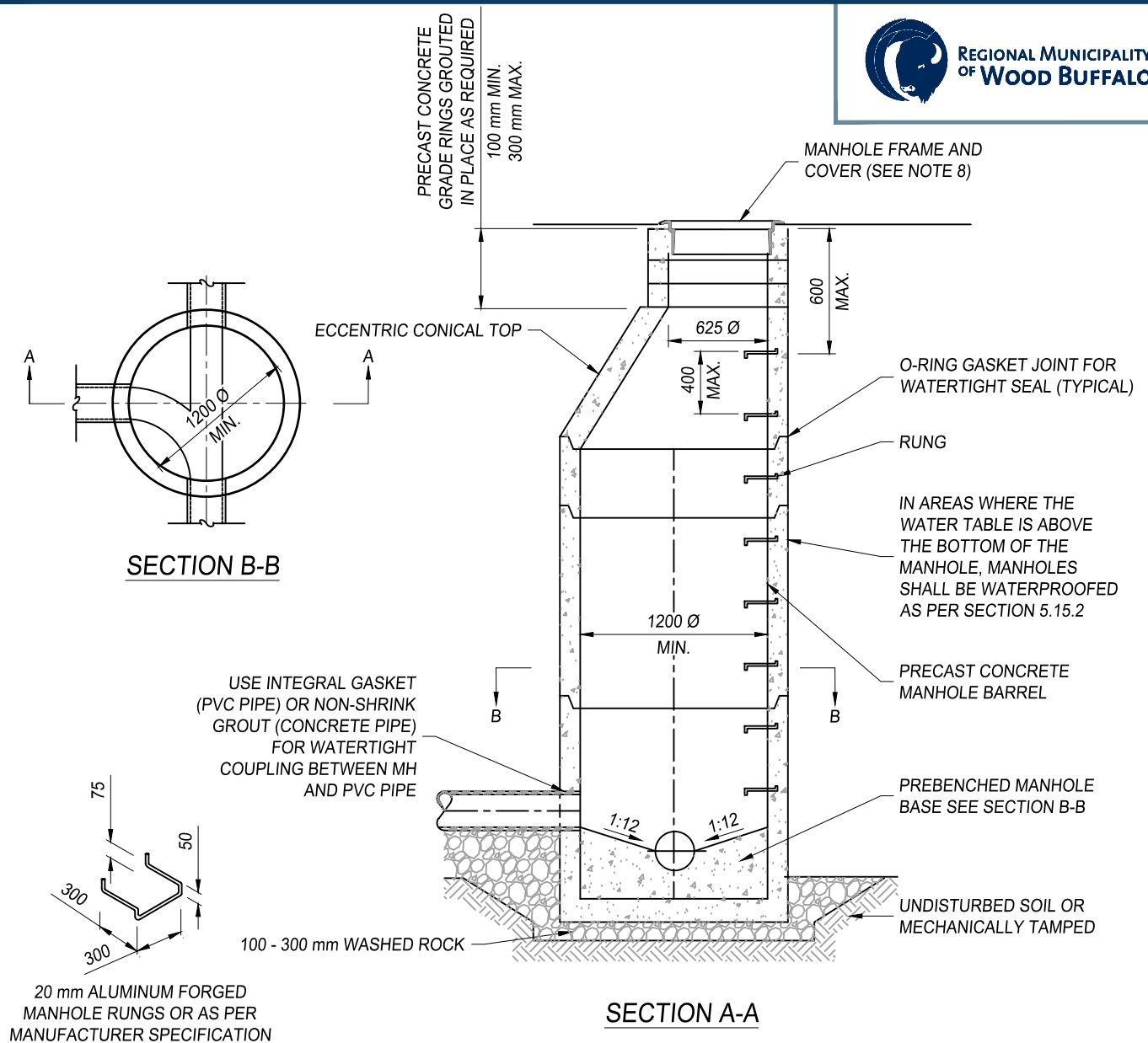
2024

REV.

0

STANDARD DETAIL #:

5-132



NOTES:

- (1) SPECIAL BASE DESIGN REQUIRED FOR DEPTHS OVER 9.0 m.
- (2) CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
- (3) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO MH COVER EXCEEDS 2 m.
- (4) VERTICAL SIDE OF CONICAL TOP TO BE SITUATED TO ALLOW ACCESS WITHOUT CONFLICTING WITH FLOW CHANNEL.
- (5) MANHOLE FRAME AND COVER TO BE AS PER STANDARD DETAIL 5-300 OR 5-301, AS SPECIFIED.
- (6) BENCHING CONCRETE SHALL BE A MINIMUM OF 30 MPa COMPRESSIVE STRENGTH, TYPE HS,
- (7) RETROFIT RUNGS TO BE EPOXIED IN PLACE (NO PLASTIC SLEEVES)
- (8) F-80 FRAME AND COVER FOR ASPHALT AREAS.
F-39 FRAME AND COVER FOR OFF ROAD AREAS.
F-90 FRAME AND COVER WITH GASKET FOR SANITARY MANHOLES IN SAG LOCATIONS.
- (9) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

PRECAST CONCRETE MANHOLE

REVISION DATE

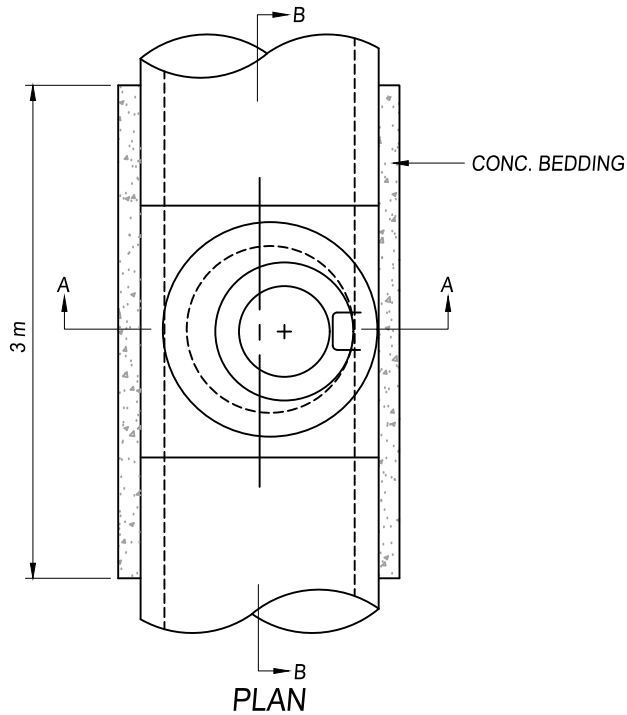
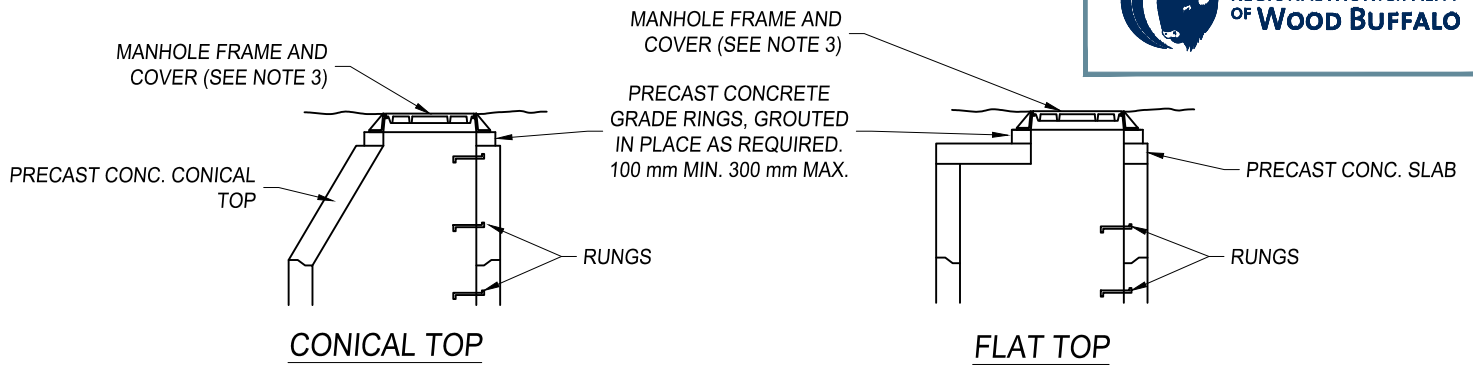
2024

REV.

0

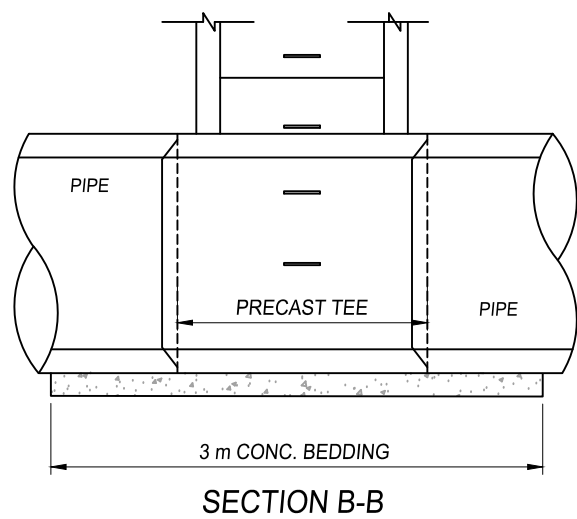
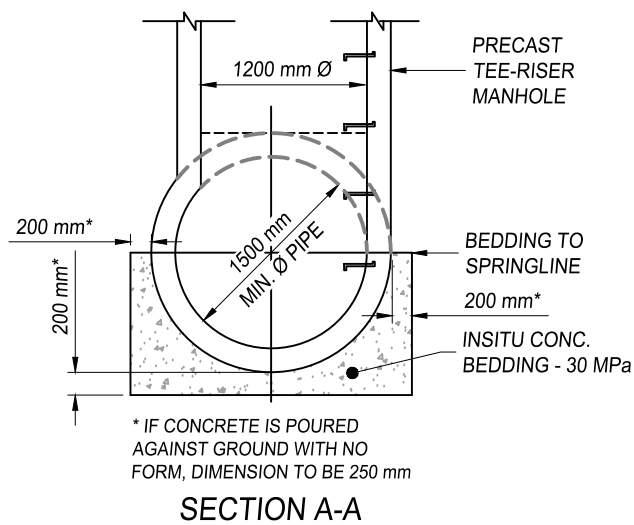
STANDARD DETAIL #:

5-200



NOTES:

- (1) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO M.H. COVER EXCEEDS 2.0 m.
- (2) VERTICAL SIDE OF CONICAL TOP TO BE SITUATED TO ALLOW ACCESS WITHOUT CONFLICTING WITH FLOW CHANNEL.
- (3) F-80 FRAME AND COVER FOR ASPHALT AREAS. F-39 FRAME AND COVER FOR OFF ROAD AREAS. F-90 FRAME AND COVER WITH GASKET FOR SANITARY MANHOLES IN SAG LOCATIONS
- (4) IN AREAS WHERE THE WATER TABLE IS ABOVE THE BOTTOM OF THE MANHOLE, MANHOLES SHALL BE WATERPROOFED AS PER SECTION 5.15.2.
- (5) CONTRACTOR TO PROVIDE SHOP DRAWINGS.



TEE-RISER MANHOLE

REVISION DATE

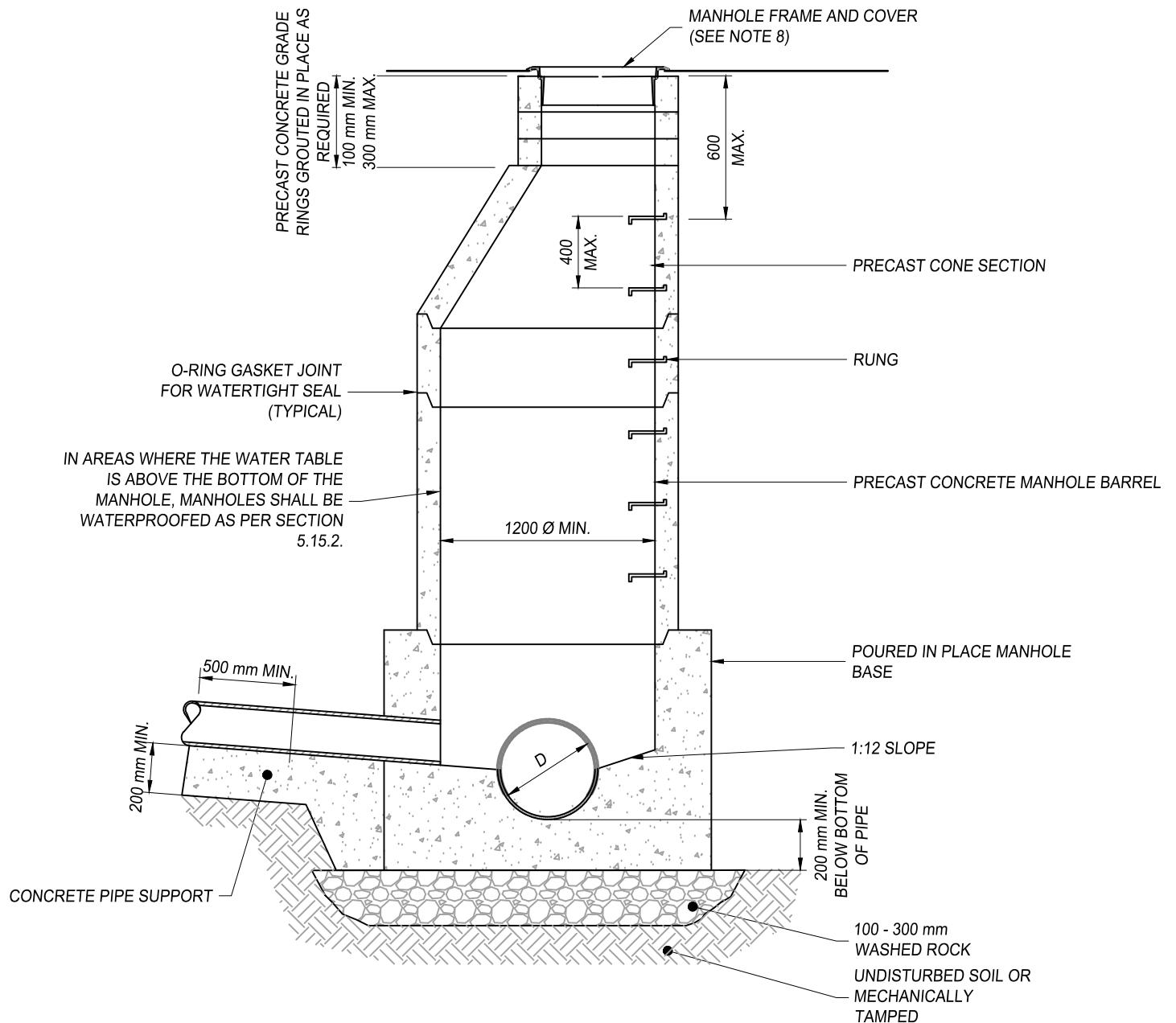
2024

REV.

0

STANDARD DETAIL #:

5-201



NOTES:

- (1) SPECIAL BASE DESIGN REQUIRED FOR DEPTHS OVER 9.0 m.
- (2) CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
- (3) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO MH COVER EXCEEDS 2 m.
- (4) VERTICAL SIDE OF CONICAL TOP TO BE SITUATED TO ALLOW ACCESS WITHOUT CONFLICTING WITH FLOW CHANNEL
- (5) MANHOLE FRAME AND COVER TO BE AS PER STANDARD DETAIL 5-300 OR 5-301, AS SPECIFIED.
- (6) BENCHING CONCRETE SHALL BE A MINIMUM OF 30 MPa COMPRESSIVE STRENGTH, TYPE HS,
- (7) RETROFIT RUNGS TO BE EPOXIED IN PLACE (NO PLASTIC SLEEVES)
- (8) F-80 FRAME AND COVER FOR ASPHALT AREAS.
F-39 FRAME AND COVER FOR OFF ROAD AREAS.
F-90 FRAME AND COVER WITH GASKET FOR SANITARY MANHOLES IN SAG LOCATIONS.
- (9) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

PERCHED MANHOLE

REVISION DATE

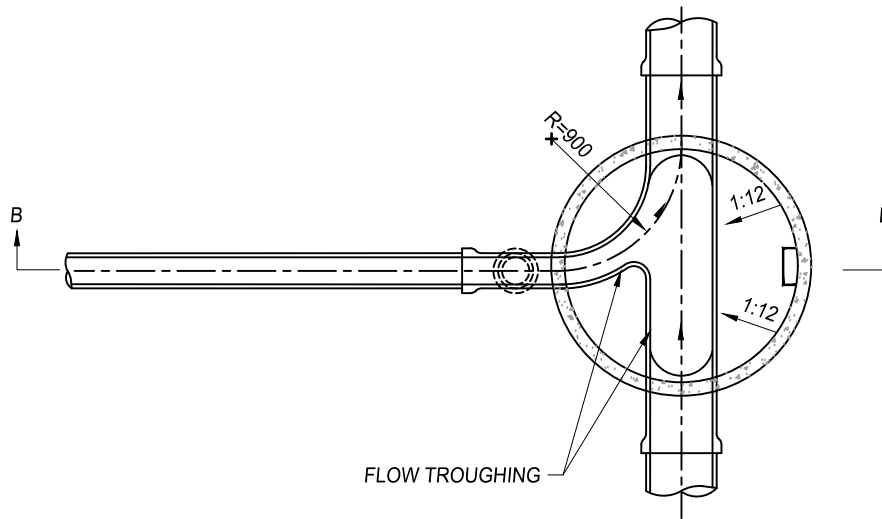
2024

REV.

0

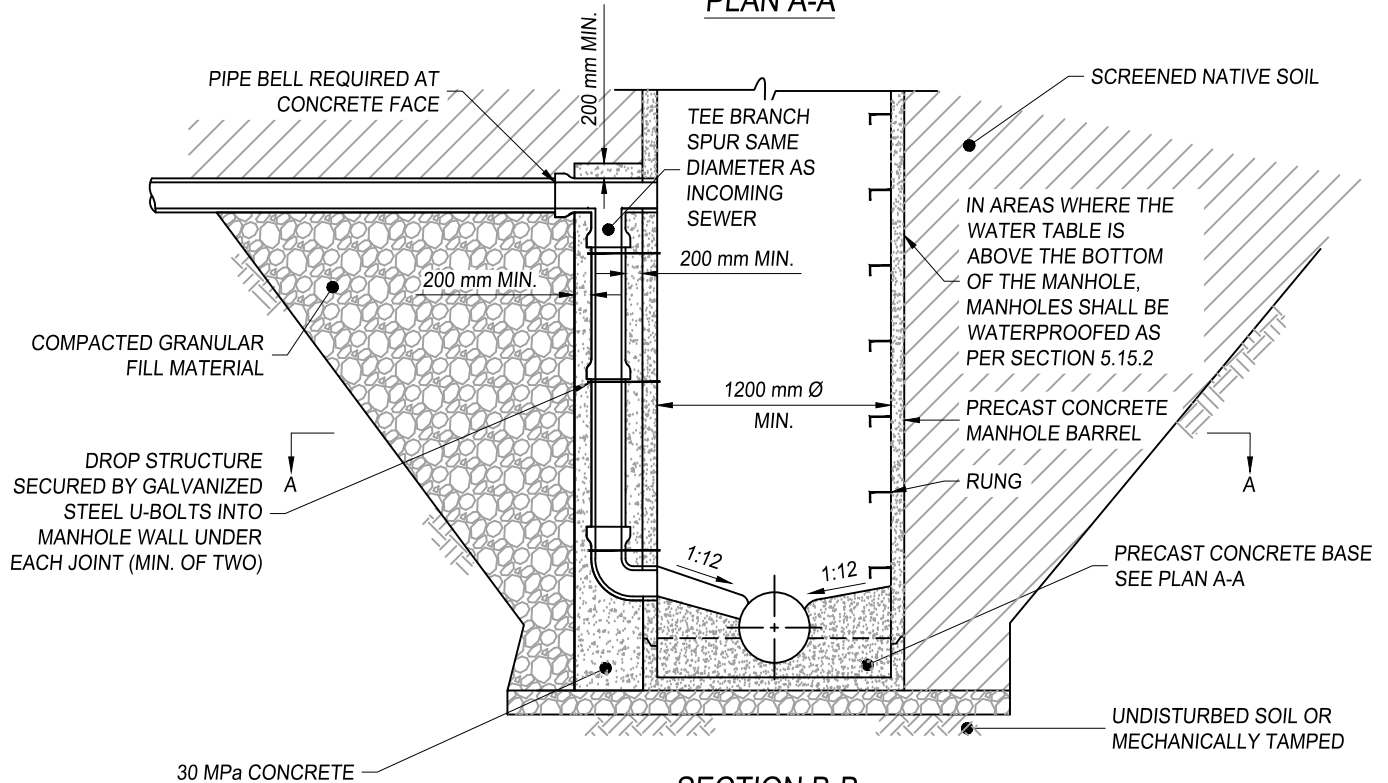
STANDARD DETAIL #:

5-202



FLOW TROUGHING

PLAN A-A



SECTION B-B

NOTES:

- (1) SPECIAL BASE DESIGN REQUIRED FOR DEPTHS OVER 9.0 m.
- (2) CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
- (3) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO MH COVER EXCEEDS 2 m.
- (4) VERTICAL SIDE OF CONICAL TOP TO BE SITUATED TO ALLOW ACCESS WITHOUT CONFLICTING WITH FLOW CHANNEL
- (5) MANHOLE FRAME AND COVER TO BE AS PER STANDARD DETAIL 5-300 OR 5-301, AS SPECIFIED.
- (6) BENCHING CONCRETE SHALL BE A MINIMUM OF 30 MPa COMPRESSIVE STRENGTH, TYPE HS,
- (7) RETROFIT RUNGS TO BE EPOXIED IN PLACE (NO PLASTIC SLEEVES)
- (8) F-80 FRAME AND COVER FOR ASPHALT AREAS.
F-39 FRAME AND COVER FOR OFF ROAD AREAS.
F-90 FRAME AND COVER WITH GASKET FOR SANITARY MANHOLES IN SAG LOCATIONS.
- (9) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

EXTERNAL DROP MANHOLE

REVISION DATE

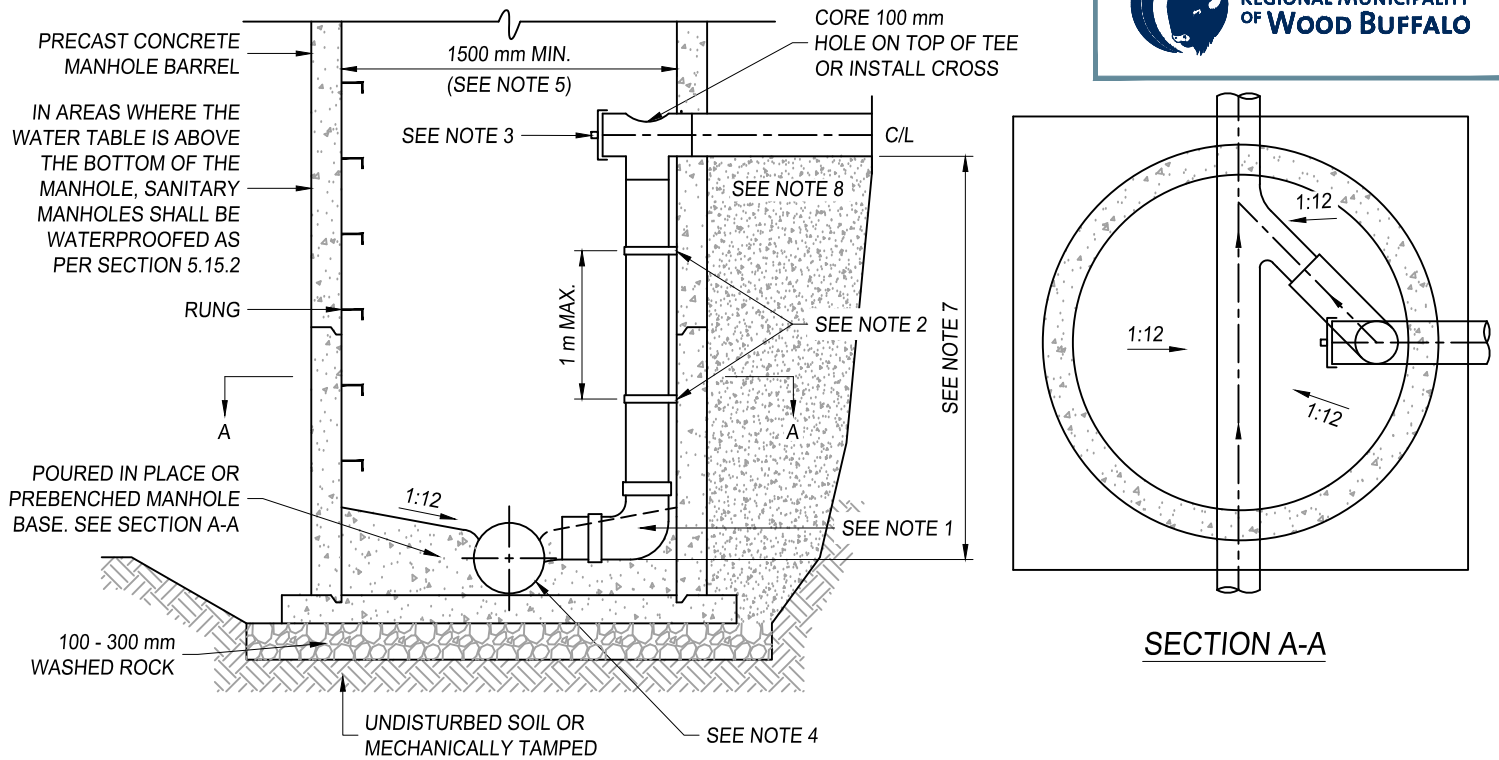
2024

REV.

0

STANDARD DETAIL #:

5-203



NOTES:

- (1) ELBOW EMBEDDED IN CONCRETE BENCHING AT 45° IN FLOW DIRECTION OF SEWER.
- (2) CLAMPING BRACKETS (MIN 2) SHALL BE STAINLESS STEEL (TYPE 304 - 11 GAUGE) AND SECURED TO THE STRUCTURE WITH TWO STAINLESS STEEL BOLTS.
- (3) INSTALL A CAP TO PREVENT WATER FROM FLOWING OUT THE END OF THE TEE, AND WHICH CAN BE REMOVED FOR INSPECTION AND MAINTENANCE PURPOSES.
- (4) DROP CONNECTION INVERT TO MATCH THE SPRINGLINE OF EXIT PIPE.
- (5) MANHOLE SHALL BE SIZED TO PROVIDE A 1200 mm MIN. CLEAR ACCESS PATH.
- (6) INTERNAL DROP PIPES FOR SERVICES ARE NOT PERMITTED.
- (7) FOR SANITARY SEWER: MIN. 0.6 m.
FOR STORM SEWER: MIN. 1.0 m.
IN ALL CASES, DROPS GREATER THAN 3.0 m REQUIRE AN EXTERNAL DROP.
- (8) FILLCRETE TO FIRST UPSTREAM BELL OF INCOMING PIPE.
- (9) SPECIAL BASE DESIGN REQUIRED FOR DEPTHS OVER 9.0 m.
- (10) CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
- (11) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO MH COVER EXCEEDS 2 m.
- (12) VERTICAL SIDE OF CONICAL TOP TO BE SITUATED TO ALLOW ACCESS WITHOUT CONFLICTING WITH FLOW CHANNEL.
- (13) MANHOLE FRAME AND COVER TO BE AS PER STANDARD DETAIL 5-300 OR 5-301, AS SPECIFIED.
- (14) BENCHING CONCRETE SHALL BE A MINIMUM OF 30 MPa COMPRESSIVE STRENGTH, TYPE HS,
- (15) RETROFIT RUNGS TO BE EPOXIED IN PLACE (NO PLASTIC SLEEVES)
- (16) F-80 FRAME AND COVER FOR ASPHALT AREAS.
F-39 FRAME AND COVER FOR OFF ROAD AREAS.
F-90 FRAME AND COVER WITH GASKET FOR SANITARY MANHOLES IN SAG LOCATIONS.
- (17) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

INTERNAL DROP MANHOLE

REVISION DATE

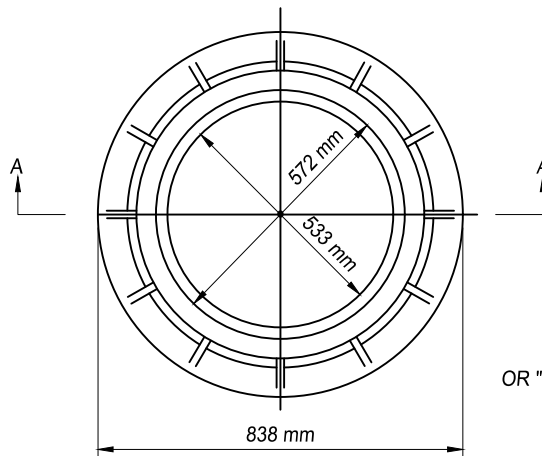
2024

REV.

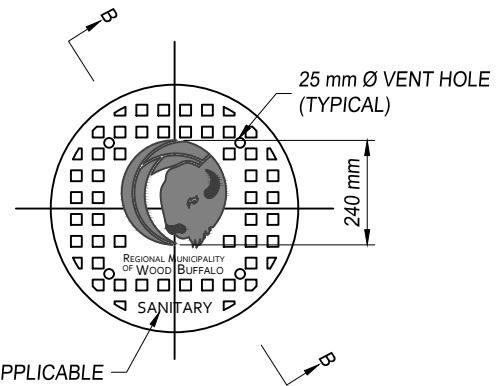
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STANDARD DETAIL #:

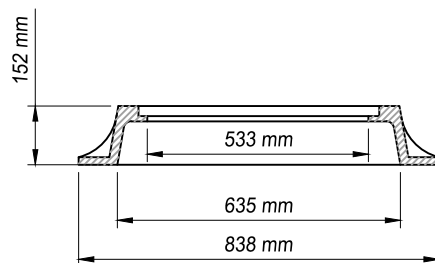
5-204



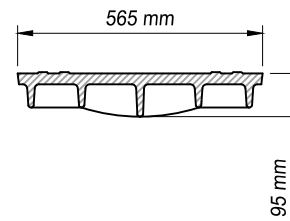
FRAME - TOP VIEW



COVER - TOP VIEW



SECTION A-A



SECTION B-B

NOTES:

- (1) COVER LETTER HEIGHT - 25 mm LETTER TYPE - CORBEL.
- (2) TO BE USED IN OFF ROAD AREAS.
- (3) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

STANDARD MANHOLE FRAME AND COVER

REVISION DATE

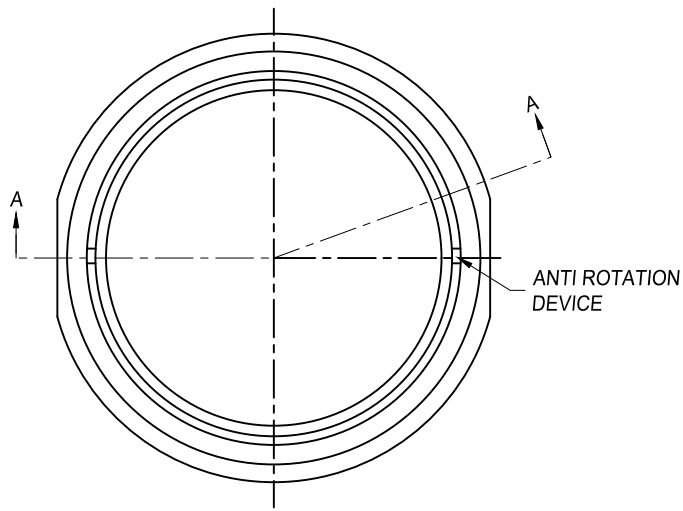
2024

REV.

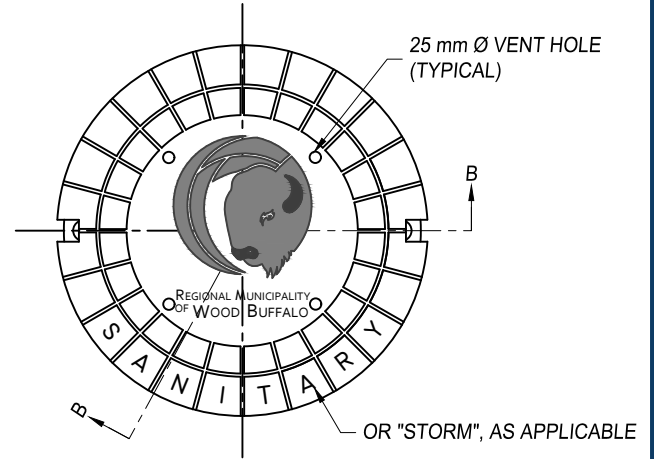
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STANDARD DETAIL #:

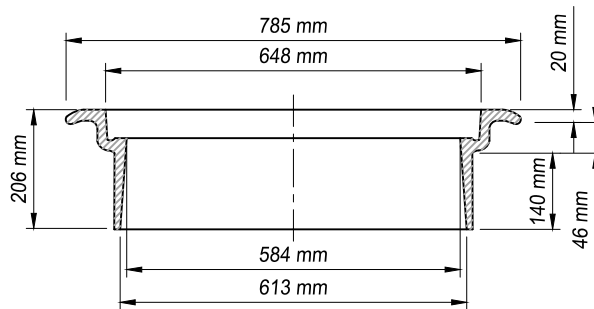
5-300



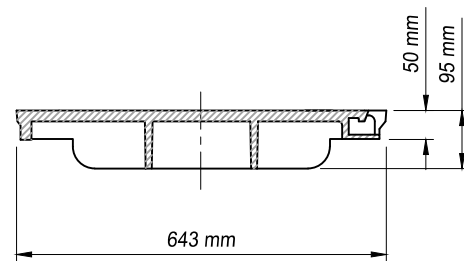
FRAME - TOP VIEW



COVER - TOP VIEW



SECTION A-A



SECTION B-B

NOTES:

- (1) COVER LETTER HEIGHT - 30 mm LETTER TYPE - CORBEL.
- (2) TO BE USED IN ASPHALT AREAS.
- (3) NOT FOR USE IN OFF ROAD AREAS.
- (4) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

FLOATING MANHOLE FRAME AND COVER

REVISION DATE

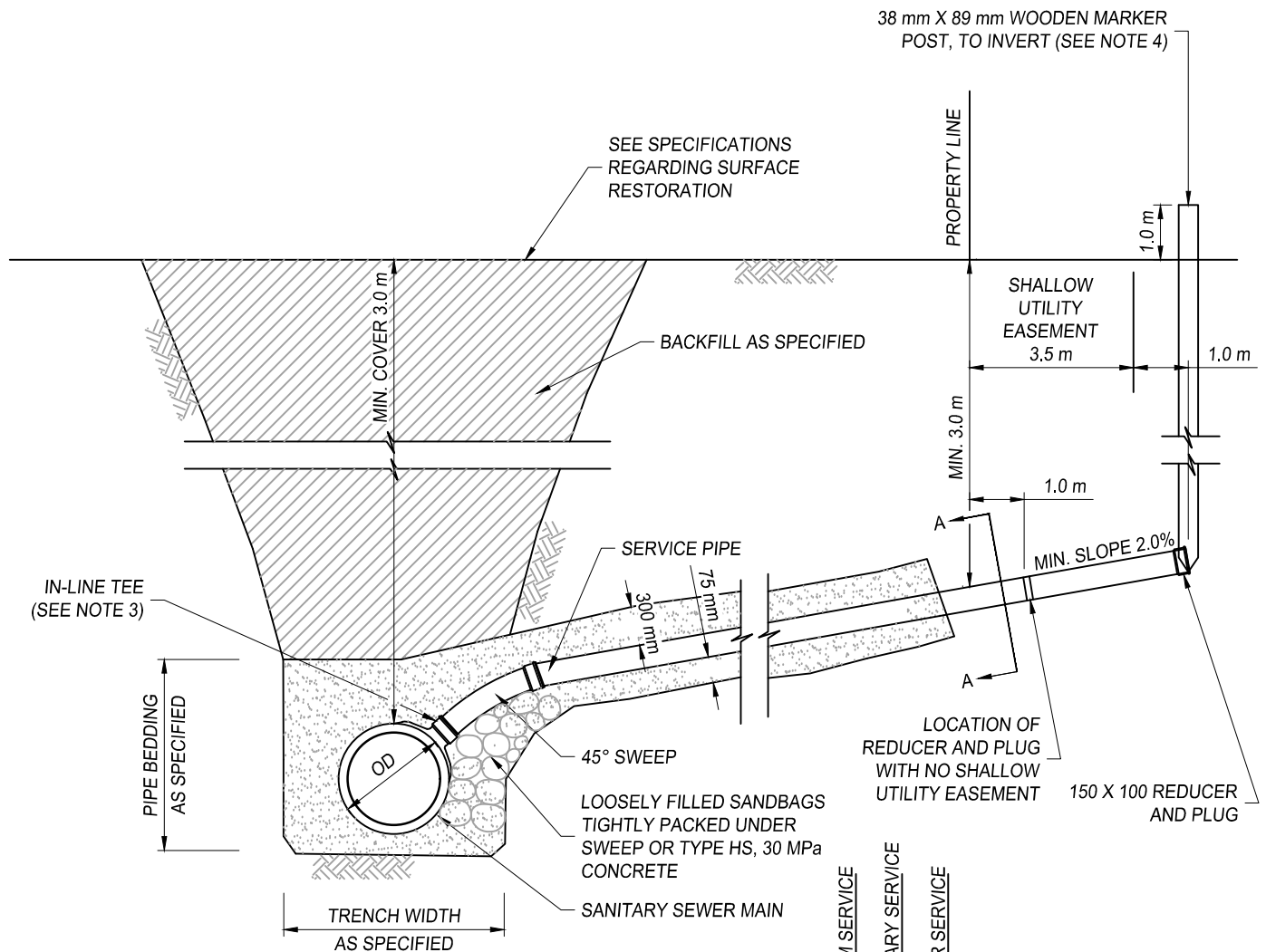
2024

REV.

0

STANDARD DETAIL #:

5-301

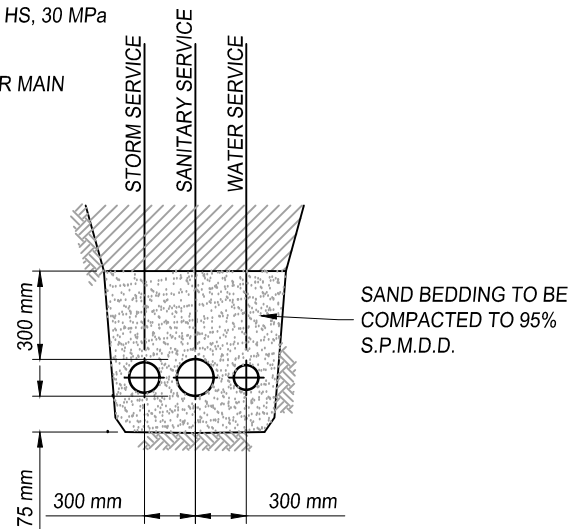


LOCATION OF
REDUCER AND PLUG
WITH NO SHALLOW
UTILITY EASEMENT

150 X 100 REDUCER
AND PLUG

NOTES:

- (1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT, OR AS PER GEOTECHNICAL RECOMMENDATIONS, WHICHEVER IS MORE STRINGENT.
- (2) OD = OUTSIDE PIPE DIAMETER.
- (3) SERVICE CONNECTIONS TO BE MADE AT THE 10:00 AND 2:00 POSITIONS.
- (4) RISERS FOR SERVICE LINES ARE REQUIRED WHEN SEWER MAINS EXCEED 4 m IN DEPTH (REFER TO STANDARD DETAIL 5-401).



SECTION A-A

SANITARY SERVICE CONNECTION WITHOUT RISER

REVISION DATE

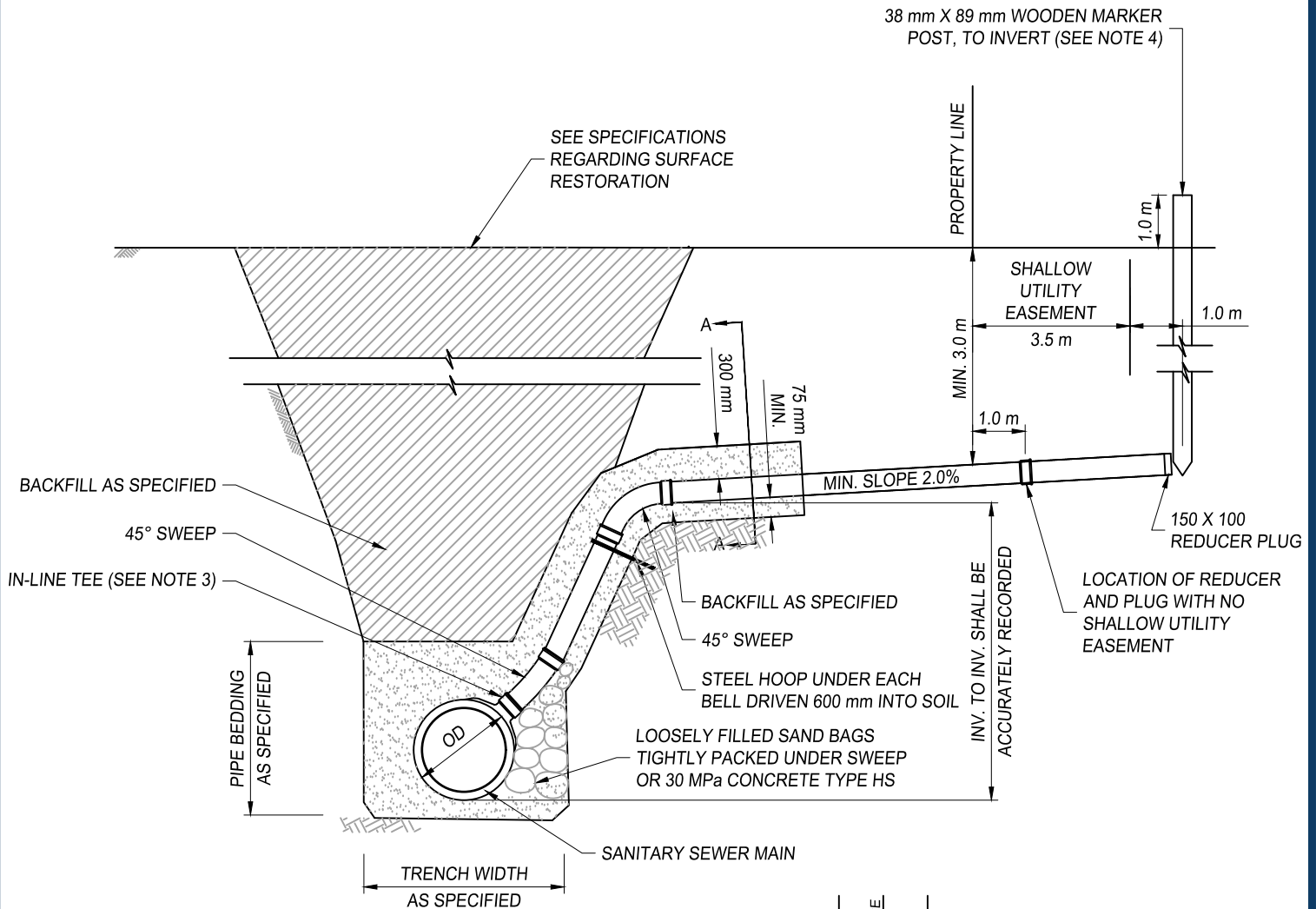
2024

REV.

0

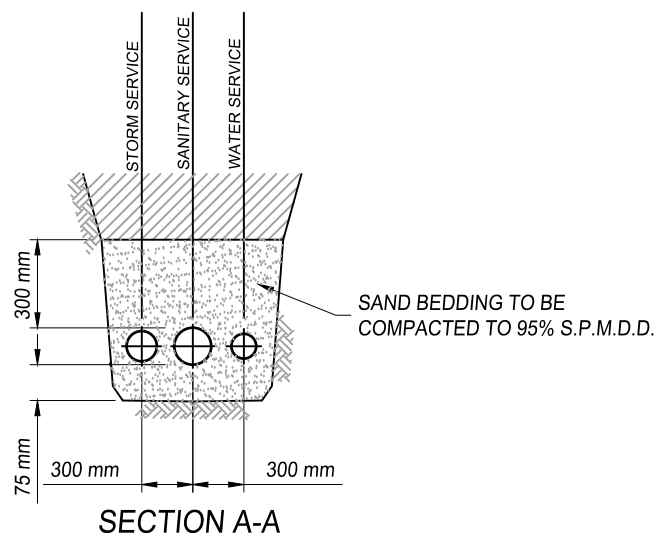
STANDARD DETAIL #:

5-400



NOTES:

- (1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT, OR AS PER GEOTECHNICAL RECOMMENDATIONS, WHICHEVER IS MORE STRINGENT.
- (2) OD = OUTSIDE PIPE DIAMETER.
- (3) SERVICE CONNECTIONS TO BE MADE AT THE 10:00 AND 2:00 POSITIONS.
- (4) RISERS FOR SERVICE LINES ARE REQUIRED WHEN SEWER MAINS EXCEEDS 4 m IN DEPTH.



SANITARY SERVICE CONNECTION WITH RISER

REVISION DATE

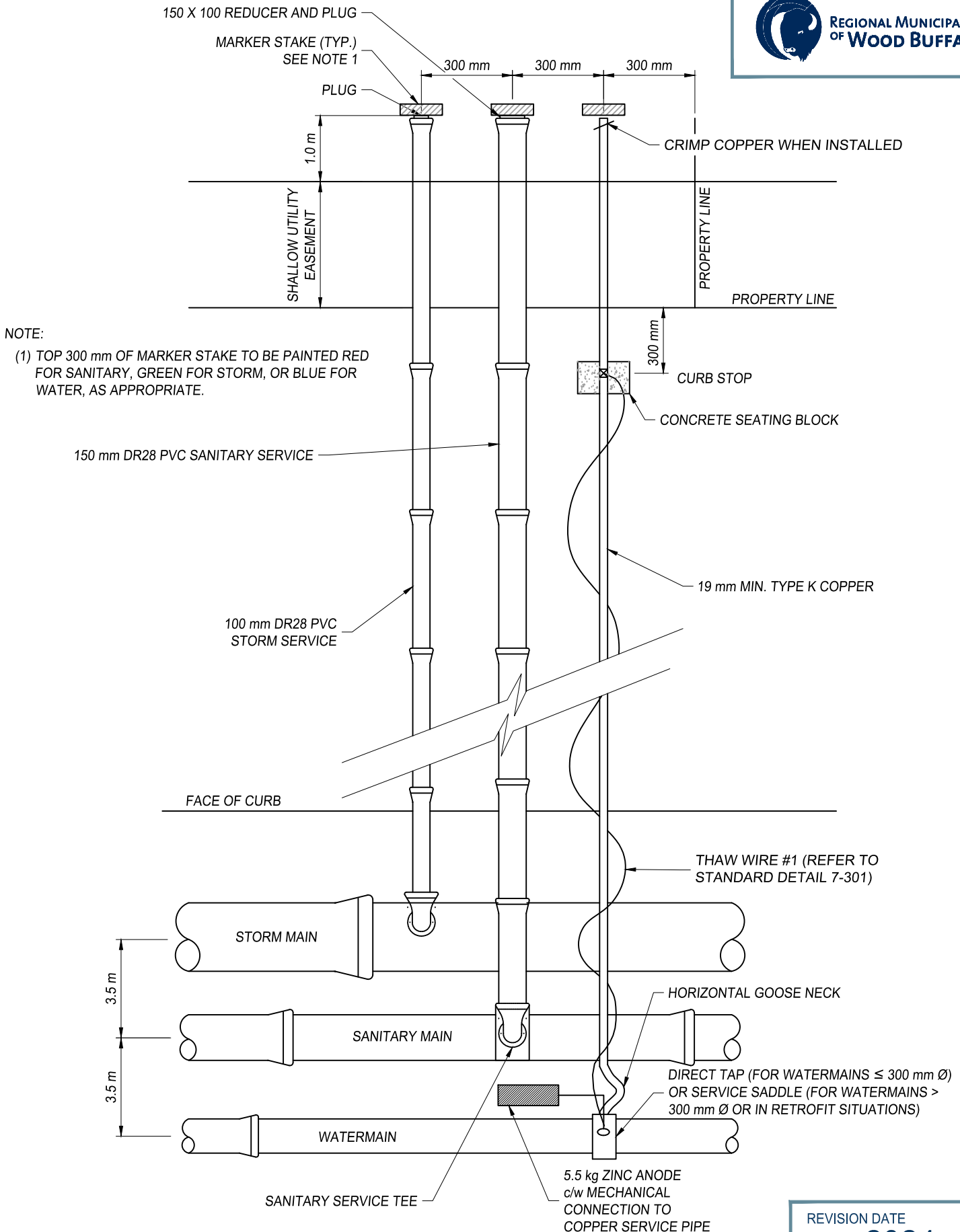
2024

REV.

0

STANDARD DETAIL #:

5-401



SINGLE LOT RESIDENTIAL SERVICING LAYOUT

REVISION DATE

2024

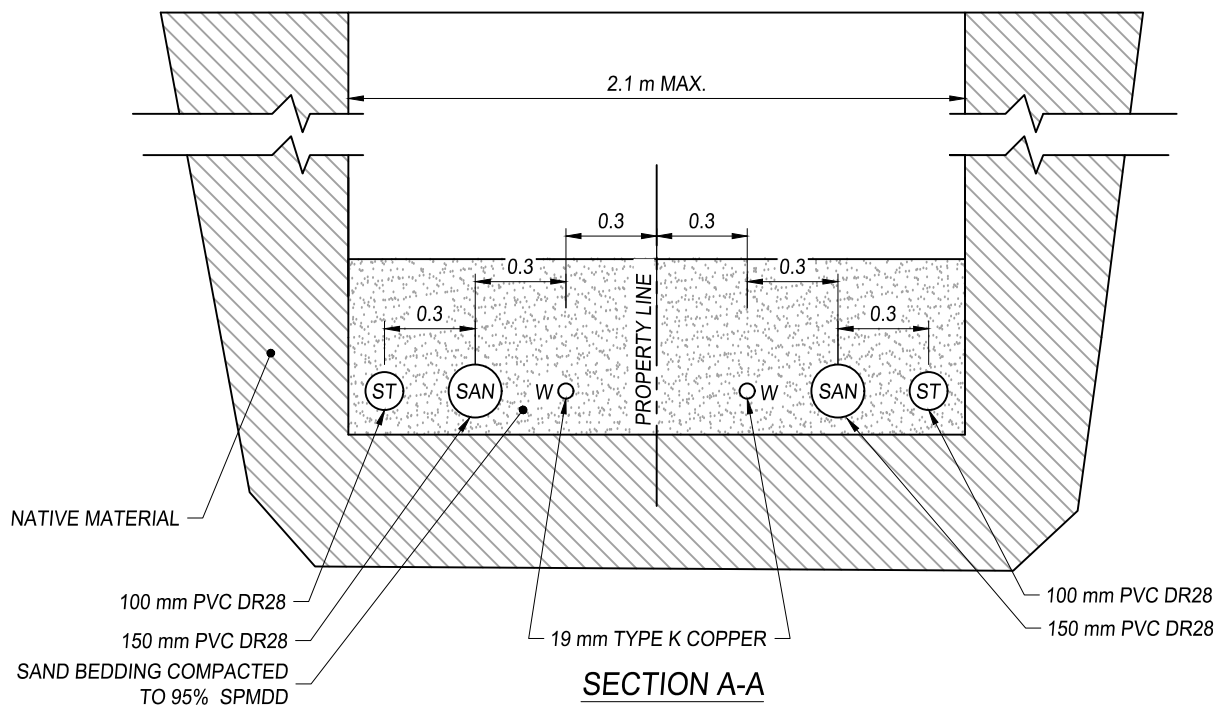
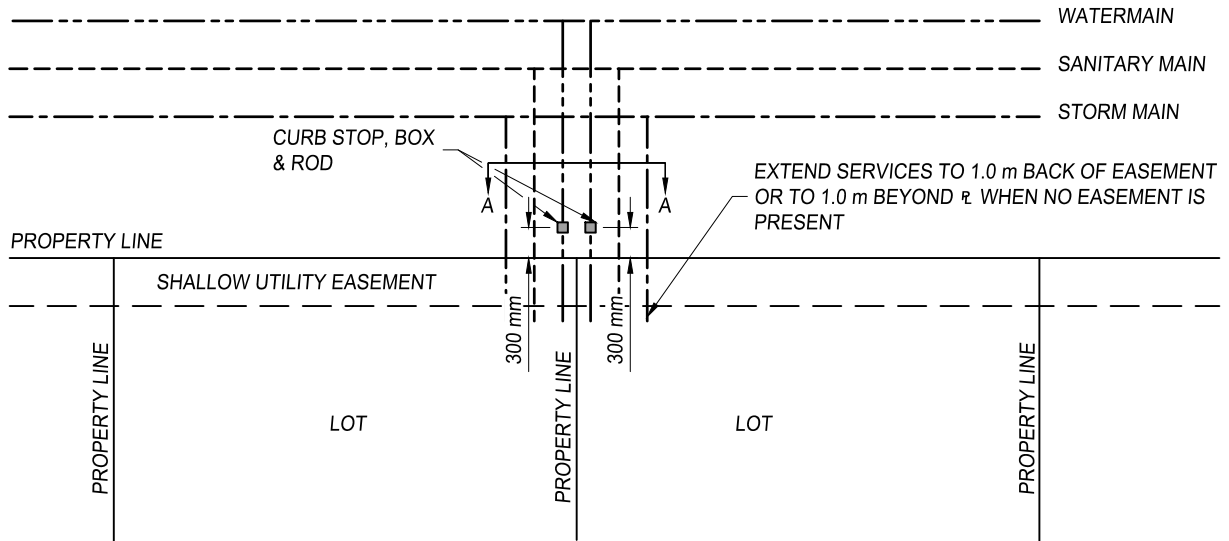
REV.

0

STANDARD DETAIL #:

5-402

PROPERTY LINE



NOTE:

(1) DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.

DUAL LOT RESIDENTIAL SERVICING LAYOUT

REVISION DATE

2024

REV.

0

STANDARD DETAIL #:

5-403



SPECIFICATIONS:

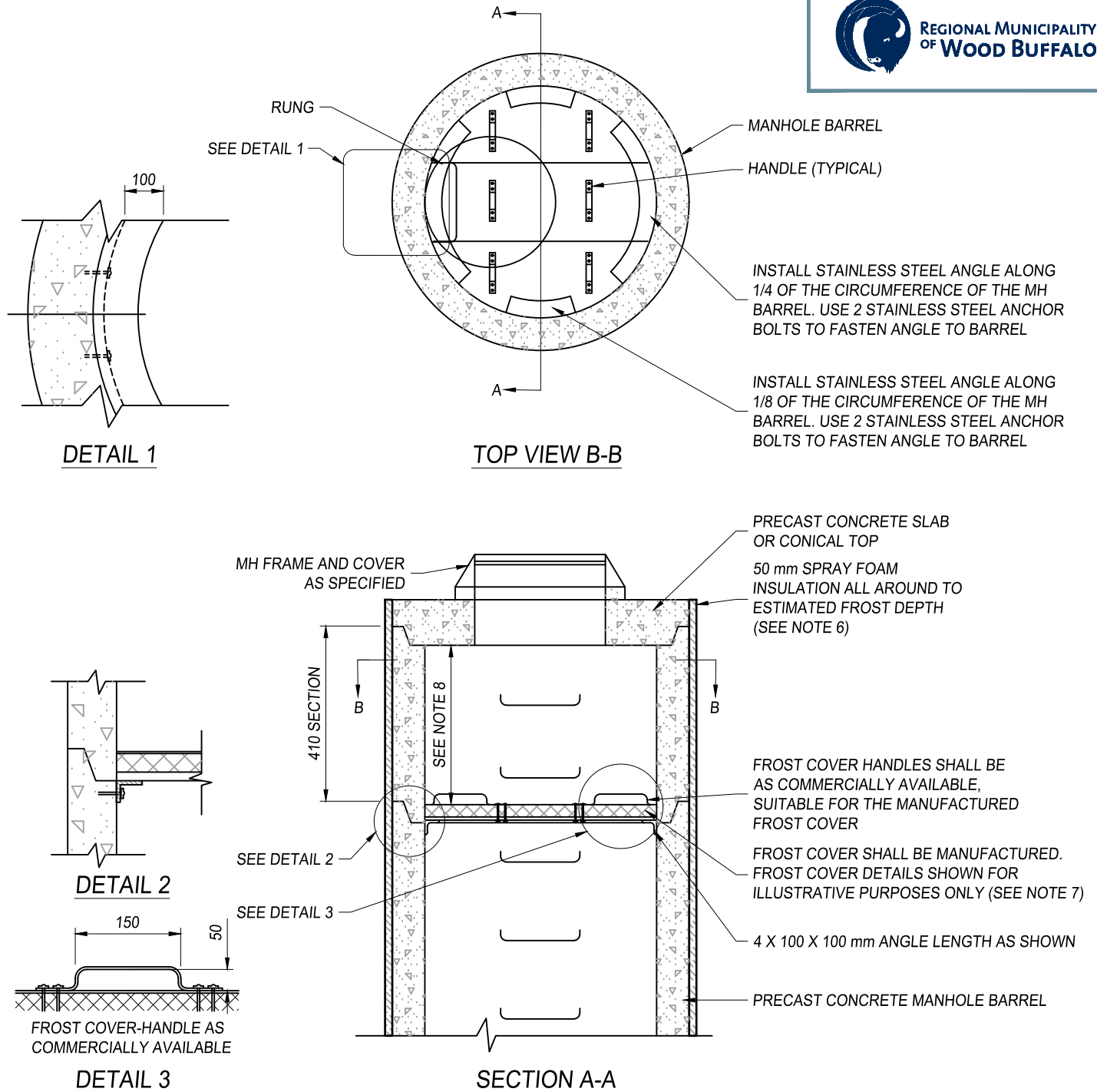
- SIZE: 432 X 305
- MATERIAL: ALUMINUM / ENGINEER GRADE
- BACKGROUND: RED / BLUE / BLACK ON WHITE BACKGROUND AS SHOWN
- CORNERS: ROUNDED, AS SHOWN
- TYPE OF PROCESS: DI-CUT
- BOLT HOLE LOCATIONS: CENTRE OF SIGN, TOP AND BOTTOM

NOTES:

- (1) WARNING SIGNS TO BE INSTALLED ON RURAL / REGIONAL PIPELINES, OR IN LANDSCAPED URBAN AREAS OUTSIDE OF ROAD ROW, AT THE DISCRETION OF THE MUNICIPALITY.
- (2) WARNING SIGNS TO BE MOUNTED ON 4.5 cm X 4.5 cm PRE-PUNCHED GALVANIZED METAL TELESCOPING TUBE. SIGN POST TO BE SET 0.8 m INTO GROUND. BOTTOM OF SIGN TO BE 1.5 m ABOVE FINISHED GRADE.
- (3) WARNING SIGNS SHALL BE SPACED AT A MAX. 500 m INTERVAL. A WARNING SIGN IS REQUIRED AT EACH BEND IN PIPELINE ALIGNMENT.

SEWER LINE WARNING SIGN

REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	5-600



NOTES:

- (1) ALL METAL PARTS IN MANHOLE SHALL BE STAINLESS STEEL.
- (2) USE EPOXY COATED ANCHOR BOLTS TO FASTEN ANGLE TO BARREL.
- (3) FABRICATE ANGLE TO SUIT BARREL RADIUS.
- (4) INSTALL COVER IMMEDIATELY ABOVE VALVES, IF PRESENT.
- (5) THIS DETAIL TO BE SPECIFIED IN SITUATIONS WHERE THERE IS A HIGH RISK OF THE SANITARY SYSTEM FREEZING.
- (6) INSULATION SHOWN FOR ILLUSTRATIVE PURPOSES ONLY, INSULATION REQUIREMENTS TO BE DETERMINED BY THE DESIGNER ON A PROJECT-BY-PROJECT BASIS.
- (7) INDICATE FROST COVER SPECIFICATIONS ON THE SHOP DRAWING.
- (8) DEPTH OF COVER TO SUIT SPECIFICATIONS OF MANUFACTURED FROST COVER.
- (9) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

FROST COVER

REVISION DATE

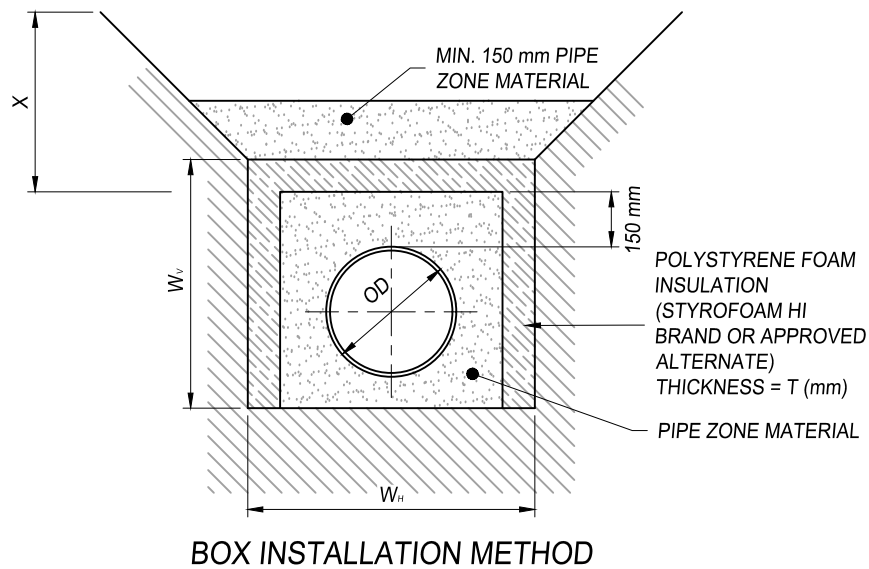
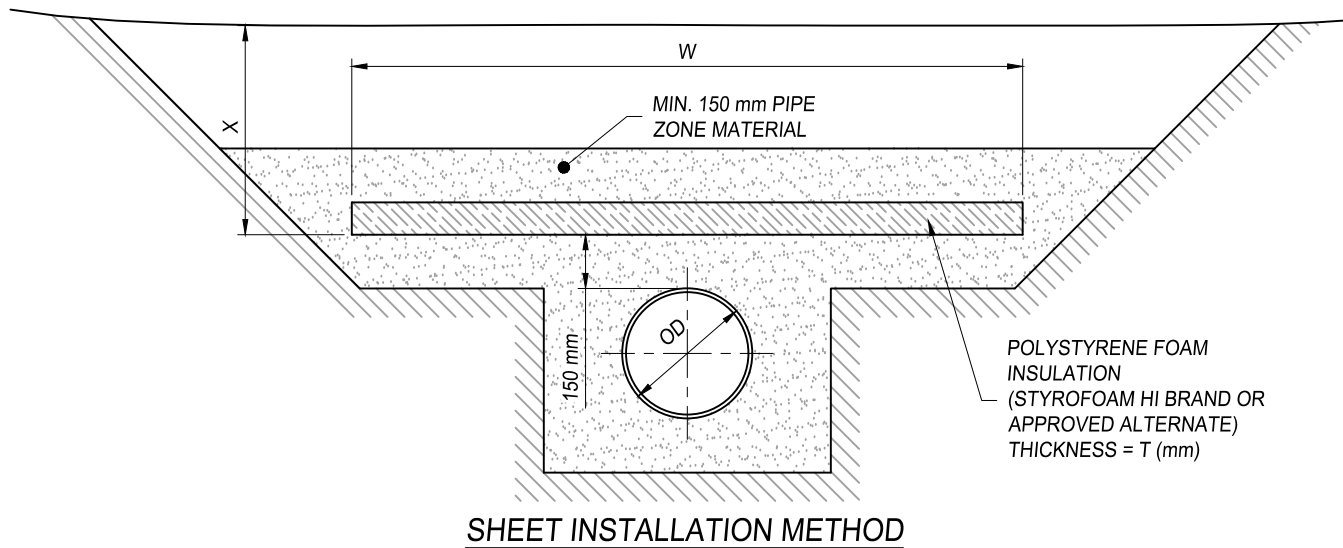
2024

REV.

0

STANDARD DETAIL #:

5-700



X (m)	T (mm)	WIDTH OF INSULATION (W) FOR NOMINAL PIPE DIAMETERS (m)							
		0.150	0.200	0.250	0.300	0.400	0.500	0.600	0.750
1.6	90	3.7	3.7	3.8	3.8	3.9	4.0	4.1	4.3
1.8	75	3.3	3.3	3.4	3.4	3.5	3.6	3.7	3.9
2.0	65	2.9	2.9	3.0	3.0	3.1	3.2	3.3	3.5
2.2	65	2.5	2.5	2.6	2.6	2.7	2.8	2.9	3.1
2.4	50	2.1	2.1	2.2	2.2	2.3	2.4	2.5	2.7
2.6	40	1.7	1.7	1.8	1.8	1.9	2.0	2.1	2.3
2.8	40	1.3	1.3	1.4	1.4	1.5	1.6	1.7	1.9
3.0	25	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.5

NOTES:

- (1) X = DEPTH FROM GROUND SURFACE TO BOTTOM OF INSULATION (METRES)
- (2) W = WIDTH OF INSULATION (METRES) = $W_i + 2(W_v)$
- (3) OD = OUTSIDE DIAMETER OF PIPE
- (4) THIS TABLE HAS BEEN GENERATED BASED ON A FROST DEPTH OF 3.5 m. IF THE GEOTECHNICAL REPORT SPECIFIES A DIFFERENT FROST DEPTH, THE DESIGNER IS RESPONSIBLE FOR CONFIRMING THE WIDTH AND THICKNESS OF ANY REQUIRED INSULATION.

PIPE INSULATION

REVISION DATE

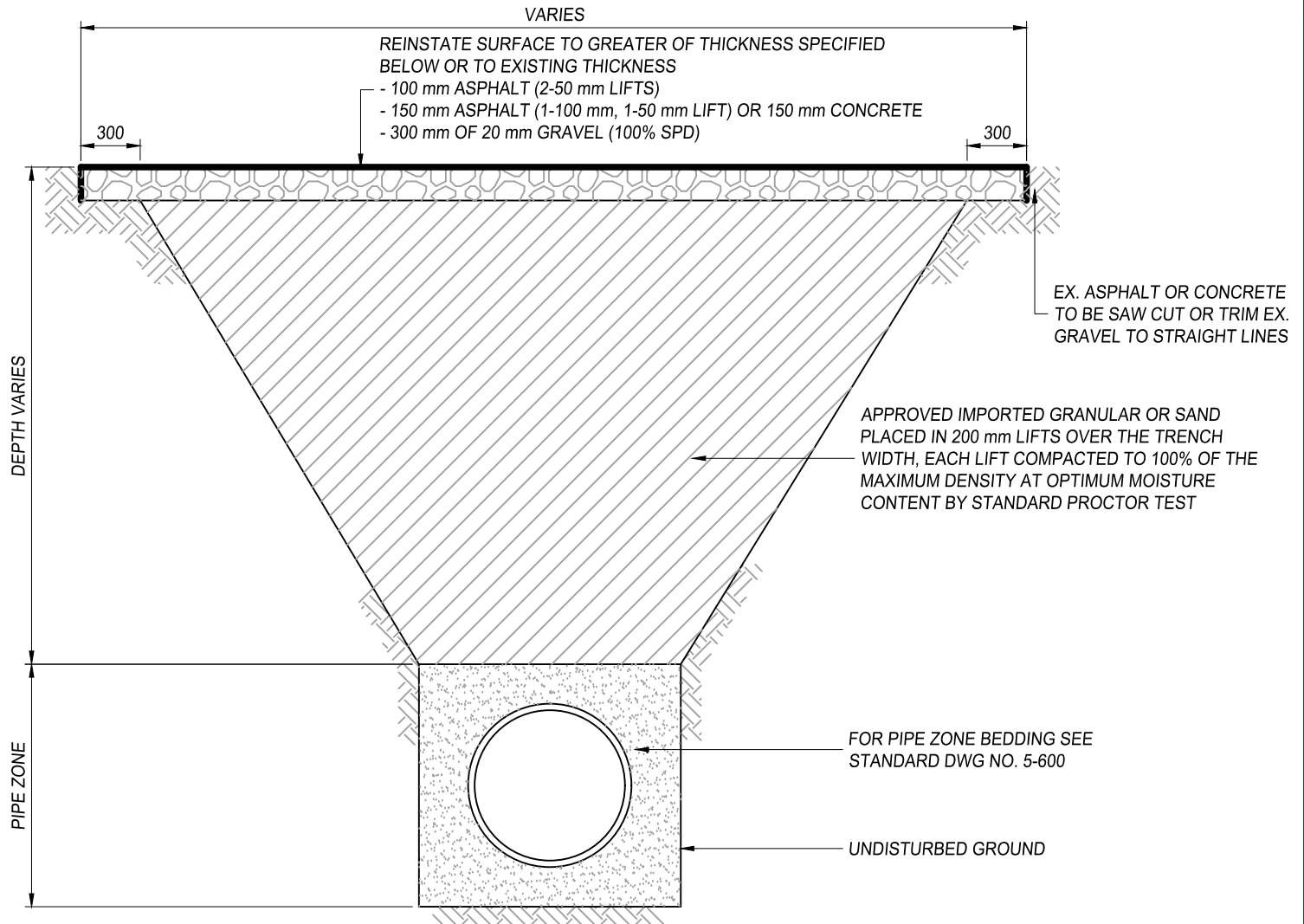
2024

REV.

0

STANDARD DETAIL #:

5-701



NOTES:

- (1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.
- (2) PAVEMENT STRUCTURE DESIGN REQUIRED FOR ASPHALT AND CONCRETE SURFACES.
- (3) LOW STRENGTH CONCRETE (FILCRETE) MAY BE USED IF DIRECTED BY THE MUNICIPALITY.

TRENCH BACKFILL FOR EMERGENCY
REPAIRS IN PAVED AREAS

REVISION DATE

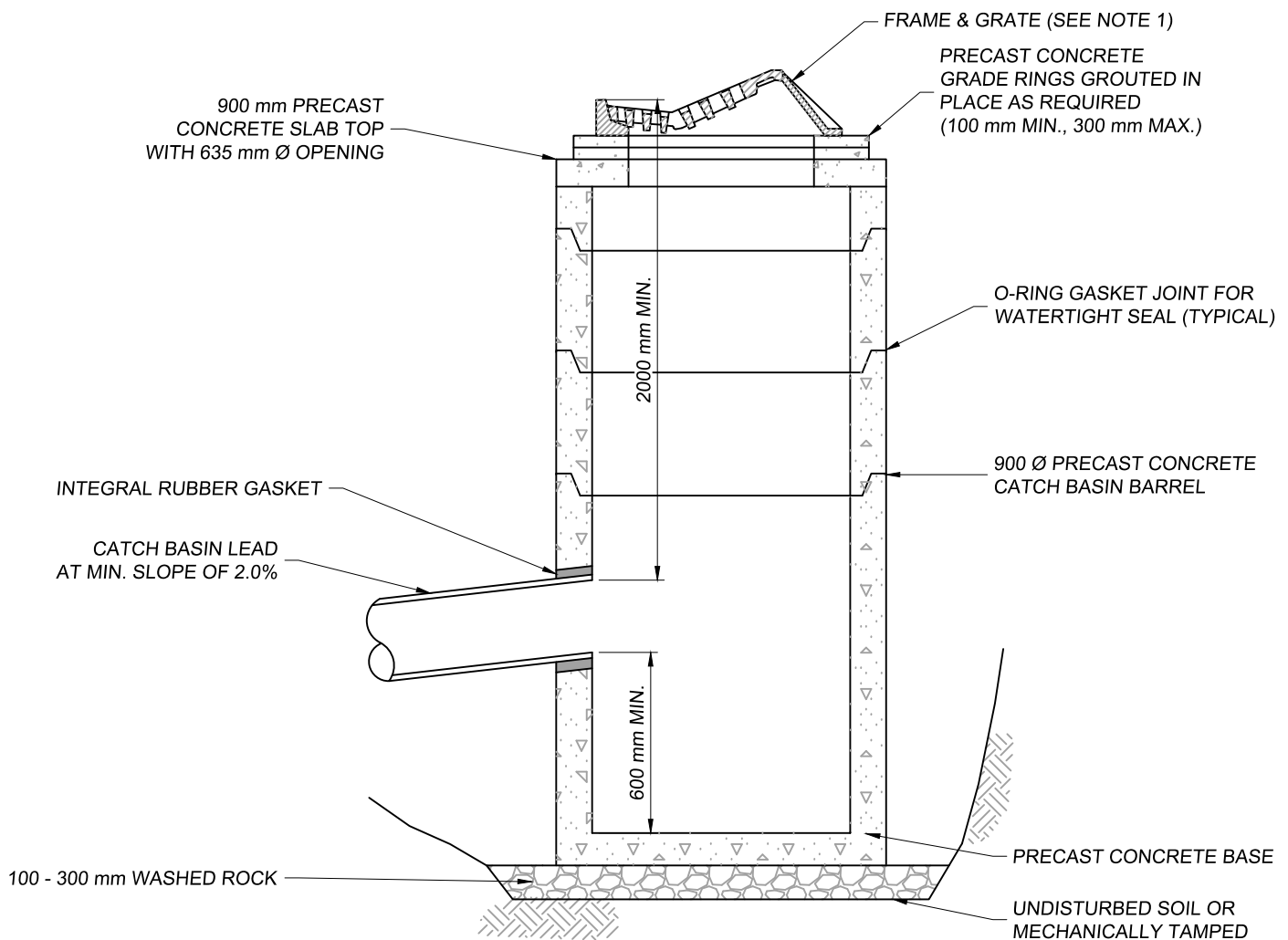
2024

REV.

0

STANDARD DETAIL #:

5-800



NOTES:

- (1) K-7 FRAMES AND GRATES ARE TO BE USED IN LOCATIONS WITH ROLLED FACE CURB AND GUTTER.
- (2) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

900 mm DIAMETER CATCH BASIN WITH K-7 FRAME & GRATE

REVISION DATE

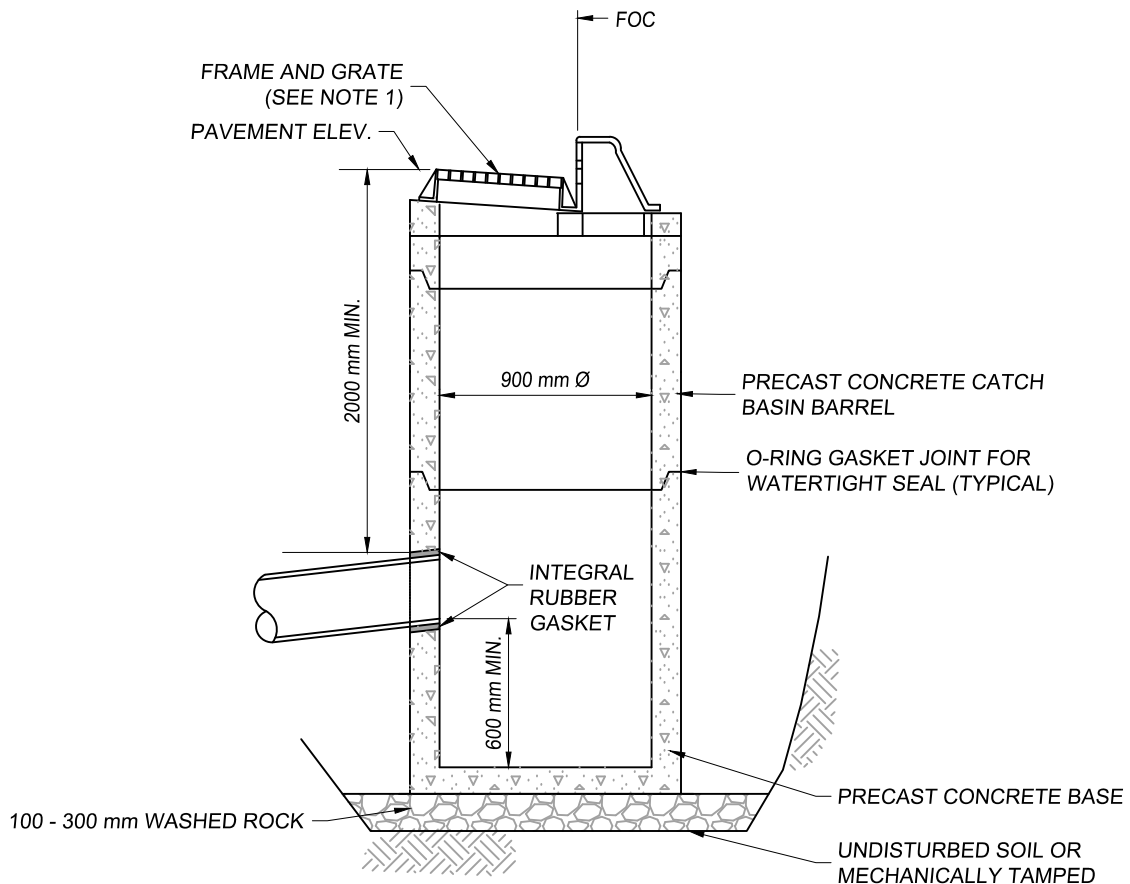
2024

REV.

0

STANDARD DETAIL #:

6-100



NOTES:

- (1) F-51 FRAMES AND GRATES ARE TO BE USED IN LOCATIONS WITH STRAIGHT FACE CURB AND GUTTER.
- (2) PRECAST CONCRETE GRADE RINGS TO BE GROUTED IN PLACE AS REQUIRED (100 mm MIN., 300 mm MAX.)
- (3) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

900 mm DIAMETER CATCH BASIN WITH F-51 FRAME & GRATE

REVISION DATE

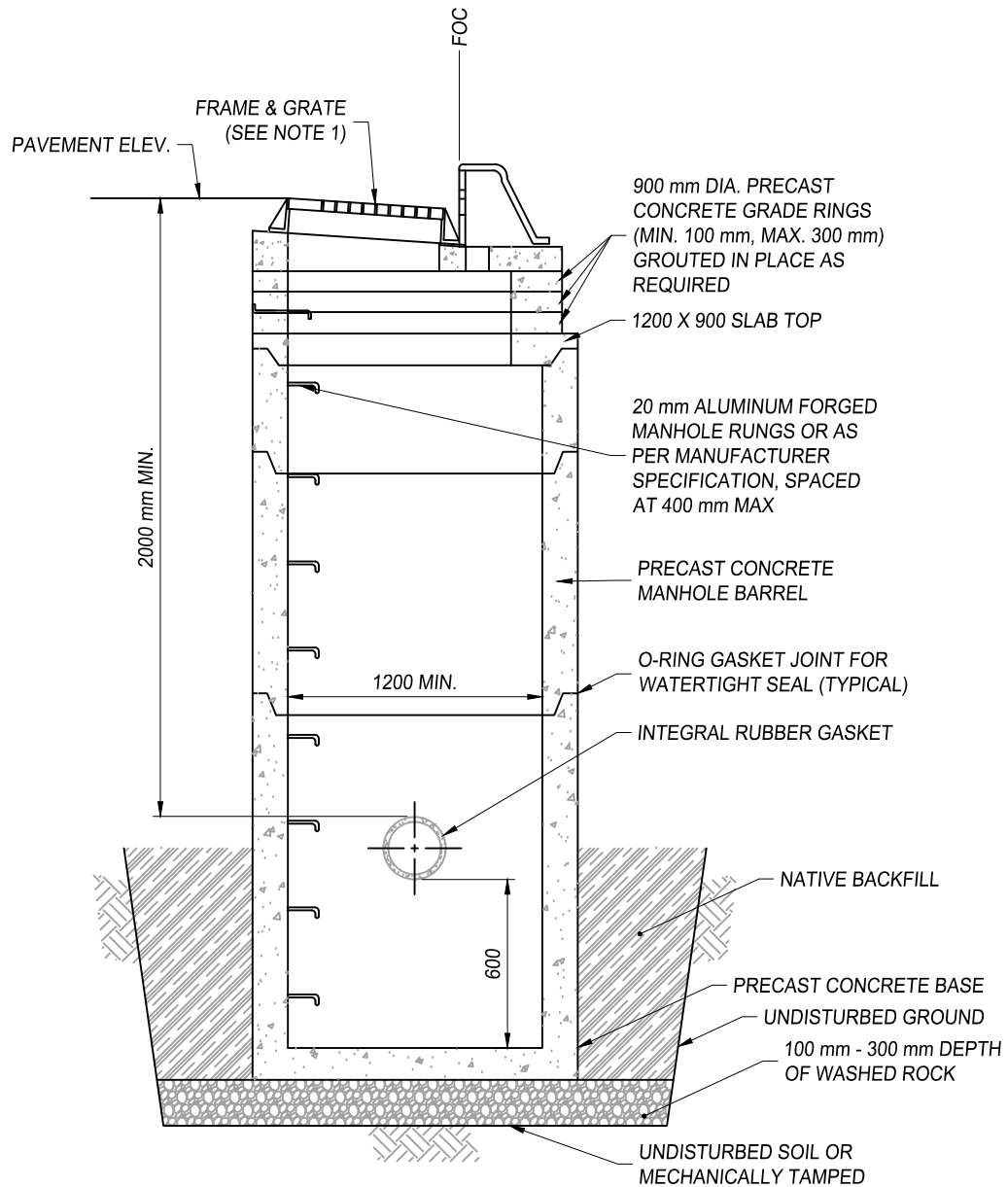
2024

REV.

0

STANDARD DETAIL #:

6-101



NOTES:

- (1) FOR ROLLED FACE CURB AND GUTTER: USE DK-7 FRAME AND GRATE.
FOR STRAIGHT FACE CURB AND GUTTER: USE F-51 FRAME AND GRATE.
- (2) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

1200 mm DIAMETER CATCH BASIN MANHOLE

REVISION DATE

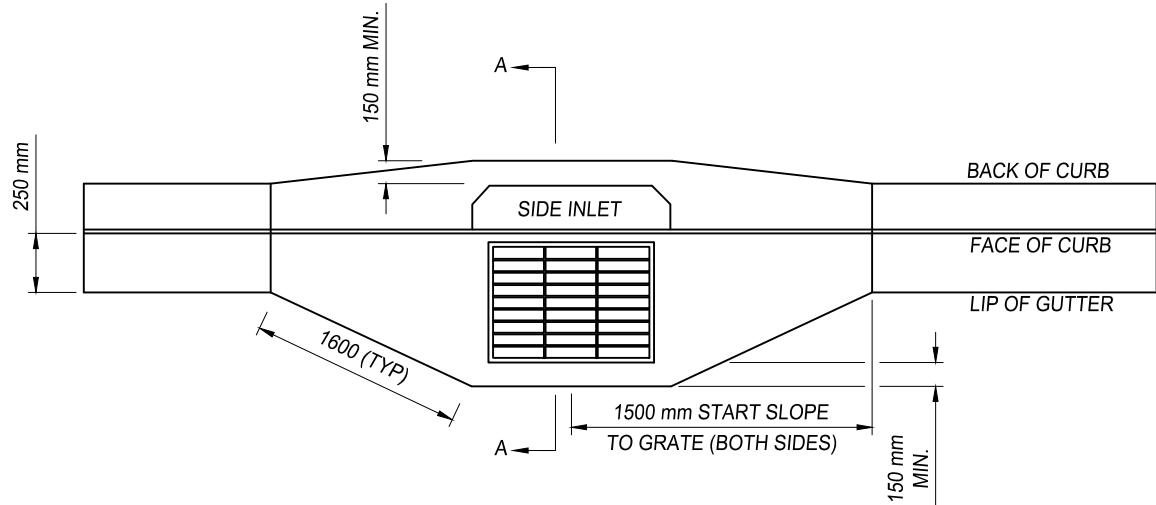
2024

REV.

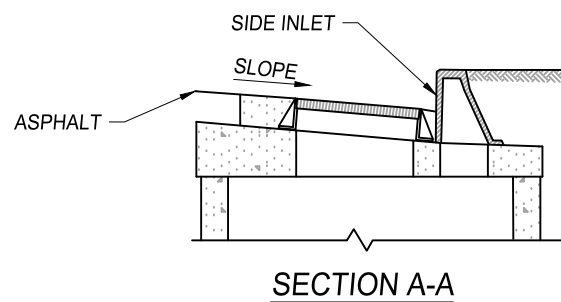
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STANDARD DETAIL #:

6-102



PLAN - F-51 ONE-PIECE SIDE INLET, FRAME AND GRATE SET IN
150 mm CURB WITH 250 mm GUTTER

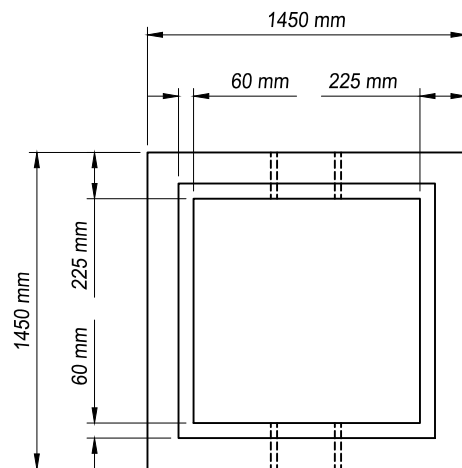


NOTE:

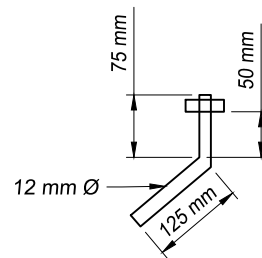
- (1) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

TYPE F-51 CATCH BASIN CURB FINISHING DETAIL

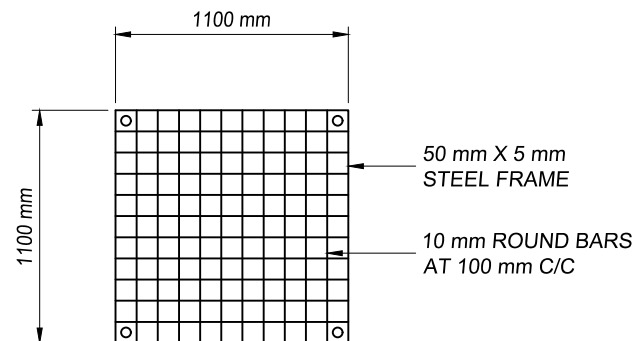
REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	6-103



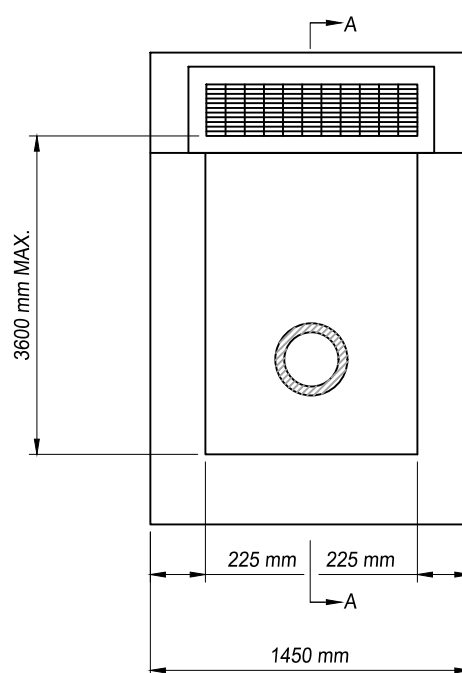
PLAN VIEW



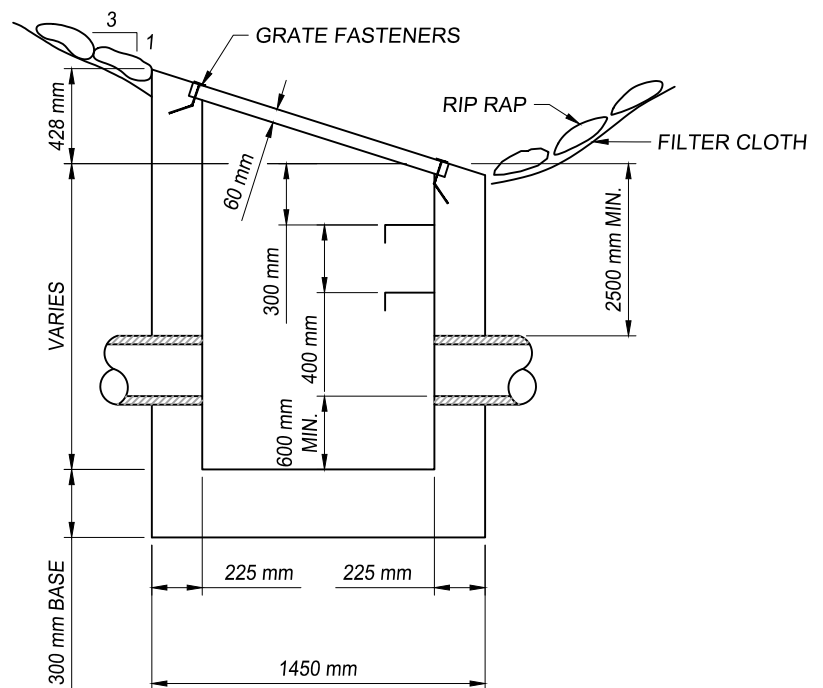
GRATE FASTENER



GRATE DETAIL



FRONT VIEW



SECTION A-A

NOTES:

- (1) CONCRETE SHALL BE 30 MPa, TYPE HS.
- (2) LADDER RUNGS AS SPECIFIED.
- (3) RIP RAP AS SPECIFIED.

DITCH INLET WITH SUMP

REVISION DATE

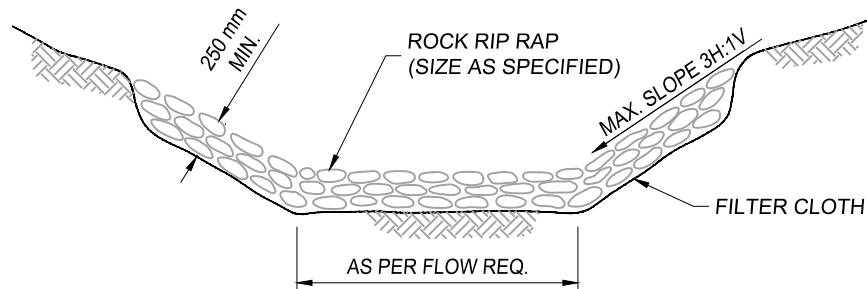
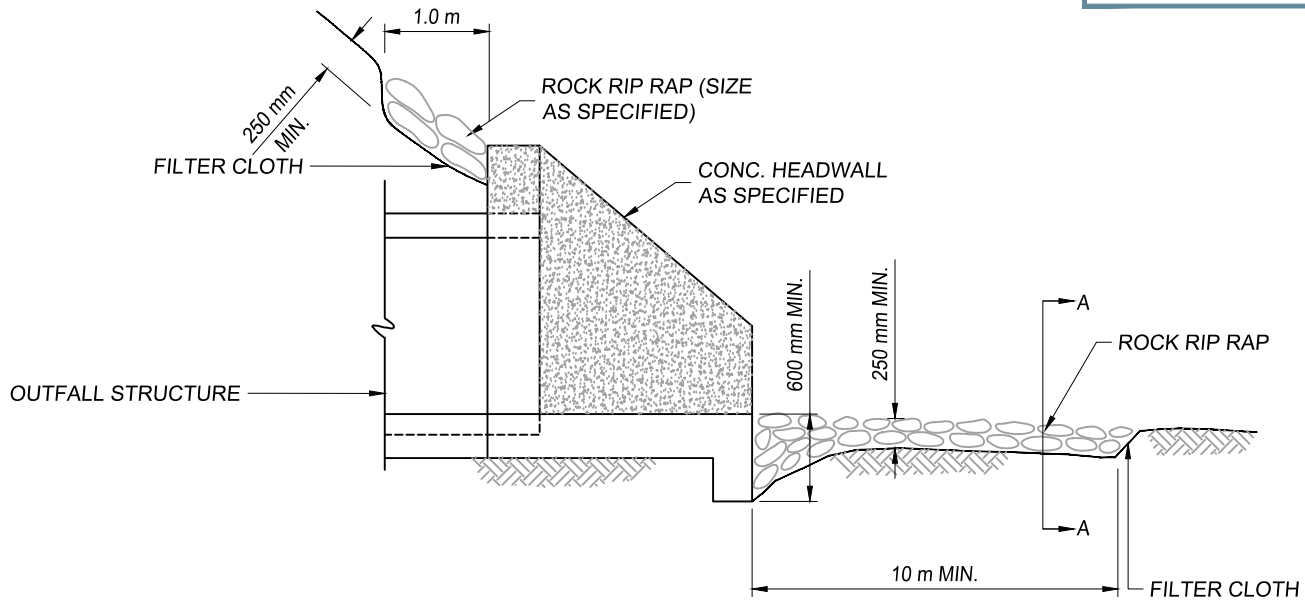
2024

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STANDARD DETAIL #:

6-200



SECTION A-A

NOTES:

- (1) A STILLING BASIN IS REQUIRED WHEN HIGH VELOCITY FLOWS ARE PRESENT.
- (2) FILTER CLOTH PANEL JOINTS TO OVERLAP A MINIMUM OF 100 mm AND SHALL BE HEAT SEALED.
- (3) FILTER CLOTH TYPE TO BE AS SPECIFIED.
- (4) FOR BAGGED CONCRETE RIP RAP SEE STANDARD DETAIL 6-302.

ROCK RIP RAP FOR OUTFALLS AND OPEN CHANNELS

REVISION DATE

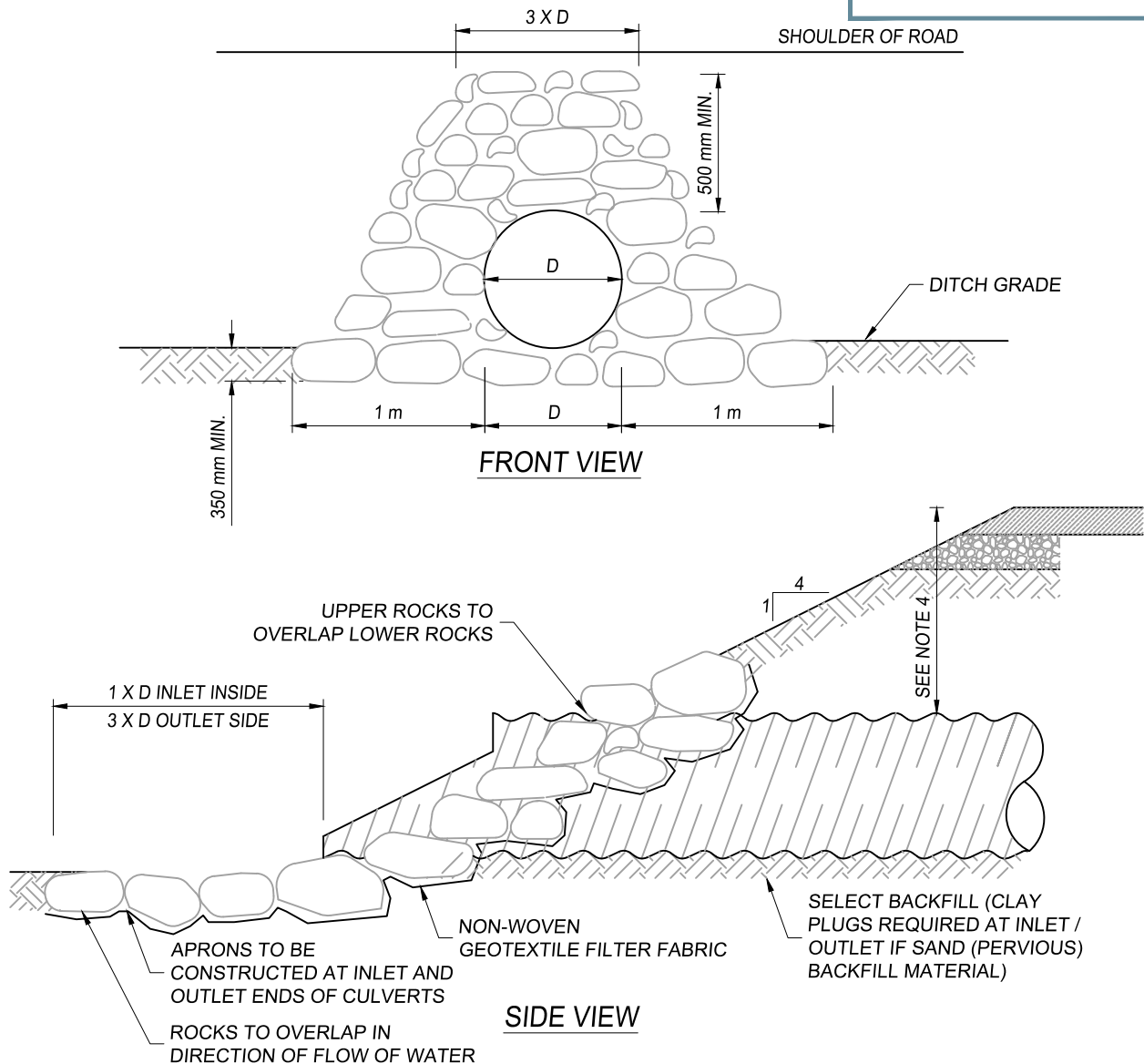
2024

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STANDARD DETAIL #:

6-300



NOTES:

- (1) ROCKS AND BOULDERS SHALL BE SELECTED AS NEARLY CUBICAL IN FORM AS PRACTICAL AND OF A SIZE GREATER THAN 150 mm. REFER TO THE MUNICIPALITY'S STANDARD CONSTRUCTION SPECIFICATIONS.
- (2) THE STONES SHALL BE PLACED WITH THEIR BEDS AT RIGHT ANGLES TO THE SLOPE, THE LARGER STONES BEING USED IN THE BOTTOM COURSES AND THE SMALLER STONES AT THE TOP.
- (3) THE STONES SHALL BE LAID IN CLOSE CONTACT SO AS TO BREAK JOINTS AND IN SUCH MANNER THAT THE WEIGHT OF THE STONES IS CARRIED BY THE EARTH AND NOT BY THE ADJACENT STONES.
- (4) MIN. COVER SHALL BE THE GREATER OF:
D/2 OR 1 m FOR ROADWAY CULVERTS.
D/2 OR 0.5 m FOR DRIVEWAY AND TRAIL CULVERTS.
- (5) BAGGED RIP RAP MAY BE USED IN LIEU OF ROCK RIP RAP. SACKS SHALL BE FILLED 2/3 FULL WITH 20 MPa CONCRETE AND SECURELY SEWN OR STAPLED TO FORM A STRAIGHT EDGE CLOSURE.
 - THE PREPARED SACKS SHALL BE PLACED DIRECTLY ON THE PREPARED SURFACE AND SHALL BE RAMMED AND PACKED AGAINST EACH OTHER TO FORM A CLOSE MOULDED AND UNIFORM SURFACE AVERAGING 125 mm IN THICKNESS.
 - JOINTS BETWEEN ROWS SHALL NOT BE STAGGERED.
 - SACKS SHALL OVERLAP IN THE DIRECTION OF THE FLOW OF WATER.
 - APRONS SHALL BE CONSTRUCTED AT THE INLET AND OUTLET OF THE CULVERT.

ROCK RIP RAP FOR CULVERTS

REVISION DATE

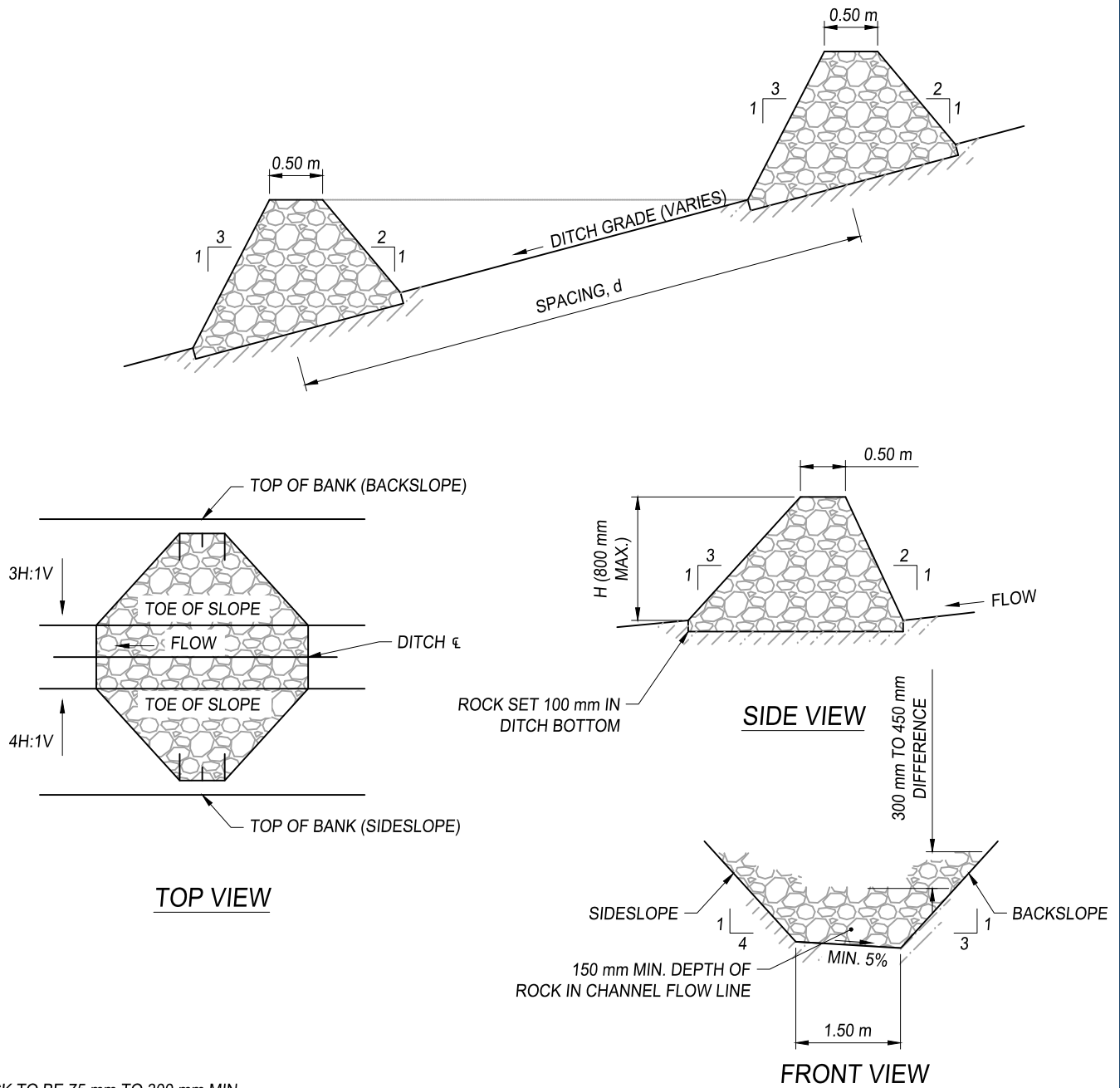
2024

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STANDARD DETAIL #:

6-301



NOTES:

- (1) ROCK TO BE 75 mm TO 300 mm MIN.
- (2) SUITABLE FOR FLOW VELOCITY NOT EXCEEDING 1.5 m/s.
- (3) SUITABLE FOR DRAINAGE AREAS NOT EXCEEDING 4 ha.
- (4) SUITABLE FOR GRADES FROM 5% TO 8%.
- (5) SPACING (d) AND ROCK SIZE (D_{50}) TO BE DETERMINED BY ENGINEER BASED ON HYDRAULIC CONDITIONS.
- (6) THIS DETAIL IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE-SPECIFIC DESIGN IS REQUIRED FROM DESIGNER / ENGINEER.

D_{50} OF ROCK (mm)	MAXIMUM FLOW DEPTH OVER ROCK (mm)
75	50
150	100

SUGGESTED ROCK DIAMETER AND OVERFLOW DEPTHS

ROCK DITCH CHECK

REVISION DATE

2024

REV.

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STANDARD DETAIL #:

6-400



STORMWATER FACILITY

CAUTION

THIS IS A MAN-MADE FACILITY DESIGNED TO HELP CONTROL FLOODING DURING RAINSTORMS AND SNOW MELT. WATER LEVELS, WATER QUALITY AND ICE THICKNESS CAN CHANGE SUDDENLY WITHOUT NOTICE. FOR YOUR SAFETY, RECREATION IS NOT ALLOWED.



NO SWIMMING
OR WADING



NO DUMPING
FISH



NO PETS
IN WATER



NO BOATING



KEEP OFF ICE



NO SKATING



NO SLEDDING



NO THROWING
ROCKS

NOTE:

(1) SIGN TO BE A MINIMUM OF 1400 mm HIGH AND 600 mm WIDE WITH ENGINEER GRADE REFLECTIVE VINYL.

STORMWATER MANAGEMENT FACILITY WARNING SIGN

REVISION DATE

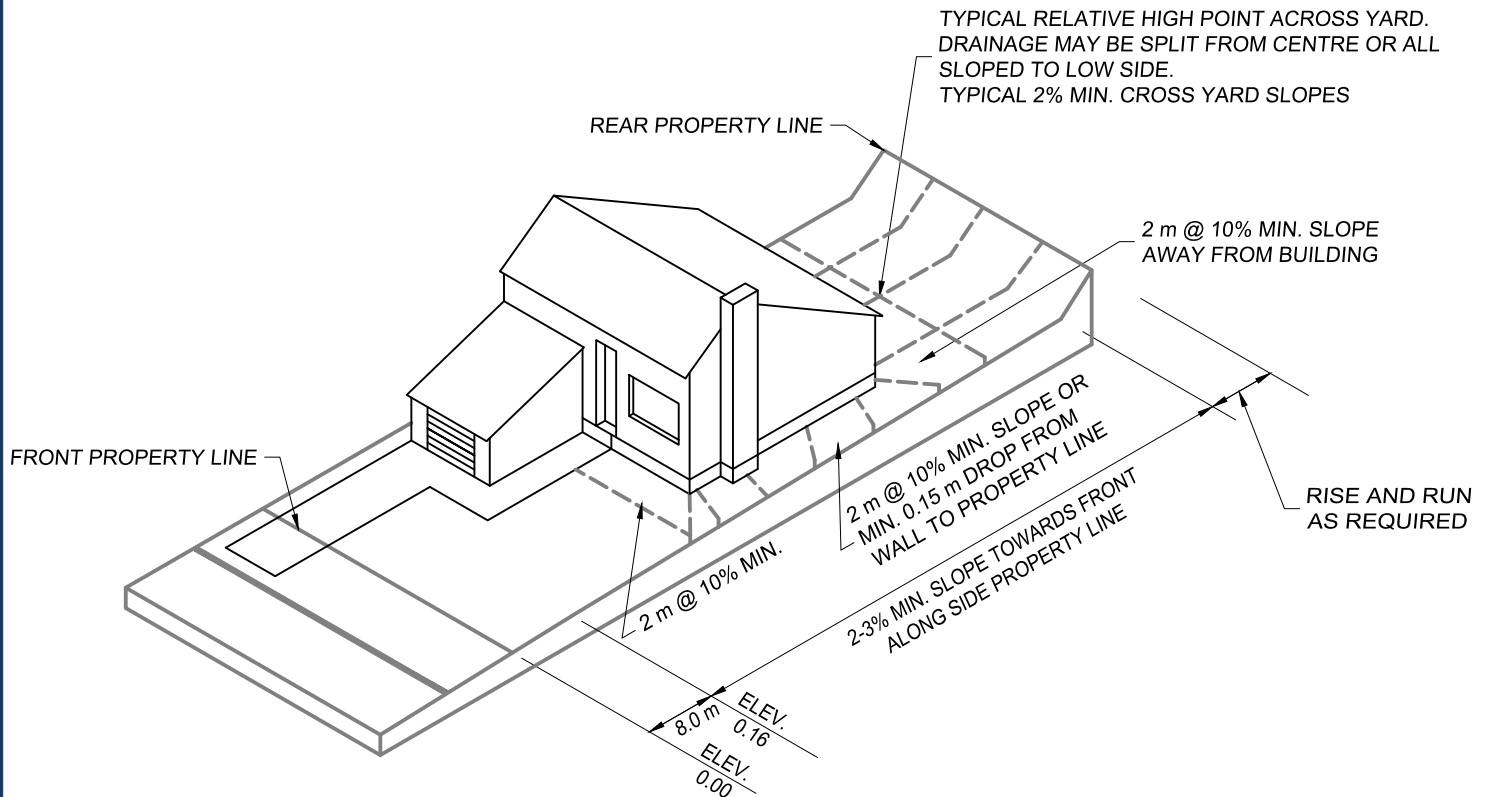
2024

REV.

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STANDARD DETAIL #:

6-500



NOTE:

- (1) MINIMUM SLOPE ALONG PROPERTY LINE IN ALL CONDITIONS IS 1.5%

REAR TO FRONT LOT DRAINAGE - TYPE A

REVISION DATE

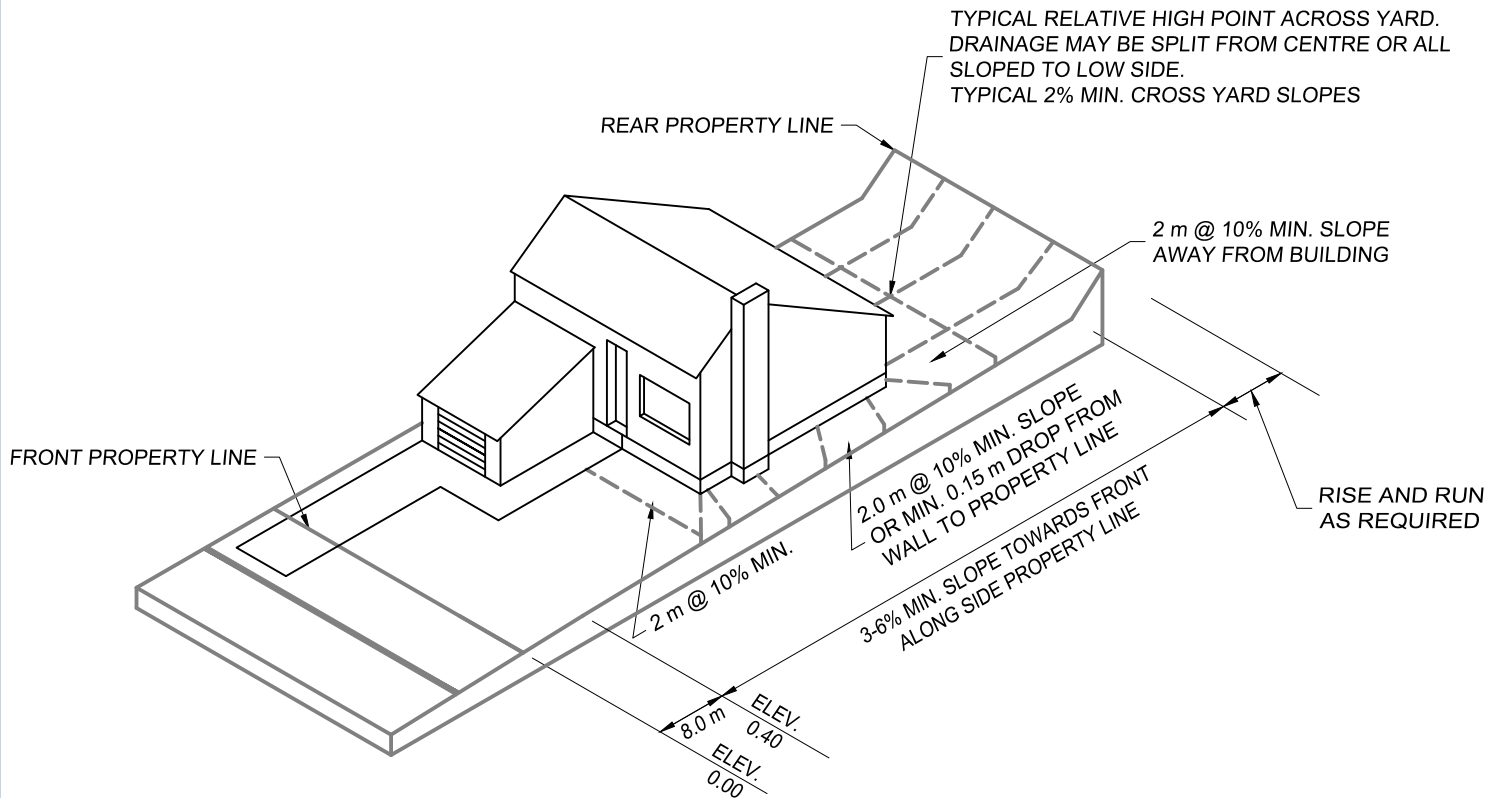
2024

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STANDARD DETAIL #:

6-600



NOTE:

- (1) MINIMUM SLOPE ALONG PROPERTY LINE IN ALL CONDITIONS IS 1.5%

REAR TO FRONT LOT DRAINAGE - TYPE B

REVISION DATE

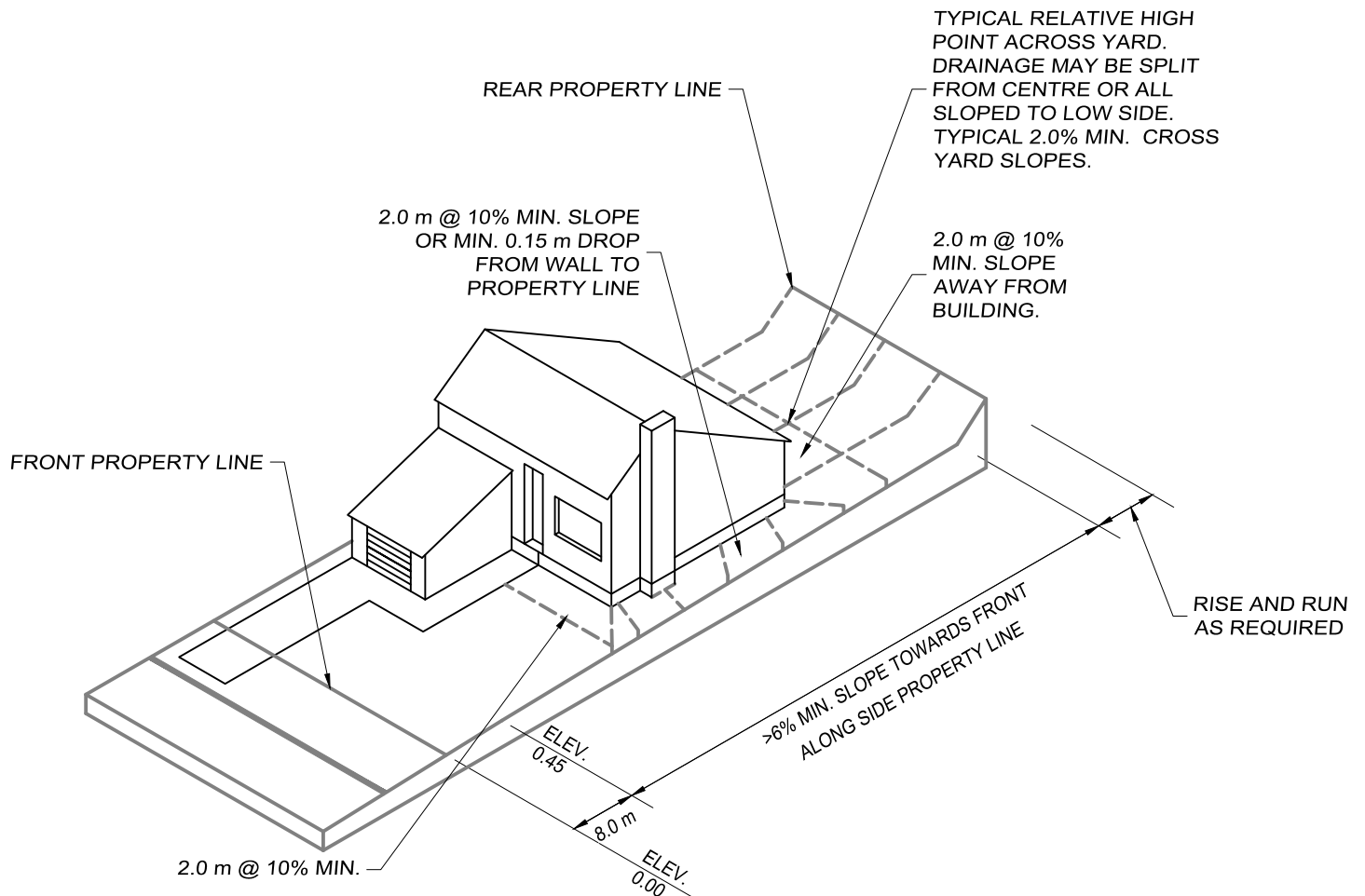
2024

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STANDARD DETAIL #:

6-601



NOTE:

- (1) MINIMUM SLOPE ALONG PROPERTY LINE IN ALL CONDITIONS IS 1.5%

REAR TO FRONT LOT DRAINAGE - TYPE C

REVISION DATE

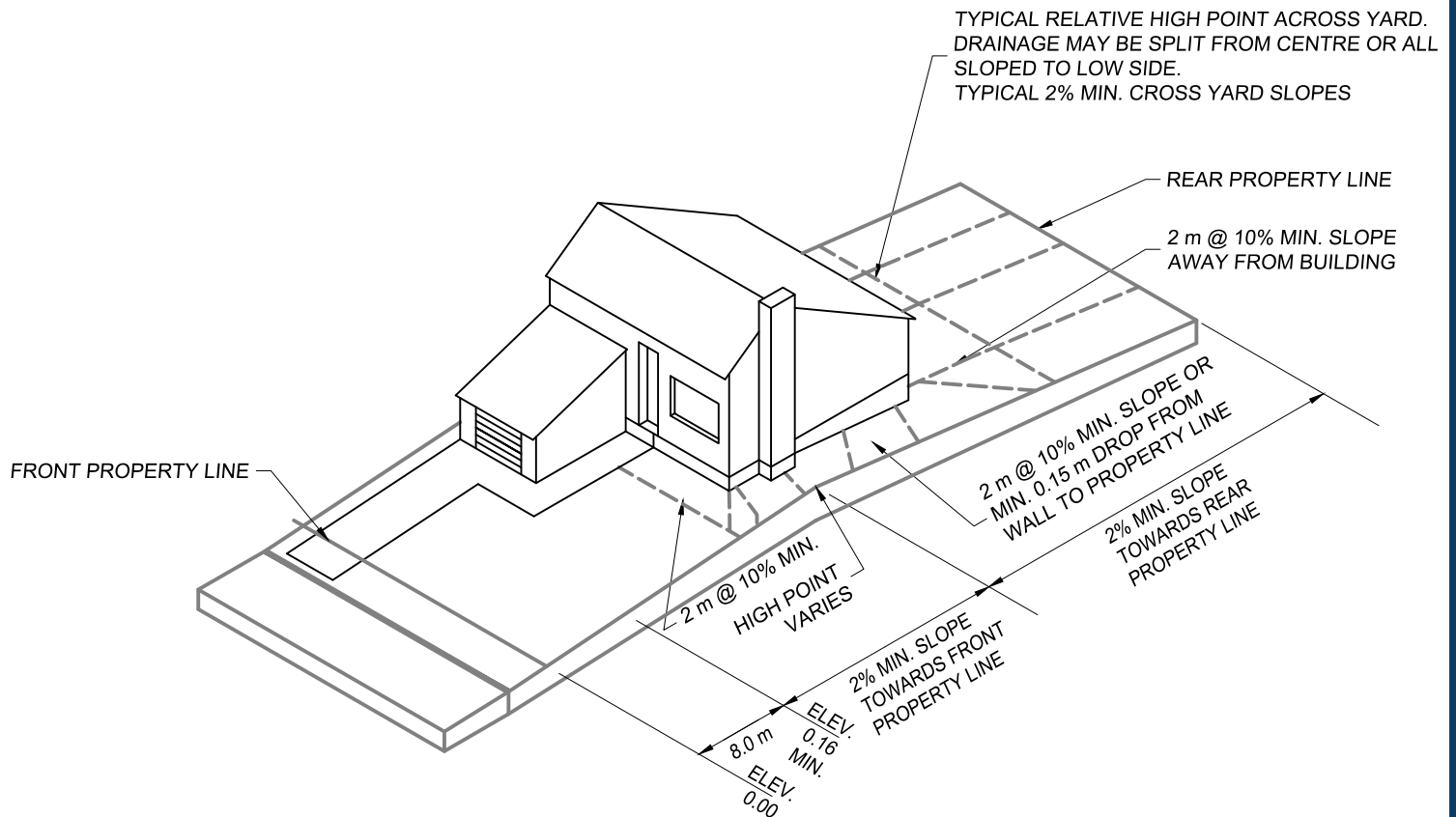
2024

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STANDARD DETAIL #:

6-602



NOTE:

- (1) MINIMUM SLOPE ALONG PROPERTY LINE IN ALL CONDITIONS IS 1.5%

SPLIT LOT DRAINAGE - TYPE D

REVISION DATE

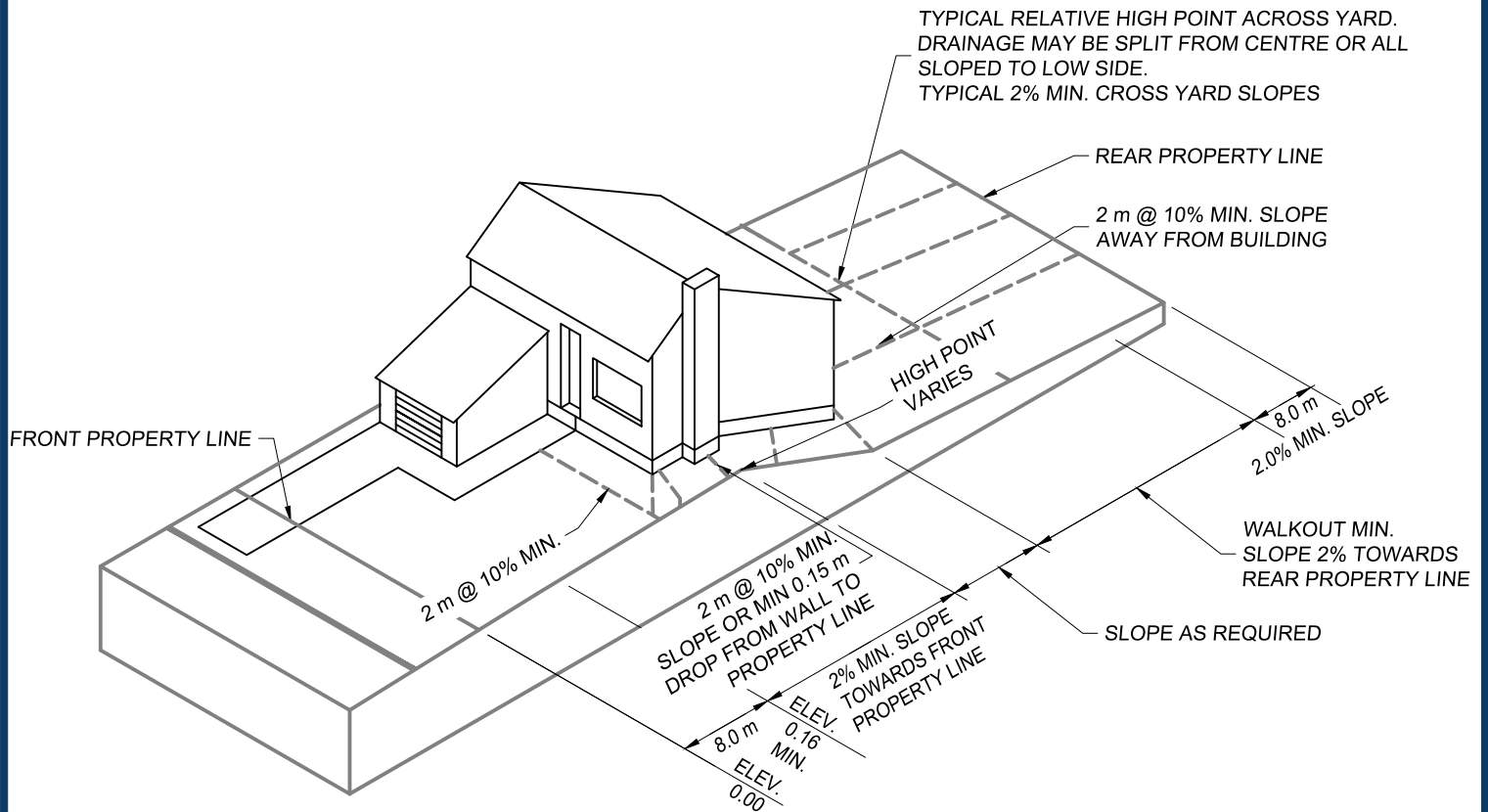
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STANDARD DETAIL #:

6-603



WALKOUT BASEMENT SPLIT LOT DRAINAGE - TYPE W

REVISION DATE

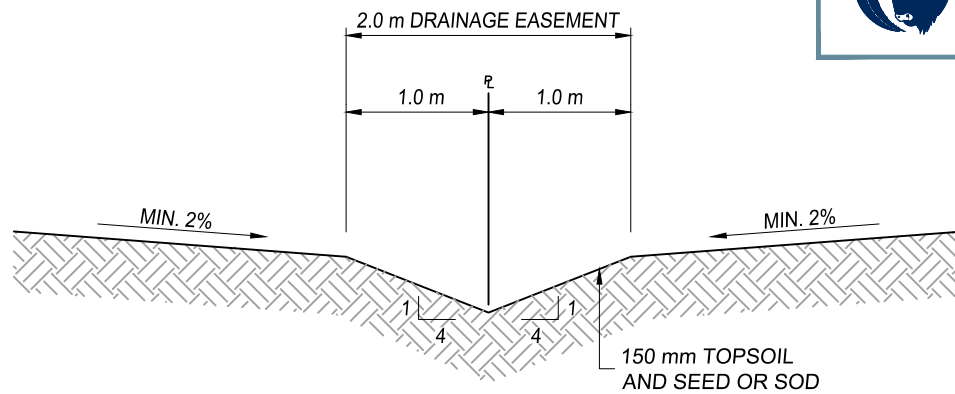
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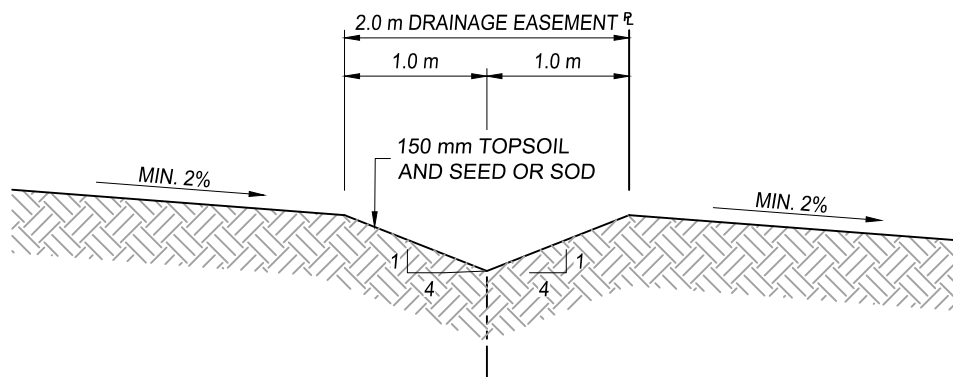
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STANDARD DETAIL #:

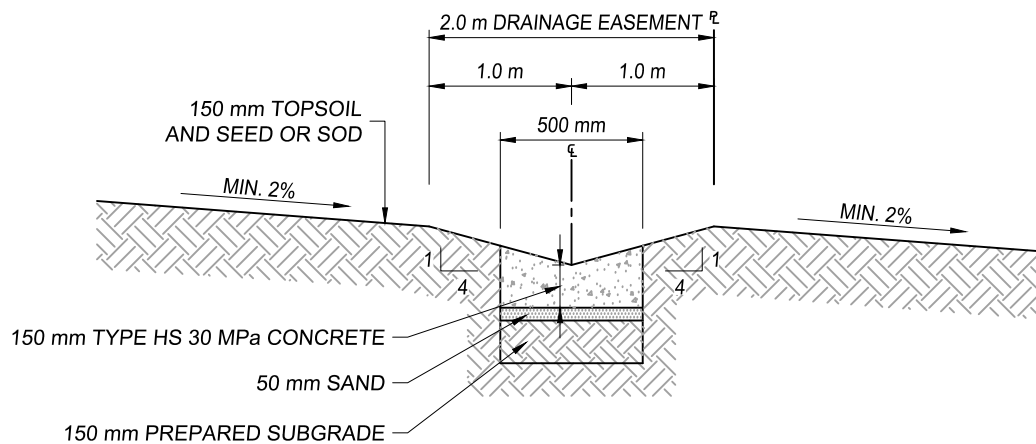
6-604



TYPE 1 GRASSED SWALE



TYPE 2 GRASSED SWALE



CONCRETE SWALE

NOTE:

- (1) CONCRETE SWALE CONTROL JOINTS PLACED AT 3.0 m O.C.

DRAINAGE SWALE

REVISION DATE

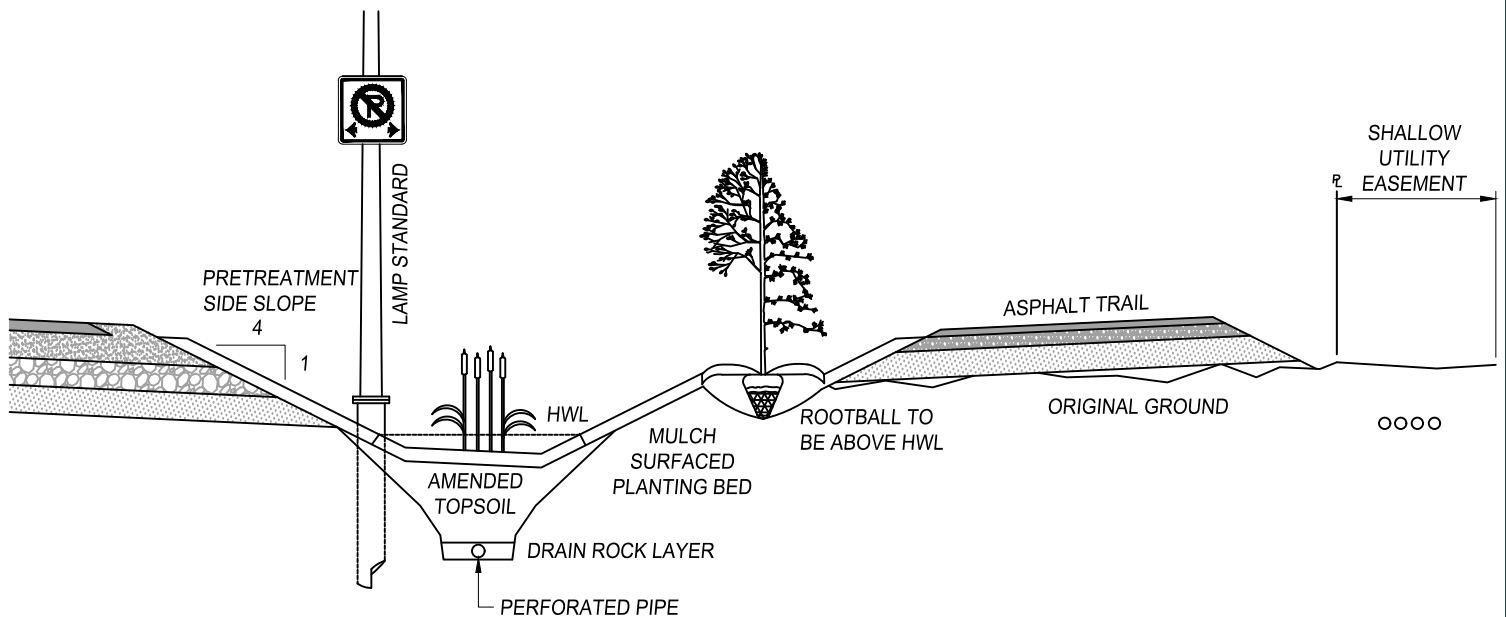
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STANDARD DETAIL #:

6-700



NOTE:

- (1) THIS DETAIL IS CONCEPTUAL IN NATURE AND IS PROVIDED FOR ILLUSTRATIVE PURPOSES. IT DOES NOT CONSTITUTE A DESIGN. REFER TO THE ROADWAY CROSS SECTIONS AND LANDSCAPE DETAILS FOR MORE INFORMATION.

BIOSWALE ALONG RURAL ROADWAY

REVISION DATE

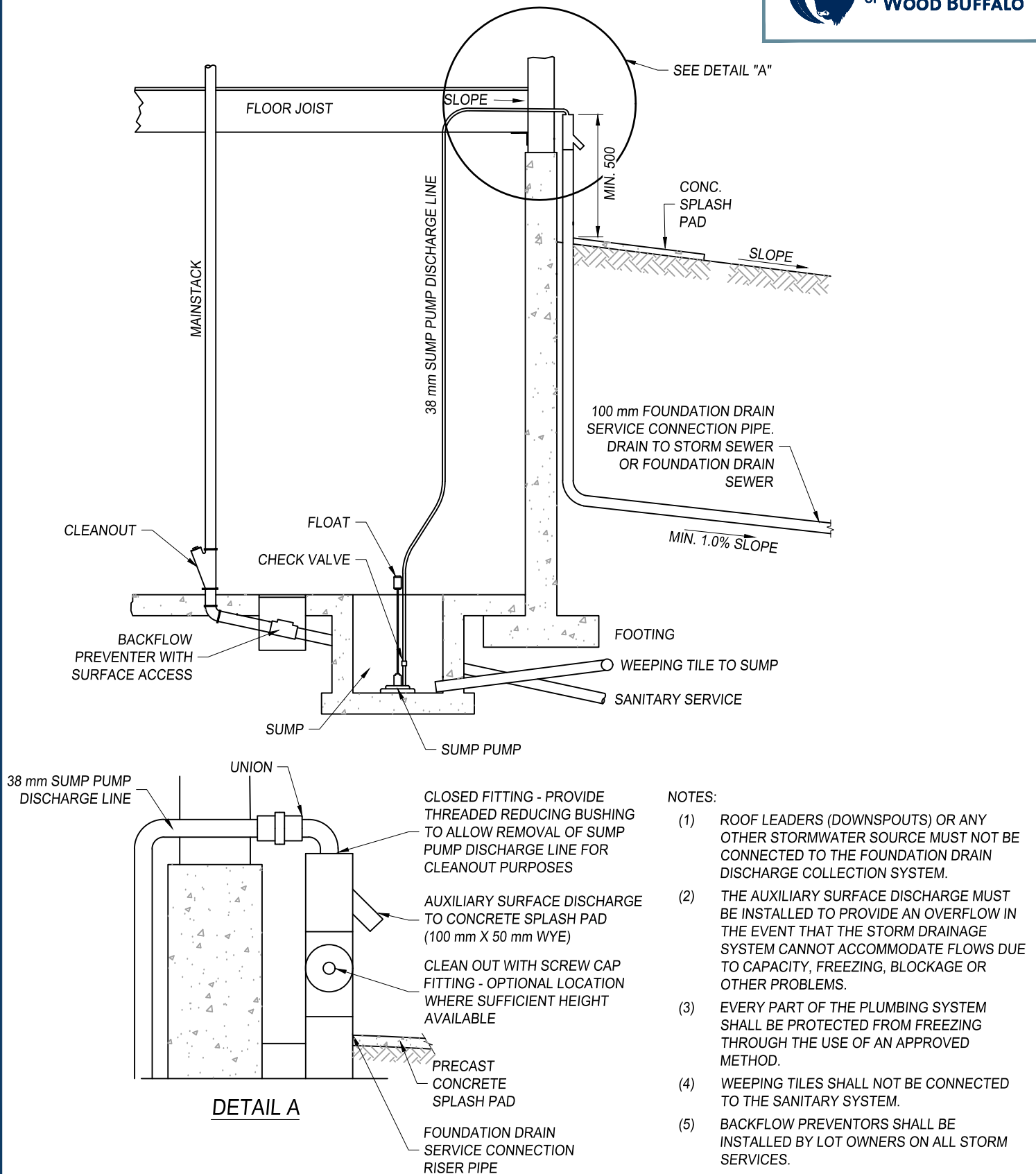
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REV.

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STANDARD DETAIL #:

6-750



WEEPING TILE AND SUMP PUMP DISCHARGE - PROFILE VIEW

REVISION DATE

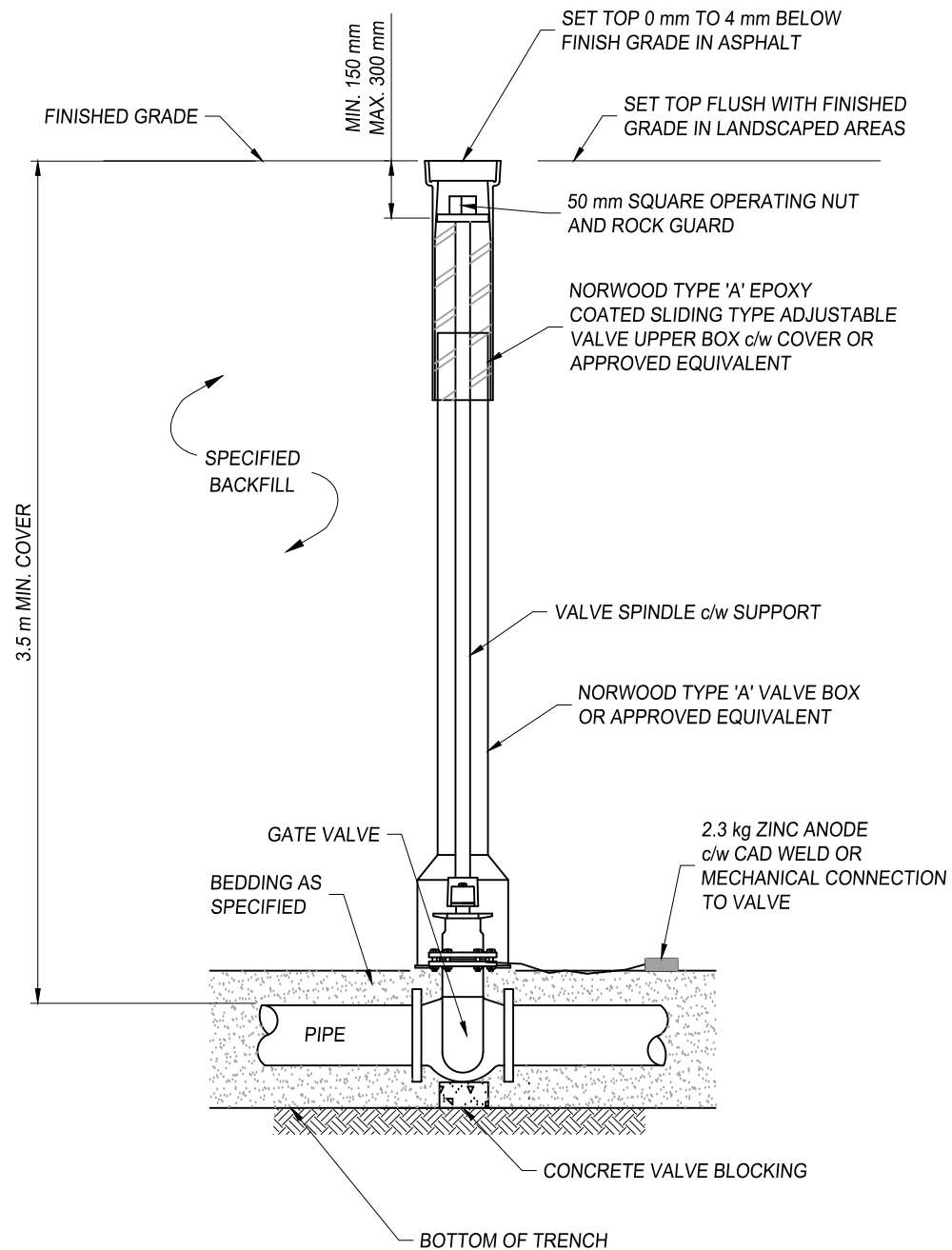
2024

REV.

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STANDARD DETAIL #:

6-800



NOTES:

- (1) VALVES REQUIRE THRUST BLOCKS. CONSULTING ENGINEER TO REVIEW AND PROVIDE RECOMMENDATIONS FOR MECHANICAL JOINT RESTRAINTS.
- (2) ALL GATE VALVES 350 mm AND LARGER SHALL HAVE A BYPASS VALVE BUILT INTO THE BODY OF THE VALVE.
- (3) BOLTS SHALL BE WRAPPED WITH DENSO PASTE AND TAPE.
- (4) VALVE ROD SHALL BE A SINGLE ROD. JOINING MULTIPLE RODS IS NOT PERMITTED.

VALVE INSTALLATION

REVISION DATE

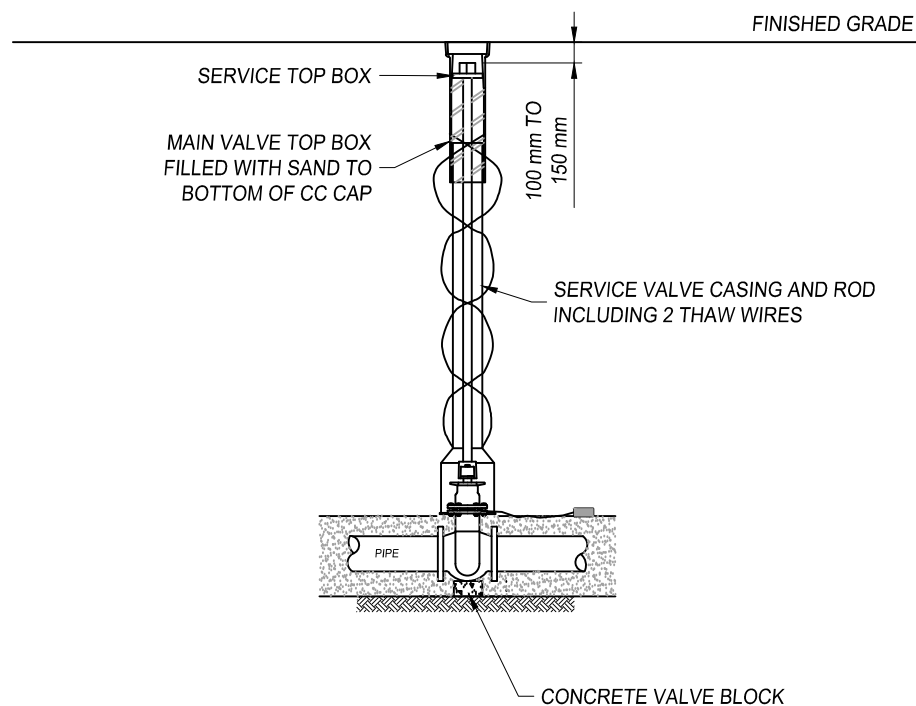
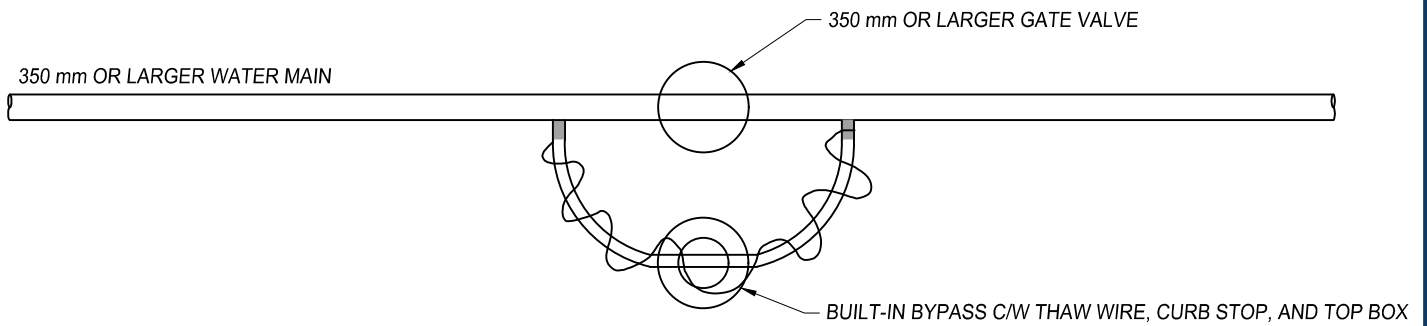
2024

REV.

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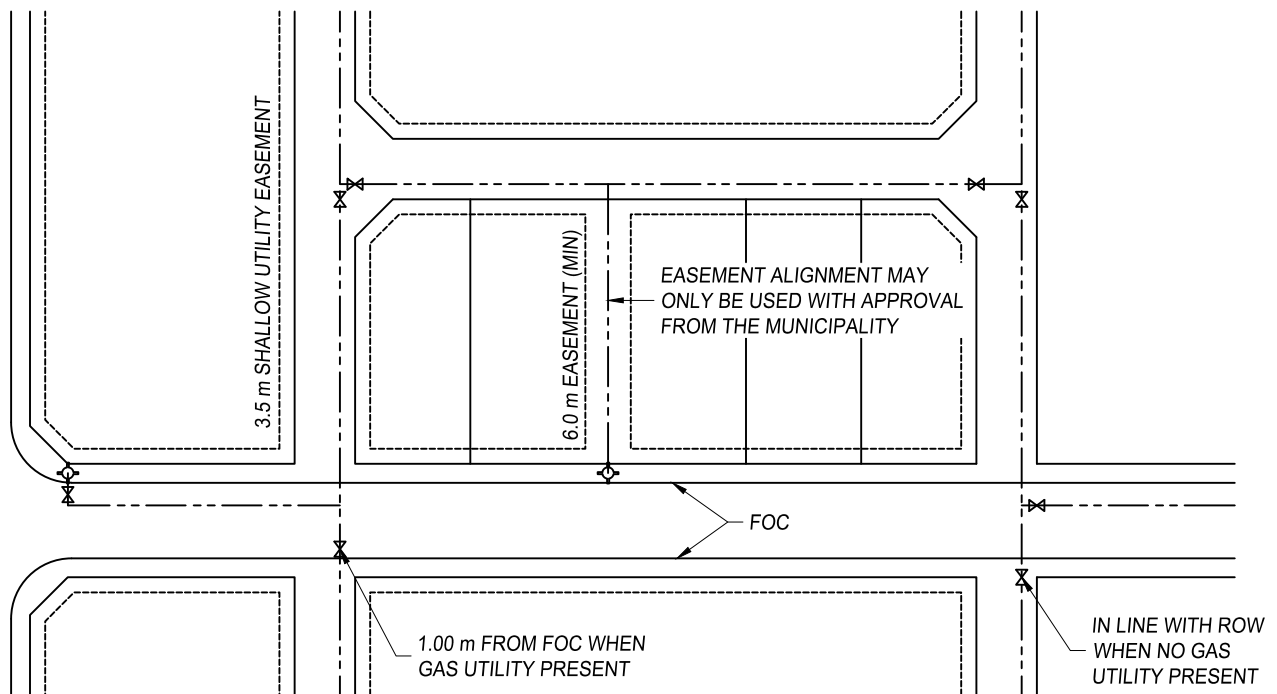
STANDARD DETAIL #:

7-100

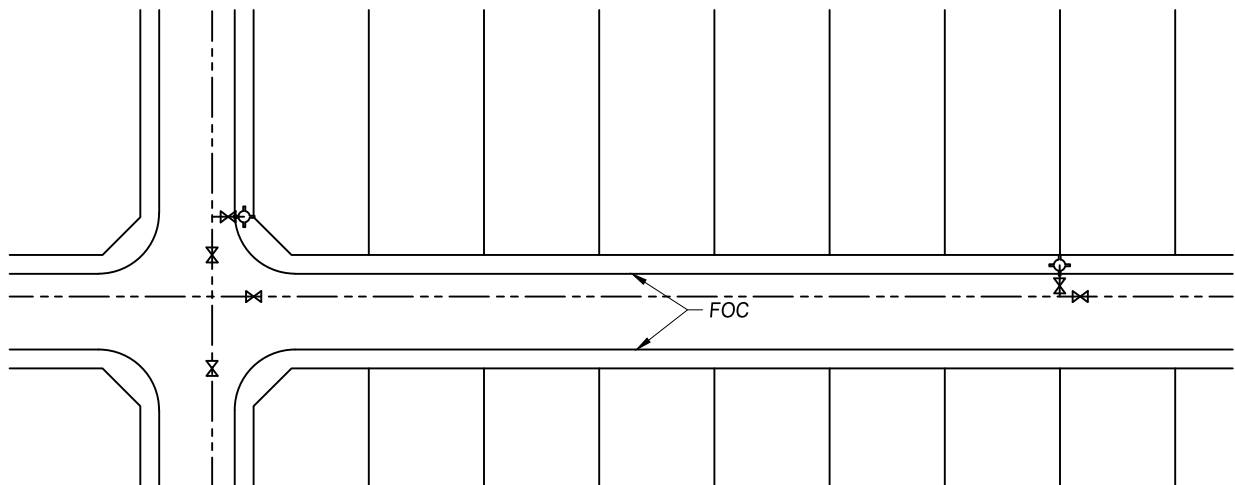


BYPASS VALVE

REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	7-101



LANE SERVICING



ROAD SERVICING

NOTES:

- (1) AVOID USE OF EASEMENTS WHERE A STREET OR LANE ALIGNMENT IS AVAILABLE.
- (2) HYDRANTS TO BE LOCATED NEAR STREET INTERSECTIONS.
- (3) VALVES TO BE LOCATED IN LINE WITH PROPERTY LINES AS ILLUSTRATED.
- (4) HYDRANT IS SHOWN THUS:
- (5) VALVE IS SHOWN THUS:

VALVE AND HYDRANT LOCATIONS

REVISION DATE

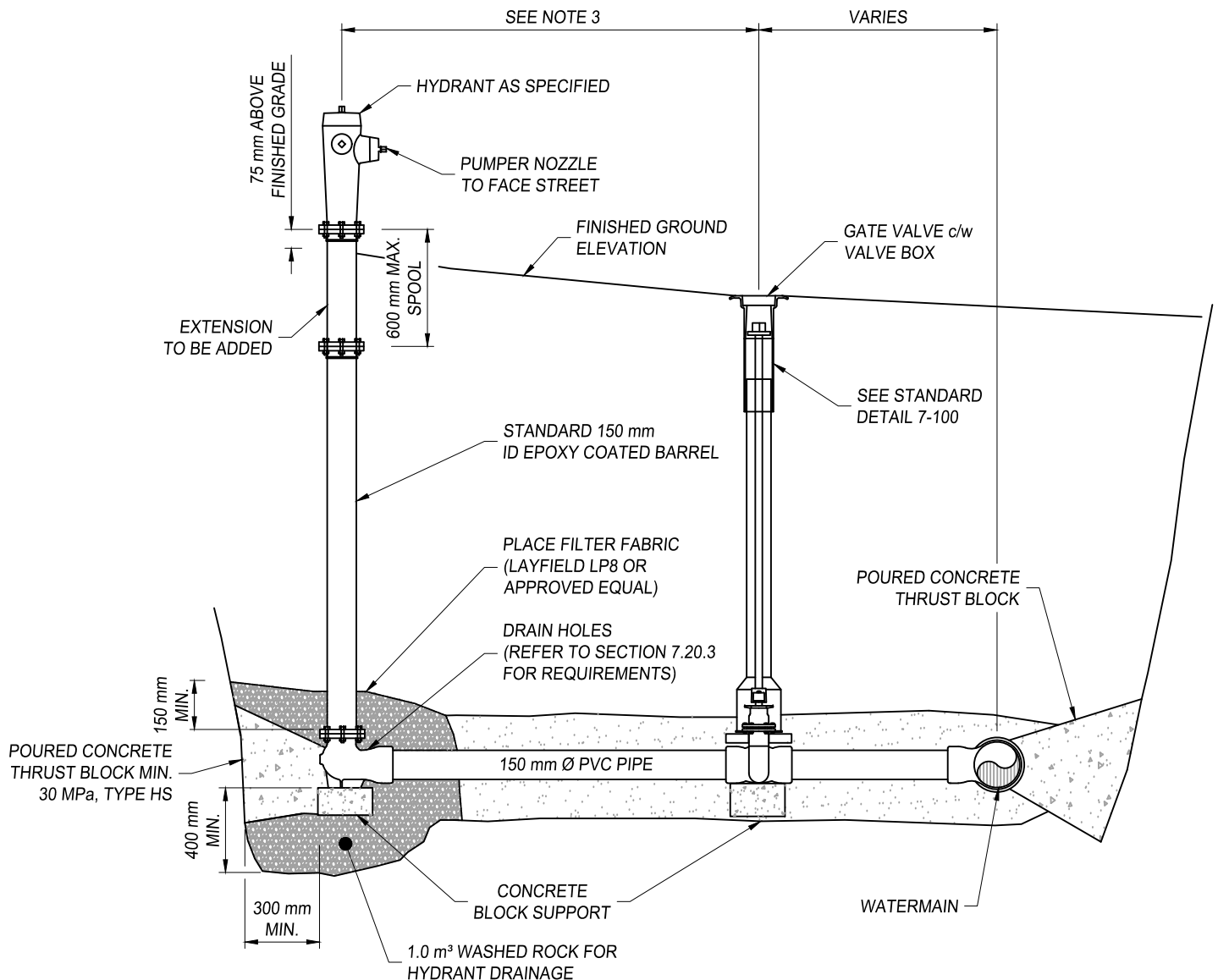
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REV.

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STANDARD DETAIL #:

7-102



NOTES:

- (1) HYDRANT TO BE SET PLUMB WITH BARREL EXTENSIONS TO SUIT DEPTH OF BRANCH. BRANCH TO BE SET LEVEL WITH A MIN. OF 3.5 m OF COVER ABOVE TOP OF PIPE. EXTENSION TO BE INSTALLED BETWEEN HYDRANT AND TOP OF BARREL.
- (2) ALL THRUST BLOCKING TO BE AGAINST UNDISTURBED TRENCH WALL WITH DRAIN HOLES CLEAR OF CONCRETE.
- (3) HYDRANT VALVE SHALL BE LOCATED A MINIMUM OF 1 m AND A MAXIMUM OF 2 m FROM THE HYDRANT, PREFERABLY WITHIN A LANDSCAPED AREA. IN NO CASE SHALL A HYDRANT VALVE BE LOCATED WITHIN A SIDEWALK.
- (4) VALVE BOX TO BE INSTALLED IN VERTICAL POSITION WITH TOP FLUSH WITH FINISHED GRADE.
- (5) HYDRANT SHALL BE COMPRESSION TYPE AS SPECIFIED.
- (6) ALL CAST IRON VALVES AND FITTINGS SHALL BE CATHODICALLY PROTECTED BY 2.3 kg SACRIFICIAL ANODES; HYDRANT SHALL BE CATHODICALLY PROTECTED BY A 5.5 kg SACRIFICIAL ANODE.
- (7) HYDRANT TO BE SUPPLIED WITH A BREAKAWAY FLANGE ON TOP OF A SPOOL PIECE (MAXIMUM 600 mm).
- (8) THE HYDRANT, HYDRANT VALVE, AND ALL WATERMAIN JOINTS WITHIN THE HYDRANT LEAD SHALL BE MECHANICALLY RESTRAINED.

HYDRANT INSTALLATION

REVISION DATE

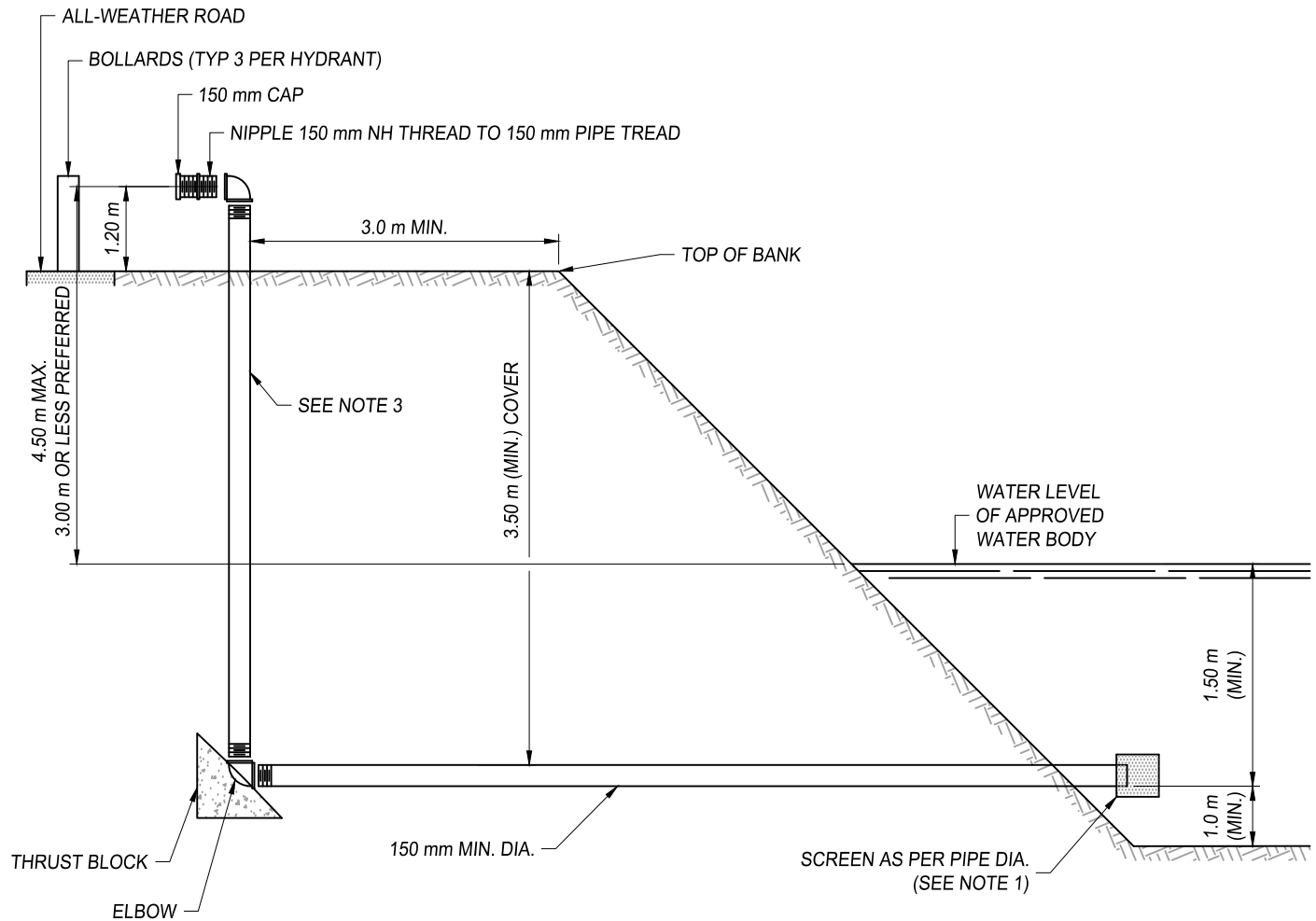
2024

REV.

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STANDARD DETAIL #:

7-200



NOTES:

- (1) WATER FOR FIRE FIGHTING SHALL BE AVAILABLE ON A YEAR-ROUND BASIS, CONSIDERING THE 50-YEAR DROUGHT AND WINTER ICE THICKNESS.
- (2) MEASURES SHALL BE TAKEN TO PREVENT THE SCREEN FROM GETTING INUNDATED WITH VEGETATION. CONSULTING ENGINEER SHALL SUBMIT DETAILS AS PART OF ENGINEERING DESIGN SUBMISSION.
- (3) STAND PIPE TO BE INSULATED TO BELOW FROST DEPTH.
- (4) VEGETATION MUST BE CLEARED FOR A MINIMUM OF 0.9 m RADIUS FROM AROUND HYDRANTS.
- (5) BOLLARDS MUST BE A MINIMUM OF 0.9 m FROM HYDRANTS.
- (6) SCREEN/STRAINER SHOULD BE A MINIMUM OF 150 mm DIAMETER.

EXPLODED VIEW OF DRY HYDRANT

REVISION DATE

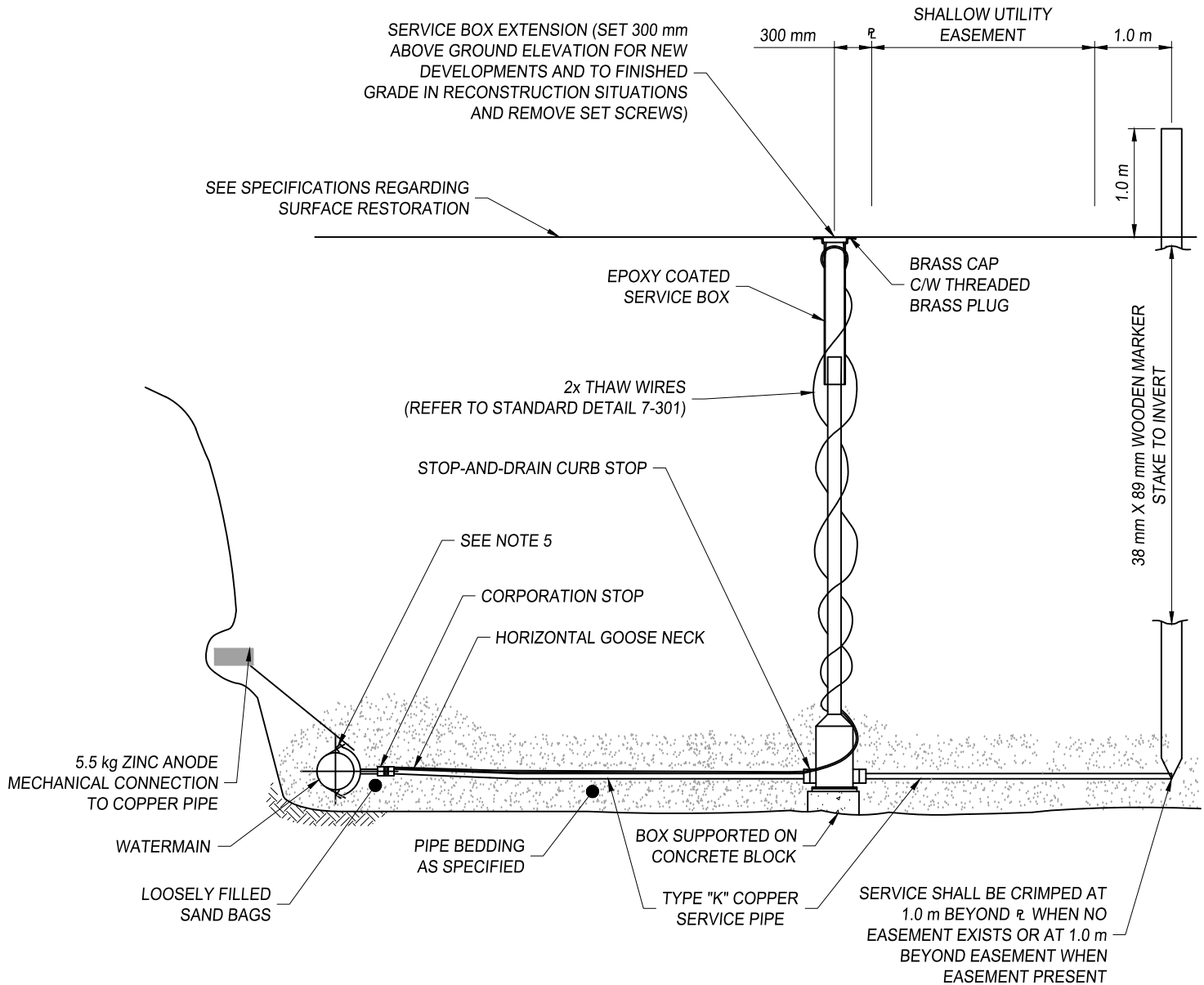
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STANDARD DETAIL #:

7-201



NOTES:

- (1) SERVICES TO BE INSTALLED AT RIGHT ANGLES TO WATERMAINS WHERE POSSIBLE.
- (2) SERVICE BOXES TO BE INSTALLED PLUMB.
- (3) DIAMETER OF COPPER SERVICE PIPE TO BE UNIFORM FROM CORPORATION STOP TO METER.
- (4) MINIMUM COVER OVER SERVICE PIPES TO BE 3.0 m AT THE PROPERTY LINE.
- (5) DIRECT TAP OR SERVICE SADDLE FOR WATERMAINS ≤ 300 mm DIA..
SERVICE SADDLE FOR WATERMAINS > 300 mm DIA. OR IN RETROFIT SITUATIONS.
- (6) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT, OR AS PER GEOTECHNICAL RECOMMENDATIONS, WHICHEVER IS MORE STRINGENT.

WATER SERVICE CONNECTION

REVISION DATE

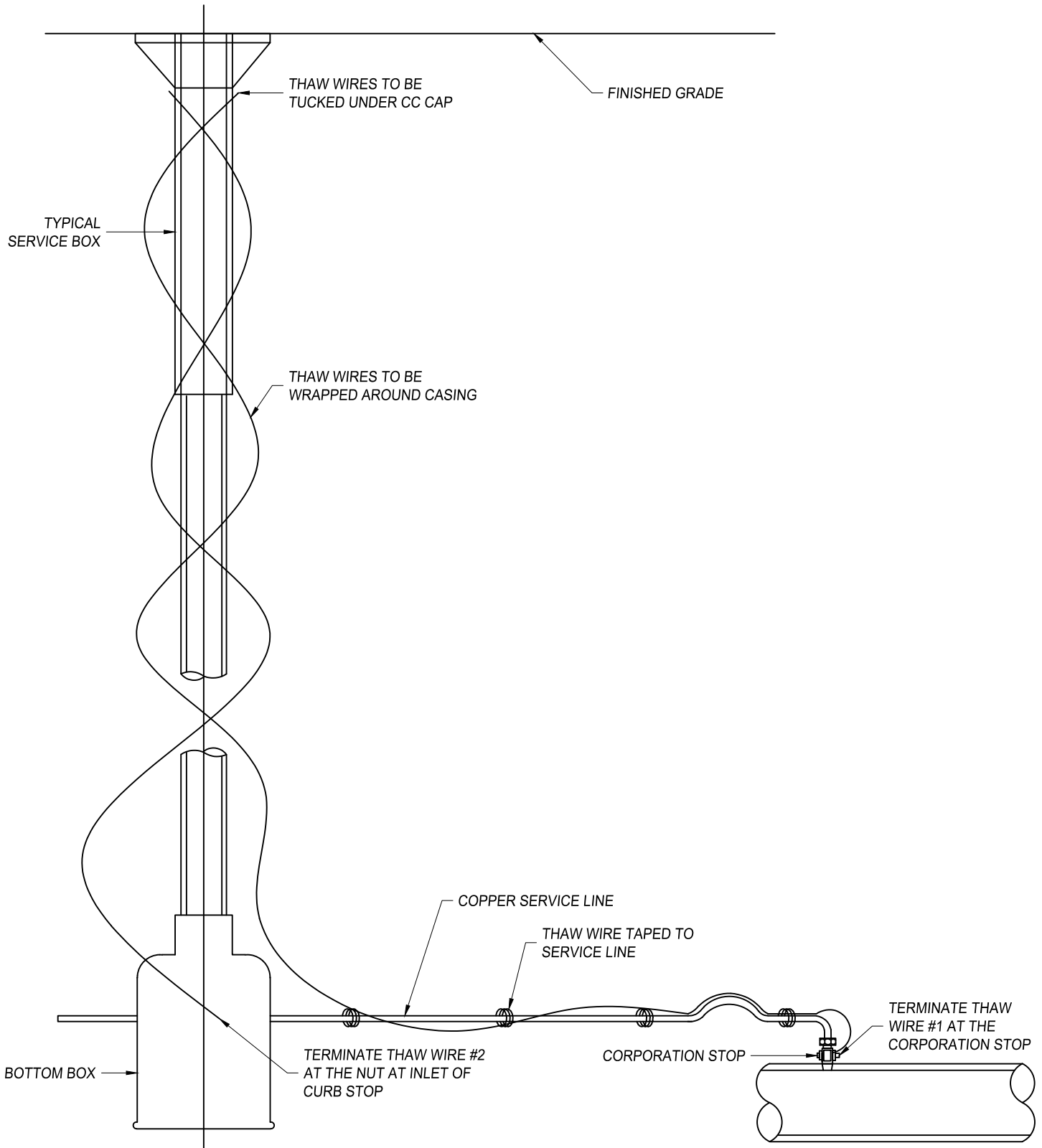
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STANDARD DETAIL #:

7-300



THAW WIRE FOR WATER SERVICE

REVISION DATE

2024

REV.

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STANDARD DETAIL #:

7-301



IF SERVICE ABANDONED AND NOT
REMOVED INSIDE PRIVATE PROPERTY,
CRIMP COPPER WATER SERVICE AND
INSTALL MANUFACTURED PLUGS ON
SANITARY AND STORM SERVICES

PROPERTY LINE

REMOVE & DISPOSE STORM SERVICE
WITHIN THE MUNICIPAL RIGHT-OF-WAY

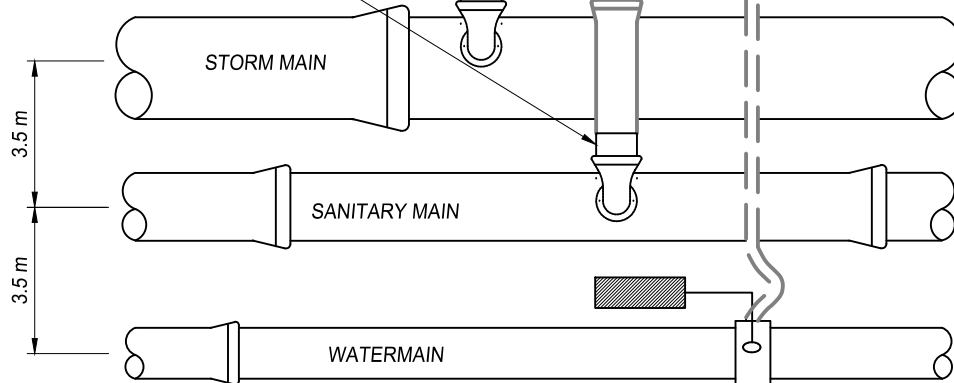
REMOVE & DISPOSE CURB STOP
AND SEATING BLOCK

REMOVE & DISPOSE SANITARY
SERVICE WITHIN THE MUNICIPAL
RIGHT-OF-WAY

REMOVE & DISPOSE WATER SERVICE
WITHIN THE MUNICIPAL RIGHT-OF-WAY

FACE OF CURB

EXISTING SERVICE SADDLE/TEE REMAINS.
INSTALL MANUFACTURED PLUG/CAP.



CLOSE CORPORATION STOP AND CUT SERVICE AT
GOOSENECK. CONFIRM THE ABANDONED
SERVICE DOES NOT LEAK PRIOR TO BACKFILLING.

SERVICE ABANDONMENT

REVISION DATE

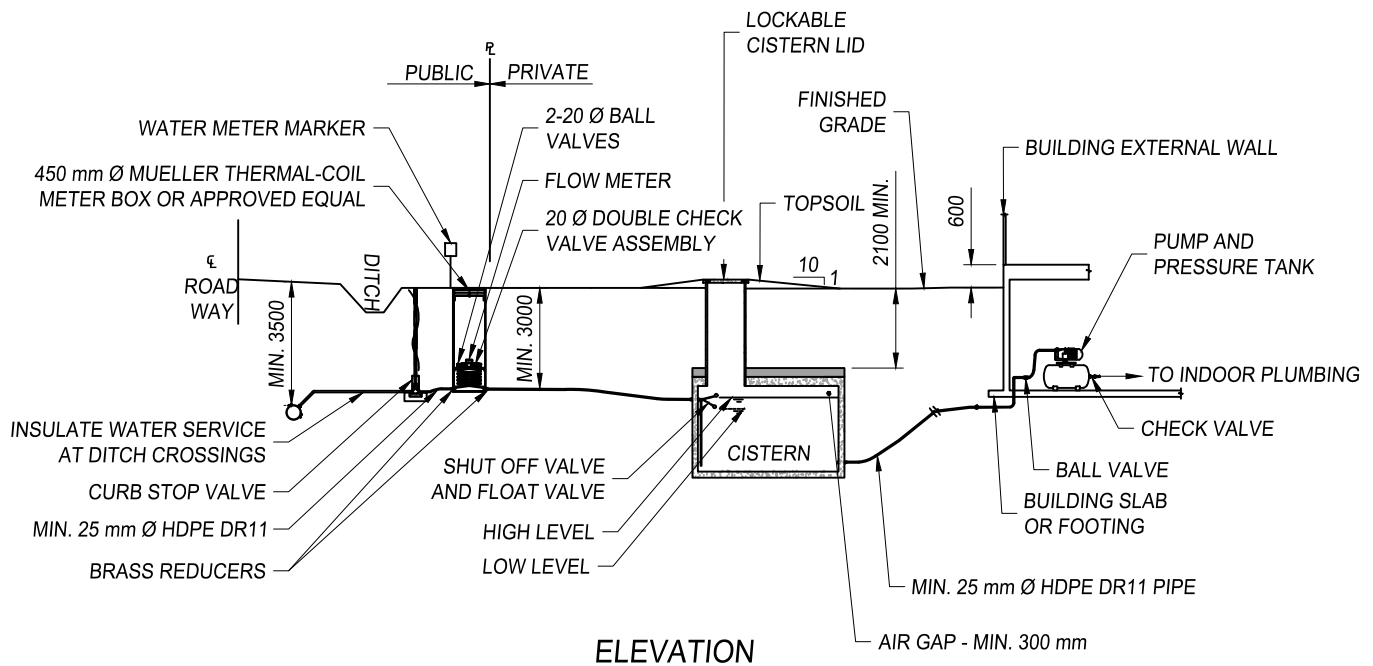
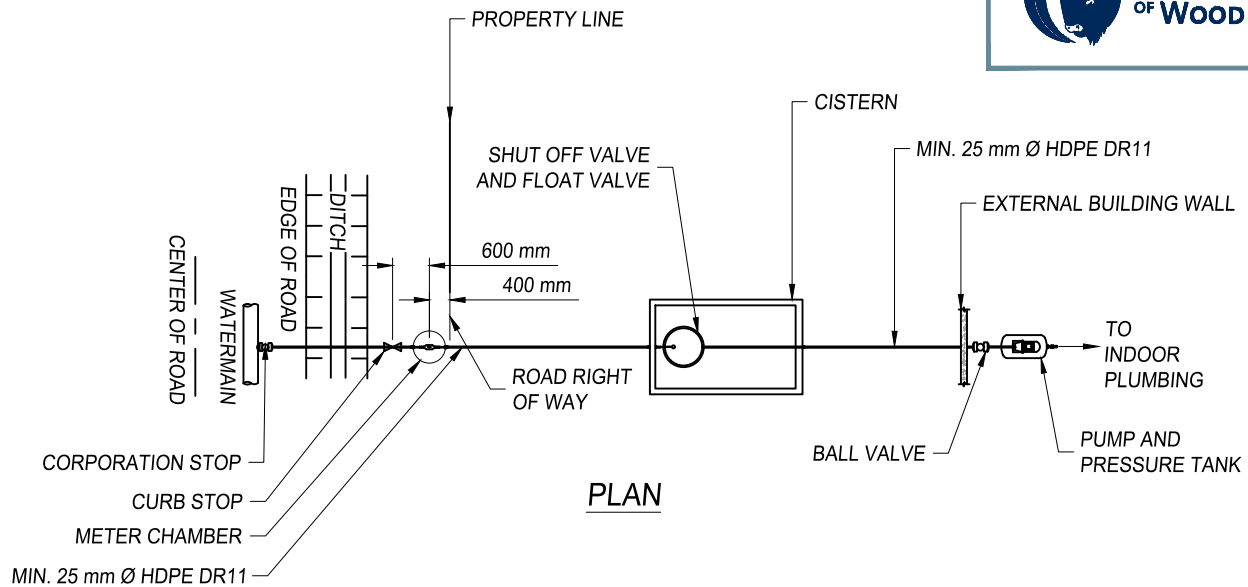
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STANDARD DETAIL #:

7-302



NOTES:

- (1) FLOW METER TO BE INSTALLED BY MUNICIPALITY.
- (2) DIAMETER OF HDPE SERVICE PIPE TO BE UNIFORM FROM CORPORATION STOP TO WATER METER.
- (3) MINIMUM COVER OVER SERVICE PIPES TO BE 3.0 m AS SHOWN.
- (4) SERVICE CONNECTION RECORDS TO SHOW ELEVATIONS AND LOCATION OF SERVICE FITTINGS.
- (5) ALL DIMENSIONS SHOWN IN MILLIMETRES UNLESS NOTED OTHERWISE.
- (6) THIS DETAIL IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE-SPECIFIC DESIGN IS REQUIRED FROM DESIGNER / ENGINEER.

RURAL RESIDENTIAL TRICKLE FILL SYSTEM

REVISION DATE

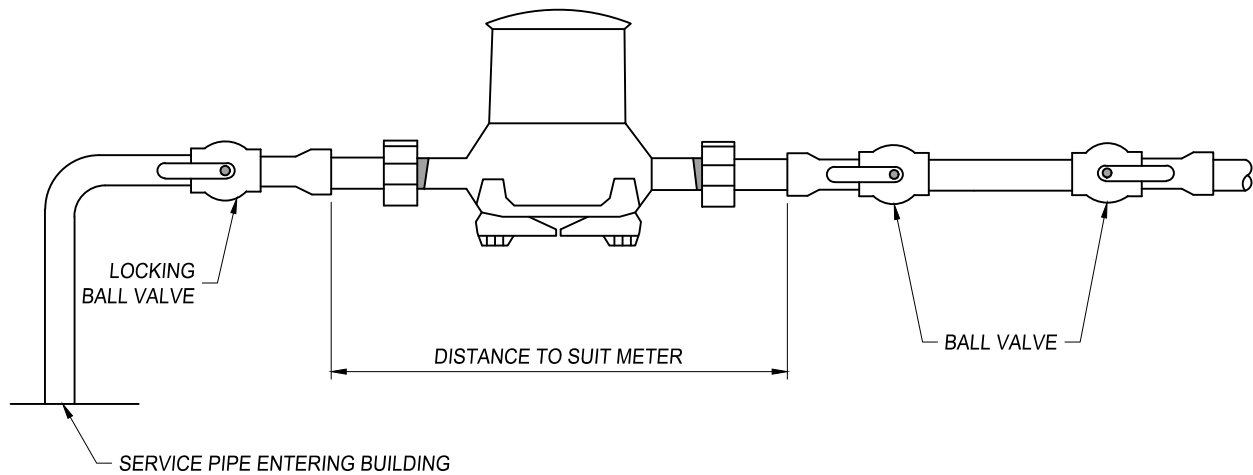
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STANDARD DETAIL #:

7-303



NOTES:

- (1) THE WATER METER SHALL BE INSTALLED NO MORE THAN 600 mm FROM THE POINT OF ENTRY OF WATER SERVICE, IN A HORIZONTAL AND UPRIGHT POSITION. THE REGISTER MUST BE UPRIGHT AND VISIBLE.
- (2) THE DISTANCE BETWEEN THE FLOOR & METER SHALL NOT BE LESS THAN 300 mm OR NOT MORE THAN 600 mm.
- (3) ALL WATER METERS AND BACKFLOW PREVENTERS SHALL HAVE A BALL VALVE INSTALLED IMMEDIATELY UPSTREAM AND IMMEDIATELY DOWNSTREAM.
- (4) WATER METER MUST BE ACCESSIBLE WITH 1.8 m HEIGHT CLEARANCE.
- (5) WATER METER MUST HAVE 0.6 m CLEARANCE ON ALL SIDES AND BE UNOBSTRUCTED.
- (6) SEE STANDARD DWG. NO. 7-300 FOR SERVICING DETAILS.
- (7) OWNERS MUST PROTECT METER FROM HEAT OR FROST DAMAGE.
- (8) FOR MANUFACTURED HOMES, SKIRTING MUST BE SECURE AND WATERLINES MUST BE HEAT TAPED. ONE WRAP OF HEAT TAPE AROUND THE BASE OF THE METER IS REQUIRED. SERVICE PIPE ENTERING HOME TO HAVE A PLASTIC TRACING CONDUIT AND WRAPPED WITH 50 mm URETHANE FOAM INSULATION (OR APPROVED EQUAL). ENDS OF CONDUIT TO BE SEALED WITH MASTIC OR HEAT SHRINK TAPE. THE MUNICIPALITY WILL PROVIDE "METERJACKET" BOX AS PART OF THEIR INSTALLATION.

WATER METER INSTALLATION FOR
SERVICES UP TO 50 mm

REVISION DATE

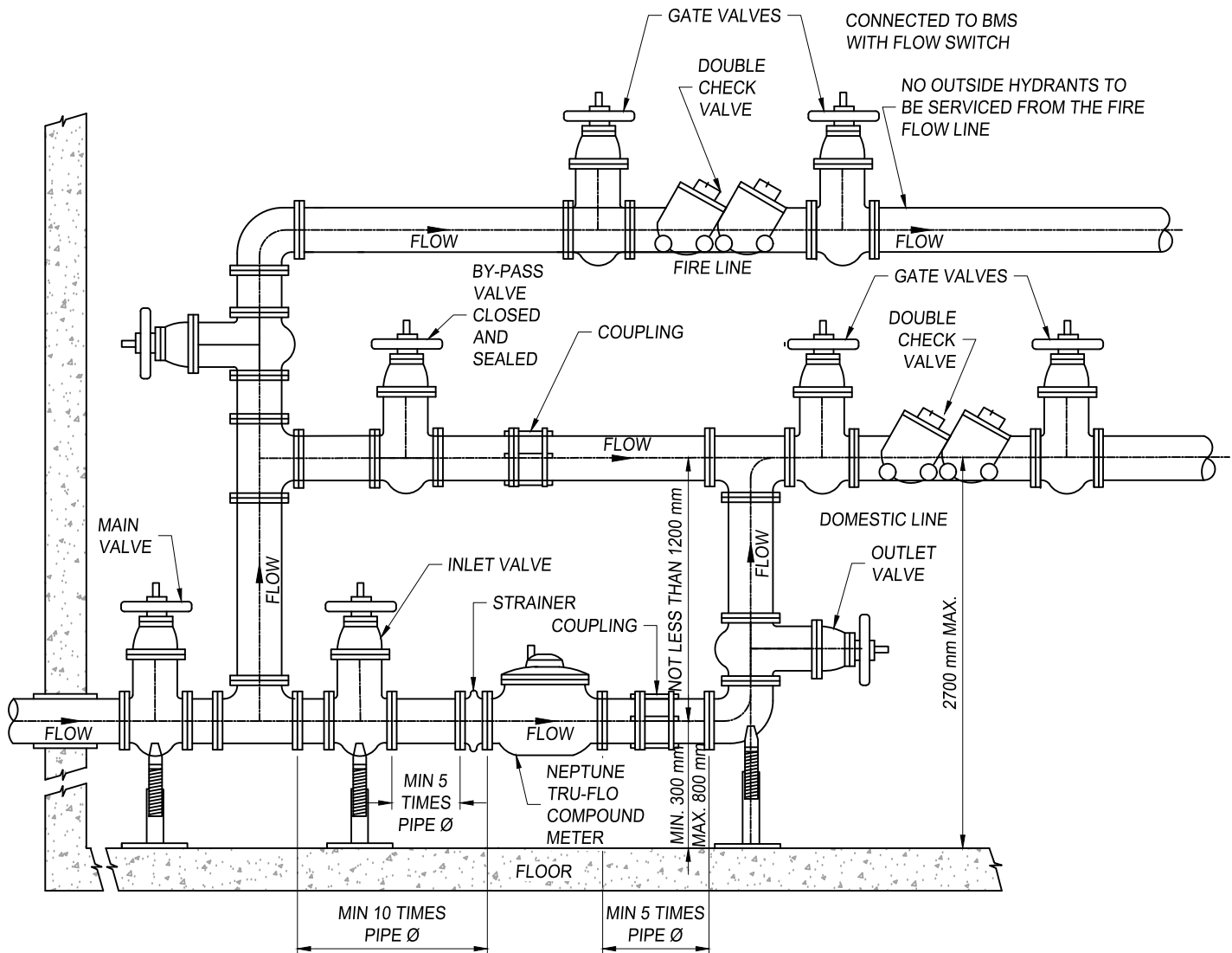
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STANDARD DETAIL #:

7-304



NOTES:

- (1) WATER METER SHALL BE INSTALLED NO MORE THAN 2000 mm FROM THE POINT OF ENTRY OF WATER SERVICE.
- (2) FOR SIZING OF WATER METERS CONTACT THE MUNICIPALITY.
- (3) METER MUST BE INSTALLED IN A HORIZONTAL AND UPRIGHT POSITION. THE REGISTER MUST BE UPRIGHT AND VISIBLE.
- (4) MINIMUM DISTANCE BETWEEN WALL AND METER MUST BE 300 mm.
- (5) MINIMUM DISTANCE BETWEEN FLOOR AND METER SHOULD BE 300 mm AND NO MORE THAN 1.0 m.
- (6) A FLOOR DRAIN IS TO BE PROVIDED.
- (7) THE AREA IN FRONT OF THE METER SHALL BE FREE OF OBSTRUCTIONS FOR 600 mm TO ALLOW FOR READING AND SERVICING.
- (8) GATE VALVES ARE REQUIRED IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE WATER METER & DOUBLE CHECK VALVE.
- (9) OWNER MUST PROTECT METER FROM HEAT OR FROST DAMAGE.
- (10) ALL WATER METERS FOR SERVICES LARGER THAN 25 mm SHALL BE INSTALLED BY THE OWNER. THE MUNICIPALITY SHALL INSPECT AND OPERATE THE METER.
- (11) NOT APPLICABLE FOR DEVELOPMENTS WITH OUTSIDE HYDRANT.

**WATER METER - BUILDING INSTALLATION SERVICE
OVER 50 mm WITH DEDICATED FIRE FLOW LINE**

REVISION DATE

2024

REV.

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STANDARD DETAIL #:

7-305

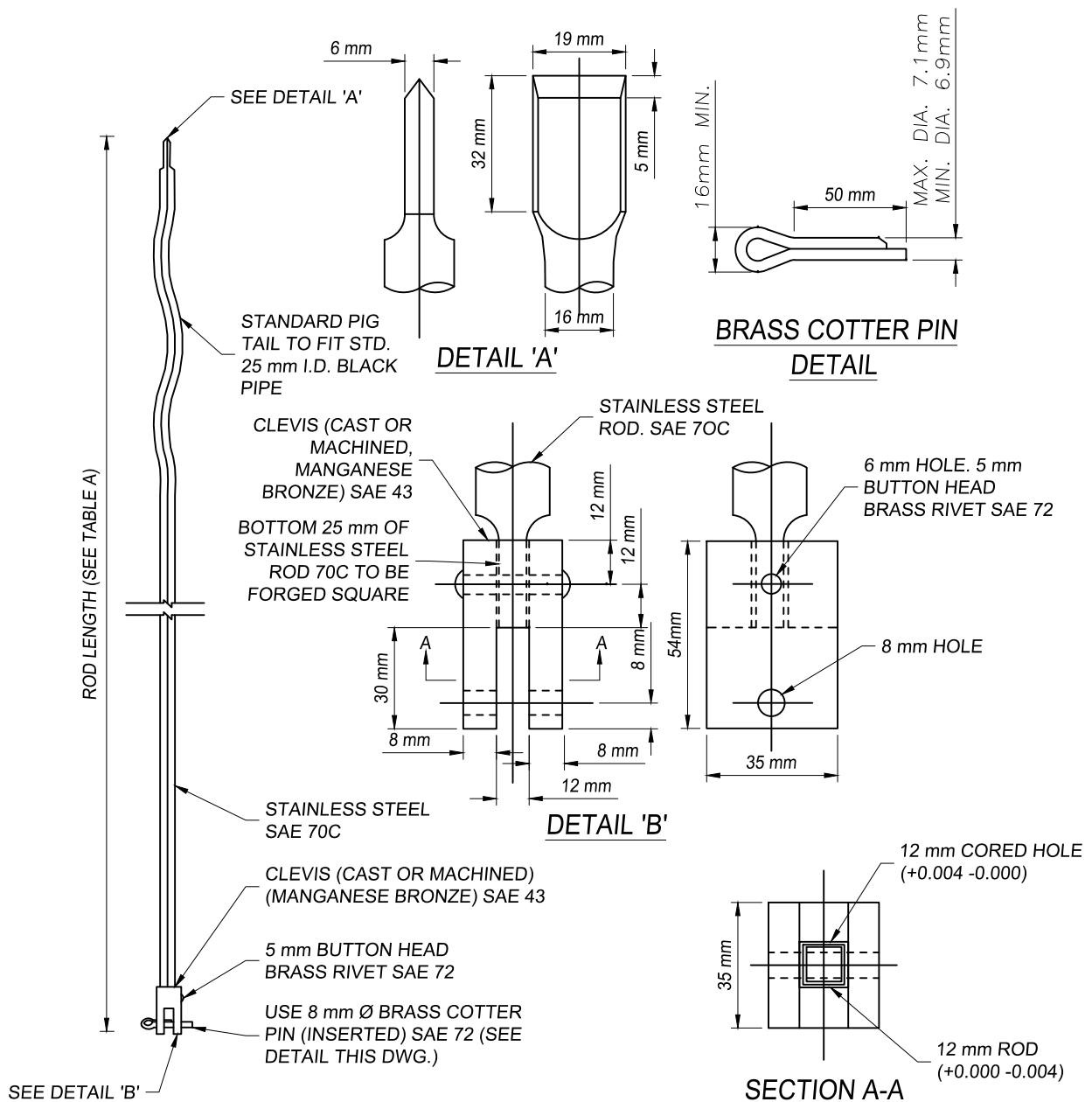


TABLE A		
DEPTH OF COVER	ROD LENGTH	CASING LENGTH
2.4 m	2.15 m	1.97 m
2.7 m	2.45 m	2.27 m
3.0 m	2.75 m	2.57 m
3.3 m	3.05 m	2.87 m

NOTE:

- (1) SERVICE VALVE RODS ARE NOT TO BE CUT OR MODIFIED IN ANY WAY.

SERVICE VALVE ROD FOR 19 mm, 25 mm, 38 mm, 50 mm
SERVICE VALVES

REVISION DATE

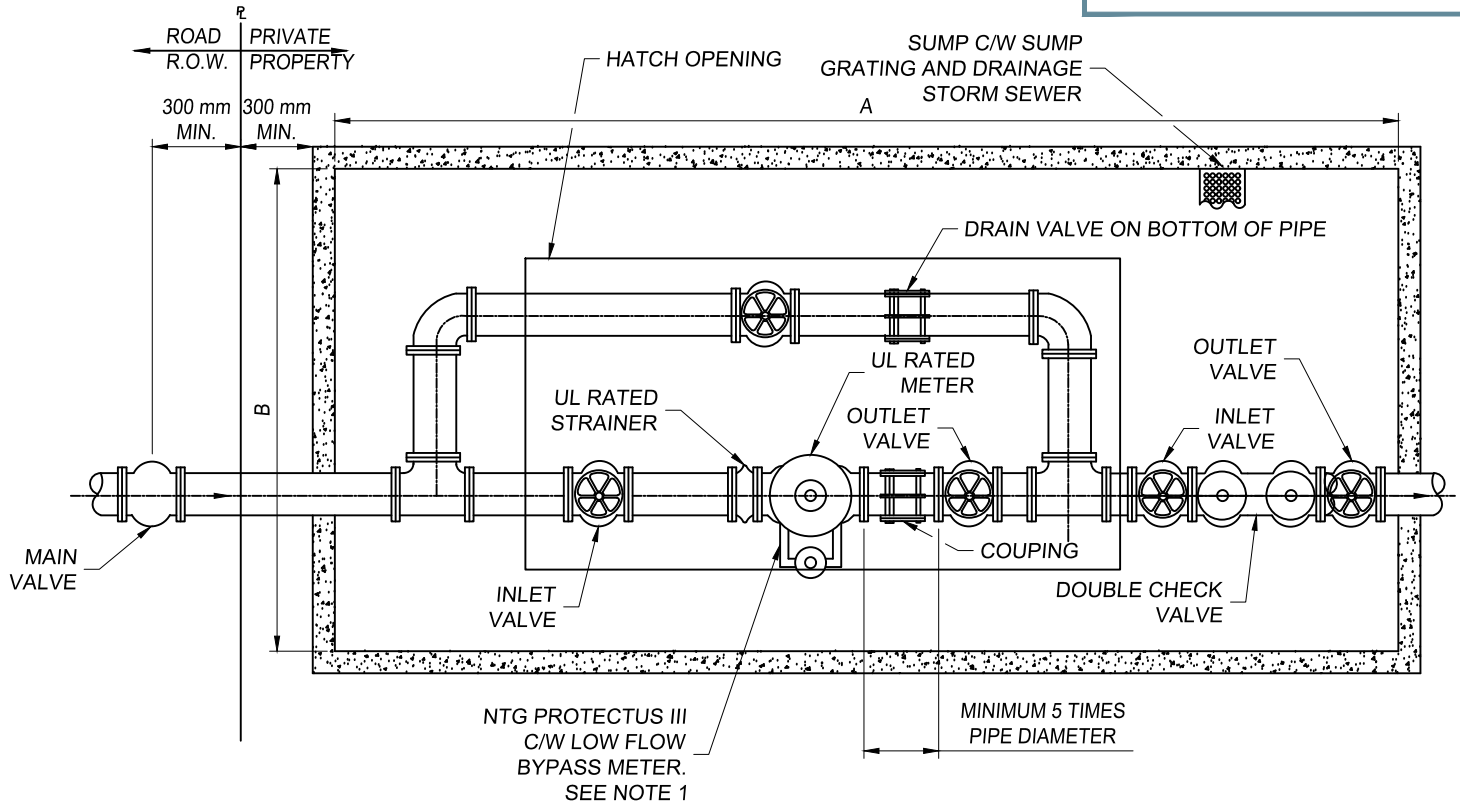
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STANDARD DETAIL #:

7-306



METER SIZE	MINIMUM INTERNAL DIMENSIONS OF VAULT	
	A	B
150 mm	4300 mm	2200 mm
200 mm	5600 mm	2500 mm
250 mm AND UP	REQUIRES SHOP DRAWINGS	

NOTES:

- (1) FOR THE SUPPLY OF METERS CONTACT THE RMWB METERING SECTION. REQUIRES UL RATED EQUIPMENT.
- (2) ANCHOR PIPE TO WALL (TO BE DESIGNED AND CERTIFIED BY A PROFESSIONAL ENGINEER).
- (3) PROVIDE 5 DIAMETER LENGTHS OF STRAIGHT PIPE DOWNSTREAM OF METER.
- (4) VAULT DRAINAGE - GRAVITY CONNECTION TO STORM, OR HYDRAULIC SUMP EJECTOR, OR SUMP PUMP.
- (5) FLOOR TO CENTRE LINE OF PIPE DIMENSION TO BE MINIMUM 300 mm.
- (6) THE BY-PASS PIPING SHALL BE THE SAME SIZE AND MATERIAL AS THE SAME MAIN LINE.
- (7) THE LID/HATCH OPENING SHOULD BE POSITIONED OVER THE METER AND HAVE HYDRAULIC OPENING/CLOSING ASSISTANCE.
- (8) WATER TIGHT CONDUIT TO BE INSTALLED FOR WIRING AS SPECIFIED BY RMWB METERING SECTION TO REMOTE PEDESTAL.
- (9) VAULTS MUST BE LOCATED IN LANDSCAPED AREAS, AND NOT BE LOCATED IN DRIVEWAYS OR ROADWAYS.
- (10) OUTSIDE HYDRANTS MAY BE PLUMBED DIRECTLY TO YARD PIPING, DOWNSTREAM OF METER VAULT.
- (11) VAULTS MUST BE WATER TIGHT AND COUNTERACT ANY FLOAT FORCES.
- (12) VAULTS TO BE OWNED AND MAINTAINED BY PROPERTY OWNER.
- (13) THIS DETAIL ILLUSTRATES MINIMUM REQUIREMENTS ONLY, THE MUNICIPALITY MAY ADJUST THE REQUIREMENTS AT THEIR DISCRETION. THE APPLICANT IS REQUIRED TO PROVIDE A PROJECT SPECIFIC DESIGN, AUTHENTICATED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE PROVINCE OF ALBERTA.

UNDERGROUND METER VAULT DETAIL COMBINED FIRE AND DOMESTIC SERVICE

REVISION DATE

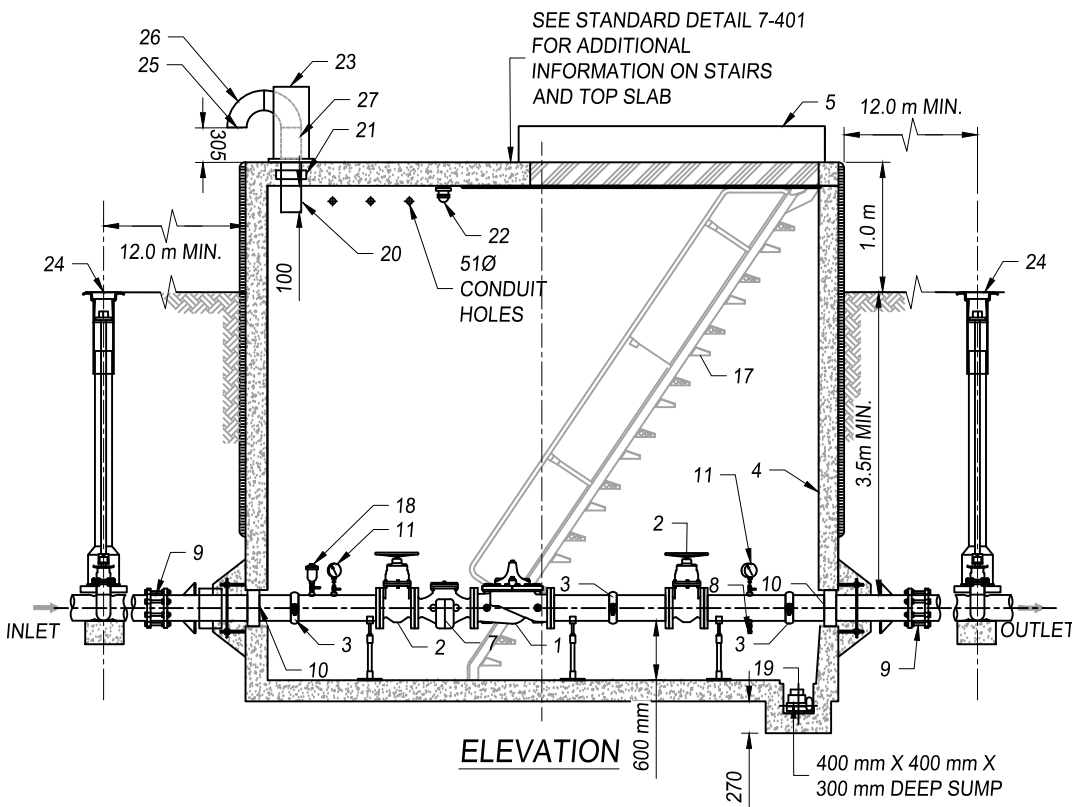
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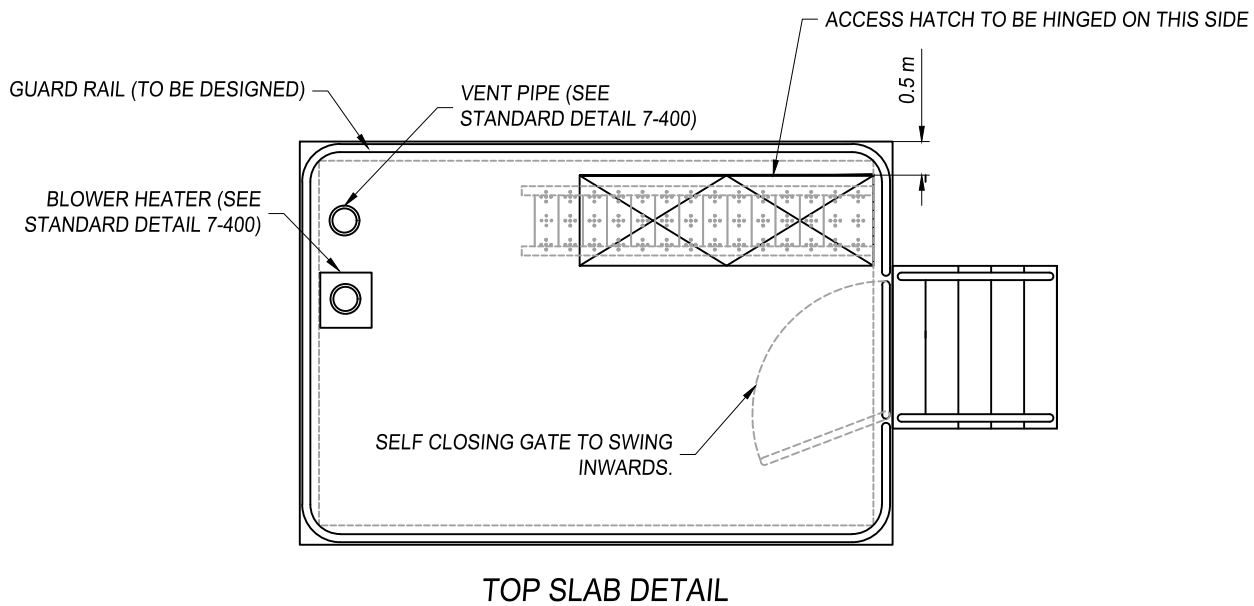
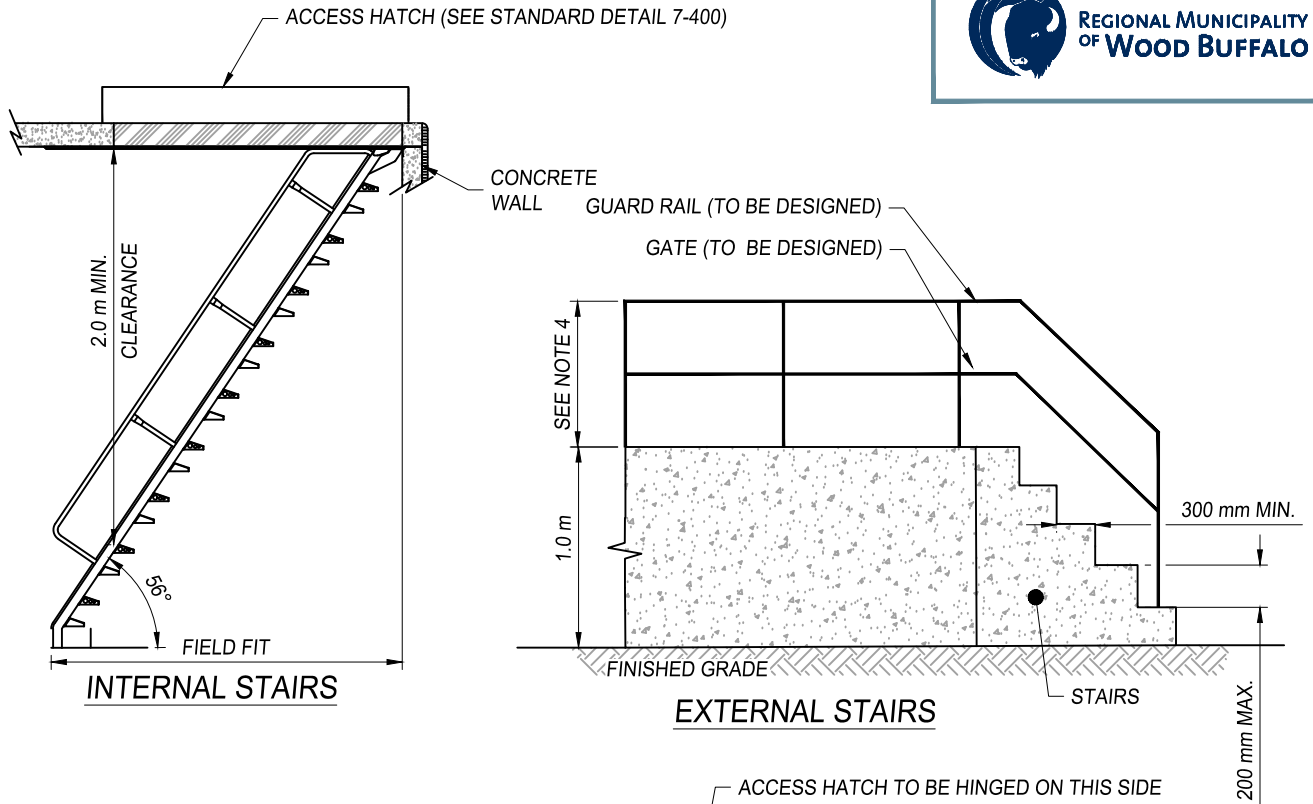
STANDARD DETAIL #:

7-307



#	QTY	DESCRIPTION
1	1	CLA-VAL PRESSURE REDUCING VALVE C/W X101 POSITION INDICATOR DI BODY, SS TRIM & BOLTS - #150 FLANGED
2	2	MUELLER NRS RW GATE VALVE C/W HANDWHEEL - #150 FLANGED
3	3	SHURJOINT #Z07 RIGID COUPLING
4	1	WATERTIGHT PRECAST CONCRETE VAULT EXTERIOR SEALANT C/W 75 mm SPRAY FOAM INSULATION AND CLADDING ABOVE GRADE
5	1	BILCO TYPE L ROOF SCUTTLE 750 mm X 2400 mm 2070 kPa LOADING (BOLTED ON TOP OF CHAMBER)
7	1	STRAINER #150 FLANGED C/W BLOWDOWN
8	2	19 mm HOSE BIBB C/W ISOLATION BALL VALVE
9	2	TRANSITION COUPLING
10	2	PIPE SEAL ASSEMBLY TO SUIT PIPE DIA.
11	2	100 mm WIKA 213-53-LM PRESSURE GAUGE (0-2070 kPa) C/W ISOLATION BALL VALVE, DUAL UNITS
12	1	CLA-VAL NRS RW PRESSURE REDUCING VALVE C/W X101 POSITION INDICATOR DI BODY, SS TRIM & BOLTS - #150 FLANGED
13	2	NRS RW GATE VALVE C/W HANDWHEEL - #150 FLANGED
14	2	VICTAULIC COUPLING
15	1	STRAINER #150 FLANGED C/W BLOWDOWN
16	3	ADJUSTABLE PIPE SUPPORTS
17	1	STAIRS (SEE STANDARD DETAIL 7-401 FOR ADDITIONAL INFORMATION)
18	1	25 mm AIR RELEASE VALVE C/W ISOLATION BALL VALVE (2070 kPa, DUAL UNITS), THREADED
19	1	LIBERTY 253-2 SUBMERSIBLE SUMP PUMP #L-L2532
20	2	150 mm FABRICATED VENT PIPES
21	2	150 mm PIPE SEAL PS-300(E) FOR VENT PIPES
22	3	LED LIGHTING
23	1	DEXON BLOWER HEATER AND VENTILATION SYSTEM - MODEL MDH4-1 (120 / 240 VAC) 4000 WATT
24	2	ISOLATION VALVE
25	1	WIRE MESH RODENT SCREEN OVER END OF PIPE TO BE WELDED ON
26	2(1)	2-90° ELBOW OR 1-180° ELBOW, GALVANIZED STEEL PIPE
27	1	GALVANIZED STEEL PIPE

7-400



NOTES:

- (1) DAVIT BASE TO BE DESIGNED IN ACCORDANCE WITH OHS LEGISLATION AND APPLICABLE CSA STANDARDS
- (2) GUARD RAIL SHALL NOT INTERFERE WITH DAVIT BASE AND OPERATION OF THE DAVIT ARM SYSTEM
- (3) A 150 mm KICK PLATE SHALL BE PROVIDED FOR OPENING HATCHES, SELF CLOSING GATE, AND GUARD RAIL.
- (4) GUARDRAIL SHALL BE IN ACCORDANCE WITH THE NATIONAL BUILDING CODE - ALBERTA EDITION.

UNDERGROUND PRV STATION
STAIRS AND TOP SLAB

REVISION DATE

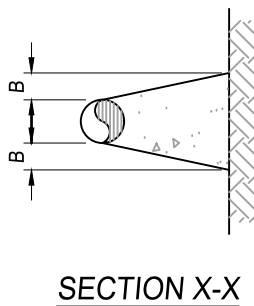
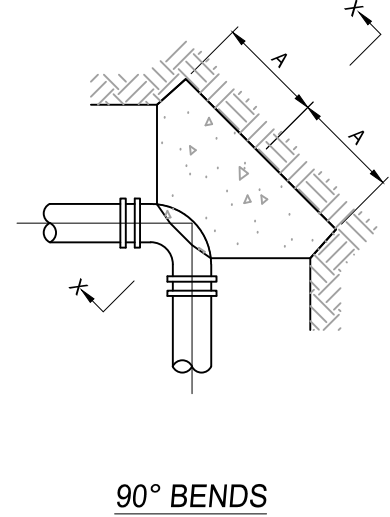
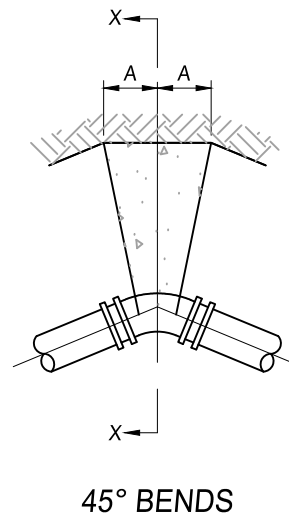
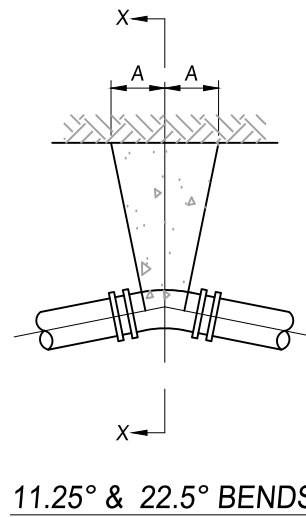
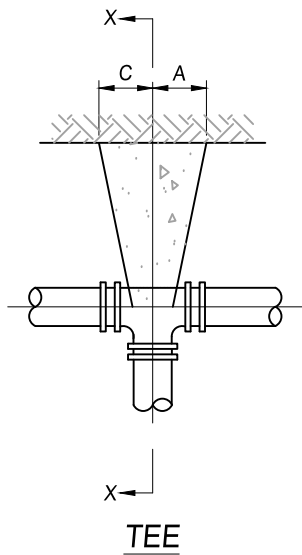
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STANDARD DETAIL #:

7-401



PIPE SIZE (mm)	FITTING														
	TEE			11.25° BEND			22.5° BEND			45° BEND			90° BEND		
	BEARING AREA (m ²)	A (mm)	B (mm)	BEARING AREA (m ²)	A (mm)	B (mm)	BEARING AREA (m ²)	A (mm)	B (mm)	BEARING AREA (m ²)	A (mm)	B (mm)	BEARING AREA (m ²)	A (mm)	B (mm)
150	0.382	546	100	0.075	125	75	0.149	248	75	0.292	487	75	0.540	900	75
200	0.679	679	150	0.133	166	100	0.265	331	100	0.520	650	100	0.960	1200	100
250	1.061	816	200	0.208	208	125	0.414	414	125	0.812	812	125	1.501	1501	125
300	1.528	955	250	0.300	250	150	0.596	497	150	1.169	975	150	2.161	1801	150
400	2.716	1,358	300	0.533	333	200	1.060	662	200	2.079	1299	200	3.842	2401	200
500	4.244	1,768	350	0.832	416	250	1.656	828	250	3.249	1624	250	6.002	3001	250
600	6.112	2,183	400	1.198	499	300	2.385	994	300	4.678	1949	300	8.644	3601	300
750	9.550	2,729	500	1.872	624	375	3.726	1242	375	7.309	2436	375	13.51	4502	375

NOTES:

- (1) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.
- (2) DESIGN BASIS:
 - a. HYDRAULIC PRESSURE 690 kPa (100 psi)
 - b. SOIL BEARING CAPACITY 48 kPa (1000 lb/sq.ft)
- (3) CONCRETE THRUST BLOCK BEARING AREA AND PARAMETERS "A" AND "B" MUST BE ADJUSTED IF HYDRAULIC DESIGN PRESSURE AND SOIL BEARING CAPACITY ARE DIFFERENT THAN SHOWN IN NOTE 2, DESIGN BASIS.
- (4) HYDRAULIC DESIGN PRESSURE MUST INCLUDE HIGHEST OPERATING PRESSURE SCENARIO WITH SURGE PRESSURE INCLUDED.
- (5) TEMPORARY BLOCKING MUST BE APPROVED BY THE MUNICIPALITY.
- (6) CONCRETE STRENGTH SHALL BE 30 MPa AT 28 DAYS, SULPHATE RESISTANT.
- (7) CONCRETE TO BE CLEAR OF BELLS AND TO BEAR AGAINST UNDISTURBED TRENCH WALLS.
- (8) CONCRETE TO BE PLACED UNDER ALL FITTINGS.
- (9) CONCRETE TO BE CURED FOR 24 HOURS PRIOR TO BACKFILLING.
- (10) BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS.
- (11) IF THE DESIGN IS BASED ON INFORMATION NOT VERIFIED IN THE FIELD AND NOT SUPPORTED BY HYDRAULIC MODELING / CALCULATIONS, A MIN. FACTOR OF SAFETY OF 1.50 SHOULD BE APPLIED TO ALL TABULATED BEARING AREAS.

POURED CONCRETE THRUST BLOCKS FOR HORIZONTAL TEES AND BENDS

REVISION DATE

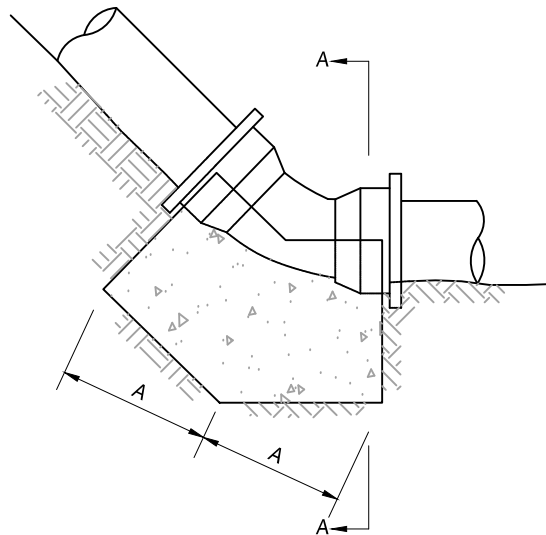
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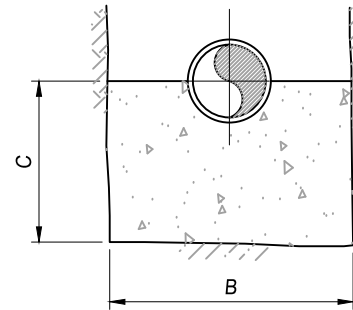
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STANDARD DETAIL #:

7-500



ELEVATION



SECTION A-A

PIPE SIZE (mm)	FITTING											
	11.25° BEND				22.5° BEND				45° BEND			
	BEARING AREA (m ²)	A (mm)	B (mm)	C (mm)	BEARING AREA (m ²)	A (mm)	B (mm)	C (mm)	BEARING AREA (m ²)	A (mm)	B (mm)	C (mm)
150	0.075	83	450	300	0.149	166	450	300	0.292	325	450	300
200	0.133	133	500	400	0.265	265	500	400	0.520	520	500	400
250	0.208	189	550	400	0.414	376	550	400	0.812	738	550	400
300	0.300	250	600	500	0.596	497	600	500	1.169	975	600	500
400	0.533	380	700	500	1.060	757	700	500	2.079	1485	700	500
500	0.832	520	800	600	1.656	1,035	800	600	3.249	2030	800	600
600	1.198	666	900	600	2.385	1,325	900	600	4.678	2599	900	600
750	1.872	891	1050	750	3.726	1,774	1050	750	7.309	3481	1050	750

NOTES:

- (1) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
- (2) DESIGN BASIS:
 - a. HYDRAULIC PRESSURE 690 kPa (100 psi)
 - b. SOIL BEARING CAPACITY 48 kPa (1000 lb/sq.ft)
- (3) CONCRETE THRUST BLOCK BEARING AREA AND PARAMETERS "A", "B", AND "C" MUST BE ADJUSTED IF HYDRAULIC DESIGN PRESSURE AND SOIL BEARING CAPACITY ARE DIFFERENT THAN SHOWN IN NOTE 2, DESIGN BASIS.
- (4) HYDRAULIC DESIGN PRESSURE MUST INCLUDE HIGHEST OPERATING PRESSURE SCENARIO WITH SURGE PRESSURE INCLUDED.
- (5) TEMPORARY BLOCKING MUST BE APPROVED BY THE MUNICIPALITY.
- (6) CONCRETE STRENGTH SHALL BE 30 MPa AT 28 DAYS, SULPHATE RESISTANT.
- (7) CONCRETE TO BE CLEAR OF BELLS AND TO BEAR AGAINST UNDISTURBED TRENCH WALLS.
- (8) CONCRETE TO BE PLACED UNDER ALL FITTINGS.
- (9) CONCRETE TO BE CURED FOR 24 HOURS PRIOR TO BACKFILLING.
- (10) BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS.
- (11) IF THE DESIGN IS BASED ON INFORMATION NOT VERIFIED IN THE FIELD AND NOT SUPPORTED BY HYDRAULIC MODELING / CALCULATIONS, A MIN. FACTOR OF SAFETY OF 1.50 SHOULD BE APPLIED TO ALL TABULATED BEARING AREAS.

POURED CONCRETE THRUST BLOCKS FOR VERTICAL BENDS (DOWNWARD THRUST)

REVISION DATE

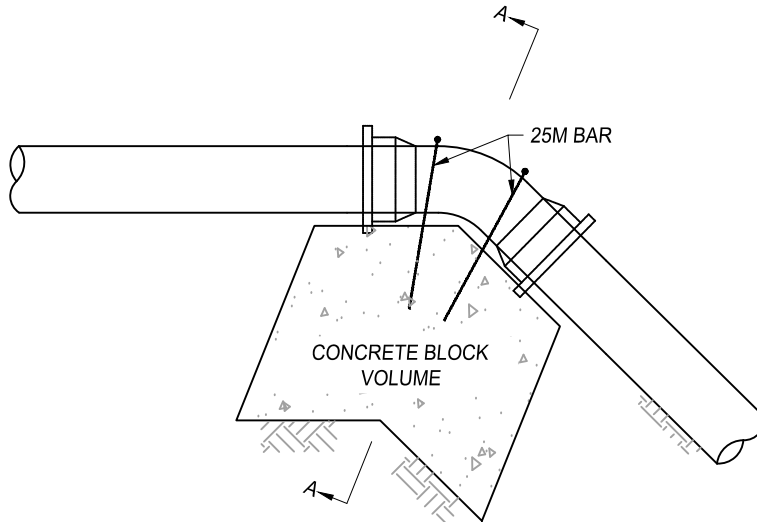
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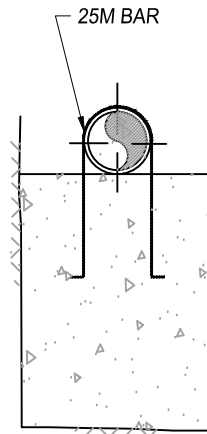
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STANDARD DETAIL #:

7-501



ELEVATION



SECTION A-A

PIPE SIZE (mm)	FITTING					
	11.25° BEND		22.5° BEND		45° BEND	
	VOLUME (m³)	BEARING AREA (m²)	VOLUME (m³)	BEARING AREA (m²)	VOLUME (m³)	BEARING AREA (m²)
150	0.1	0.007	0.3	0.029	0.5	0.112
200	0.3	0.013	0.5	0.052	1.0	0.199
250	0.4	0.020	0.8	0.081	1.5	0.311
300	0.6	0.029	1.2	0.116	2.2	0.448
400	1.1	0.052	2.1	0.207	3.8	0.796
500	1.7	0.082	3.2	0.323	6.0	1.243
600	2.4	0.117	4.7	0.465	8.6	1.790
750	3.7	0.183	7.3	0.727	13.5	2.797

NOTES:

- (1) ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.
- (2) DESIGN BASIS:
 - a. HYDRAULIC PRESSURE 690 kPa (100 psi)
 - b. SOIL BEARING CAPACITY 48 kPa (1000 lb/sq.ft)
- (3) CONCRETE THRUST BLOCK VOLUME AND BEARING AREA MUST BE ADJUSTED IF HYDRAULIC DESIGN PRESSURE AND SOIL BEARING CAPACITY ARE DIFFERENT THAN SHOWN IN NOTE 2, DESIGN BASIS.
- (4) HYDRAULIC DESIGN PRESSURE MUST INCLUDE HIGHEST OPERATING PRESSURE SCENARIO WITH SURGE PRESSURE INCLUDED.
- (5) TEMPORARY BLOCKING MUST BE APPROVED BY THE MUNICIPALITY.
- (6) CONCRETE STRENGTH SHALL BE 30 MPa AT 28 DAYS, SULPHATE RESISTANT.
- (7) CONCRETE TO BE CLEAR OF BELLS AND TO BEAR AGAINST UNDISTURBED TRENCH WALLS.
- (8) CONCRETE TO BE PLACED UNDER ALL FITTINGS.
- (9) CONCRETE TO BE CURED FOR 24 HOURS PRIOR TO BACKFILLING.
- (10) BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS.
- (11) IF THE DESIGN IS BASED ON INFORMATION NOT VERIFIED IN THE FIELD AND NOT SUPPORTED BY HYDRAULIC MODELING / CALCULATIONS, A MIN. FACTOR OF SAFETY OF 1.50 SHOULD BE APPLIED TO ALL TABULATED BEARING AREAS.

**POURED CONCRETE THRUST BLOCKS FOR
VERTICAL BENDS (UPWARD THRUST)**

REVISION DATE

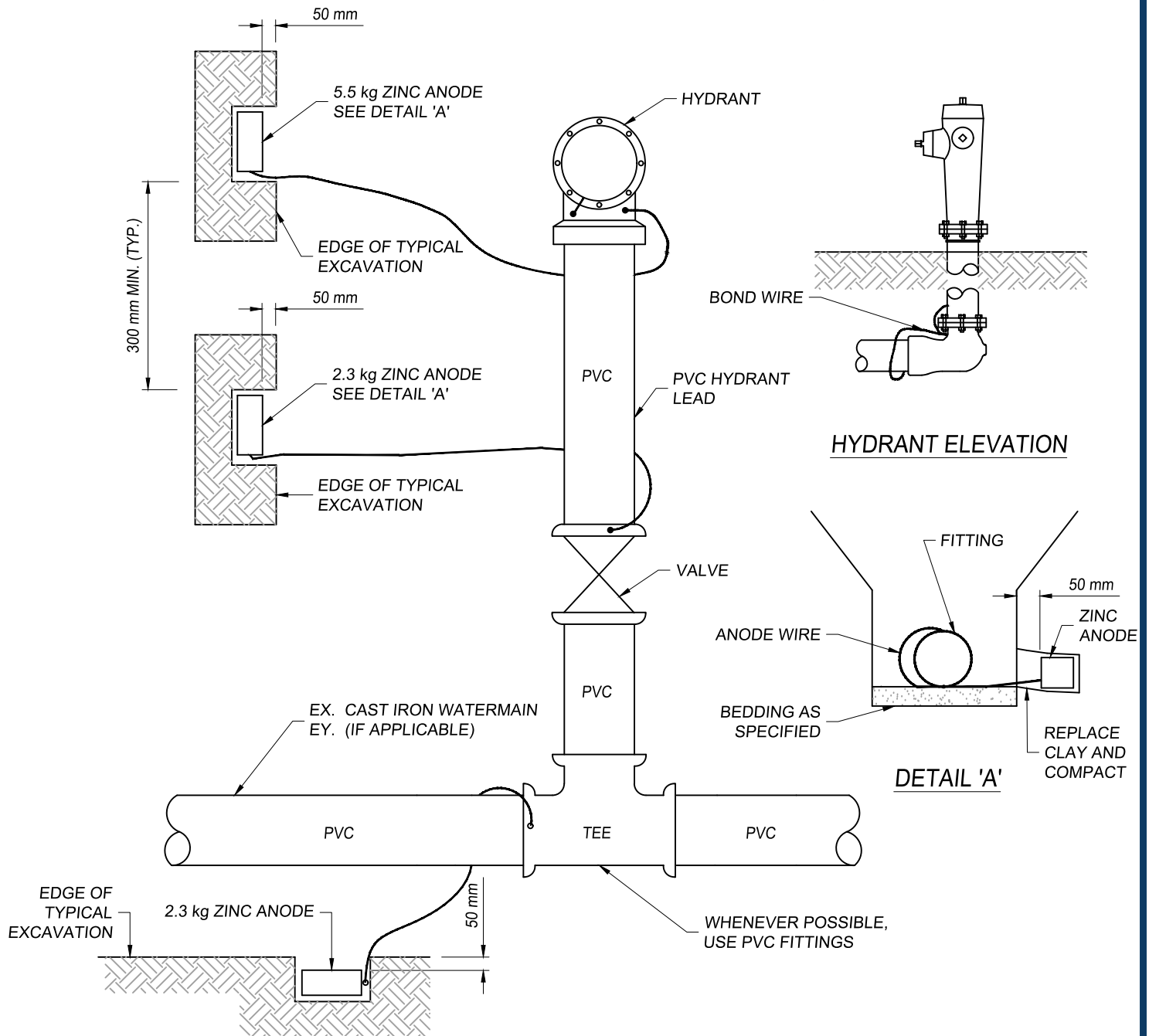
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STANDARD DETAIL #:

7-502



NOTES:

- (1) MINIMUM DISTANCE FROM ANODE TO PIPE, FITTING, VALVE, OR HYDRANT IS 150 mm.
- (2) INSTALL ANODE AT APPROX. PIPE DEPTH IN NATIVE SOIL.
- (3) ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50 mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.
- (4) ANODES TO BE AT LEAST 300 mm CLEAR OF THRUST BLOCKS.

ANODE INSTALLATION AT HYDRANT

REVISION DATE

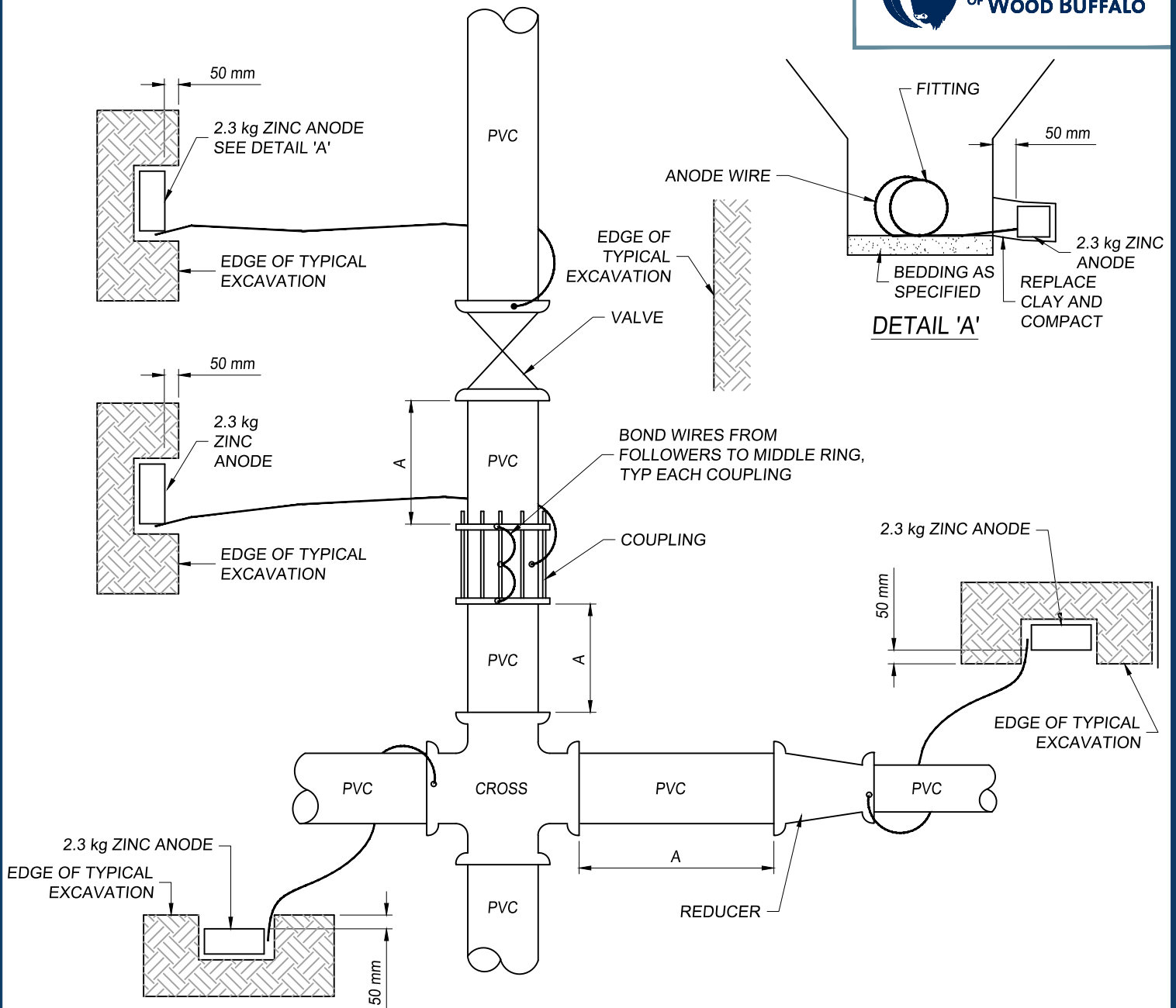
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STANDARD DETAIL #:

7-600



NOTES:

- (1) MINIMUM DISTANCE FROM ANODE TO PIPE, FITTING, VALVE OR HYDRANT IS 150 mm.
- (2) INSTALL ANODE AT APPROXIMATE PIPE DEPTH IN NATIVE SOIL.
- (3) BOND WIRES MAY BE USED TO PROTECT UP TO TWO FITTINGS WITH ONE ANODE WHEN DIMENSION 'A' DOES NOT EXCEED ONE (1) METRE.
- (4) ALL ZINC ANODES ON FITTINGS AND VALVES ARE 2.3 kg.
- (5) ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50 mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.
- (6) ANODES TO BE AT LEAST 300 mm CLEAR OF THRUST BLOCKS.

ANODE INSTALLATION AT FITTINGS

REVISION DATE

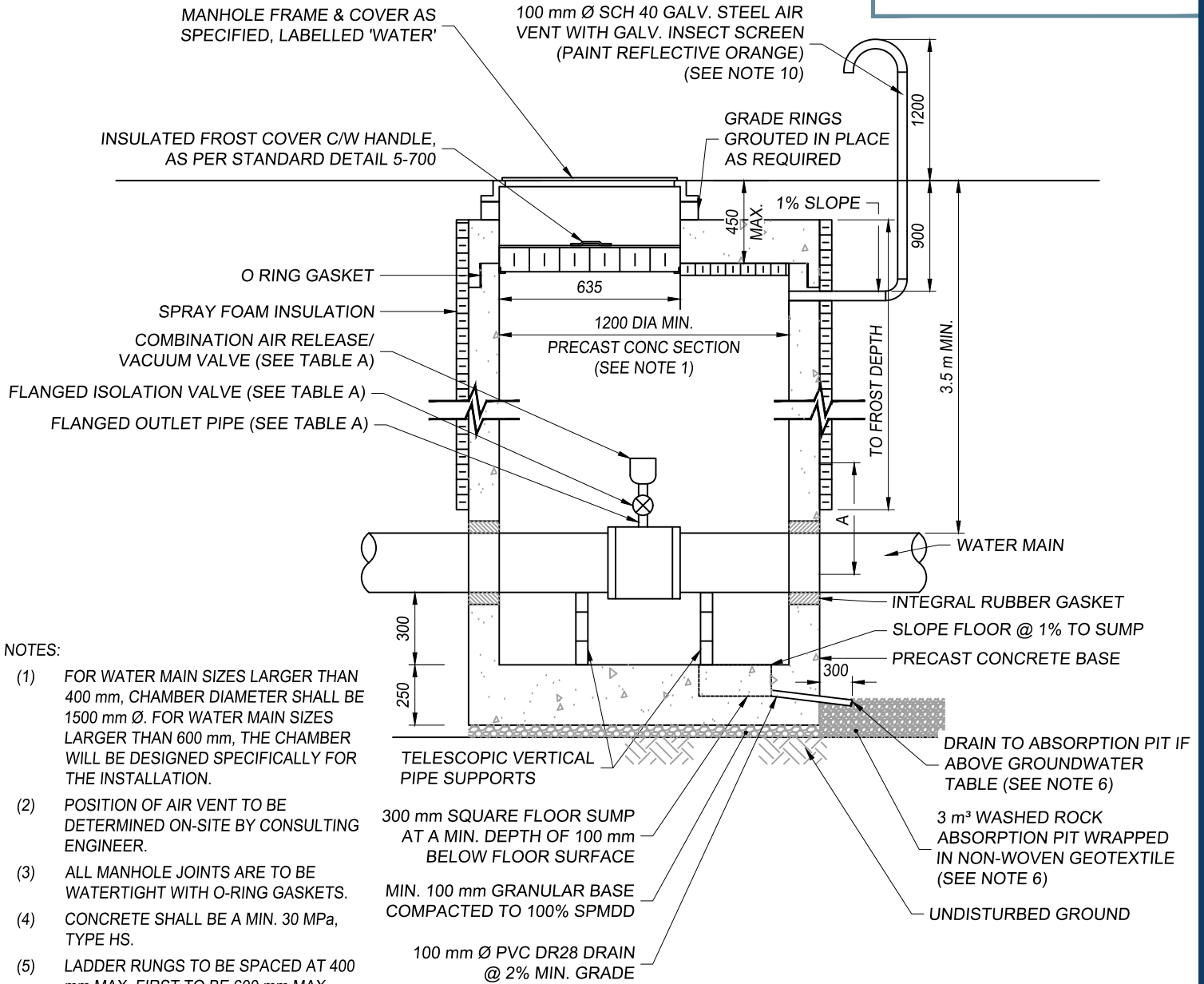
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STANDARD DETAIL #:

7-601



NOTES:

- (1) FOR WATER MAIN SIZES LARGER THAN 400 mm, CHAMBER DIAMETER SHALL BE 1500 mm Ø. FOR WATER MAIN SIZES LARGER THAN 600 mm, THE CHAMBER WILL BE DESIGNED SPECIFICALLY FOR THE INSTALLATION.
- (2) POSITION OF AIR VENT TO BE DETERMINED ON-SITE BY CONSULTING ENGINEER.
- (3) ALL MANHOLE JOINTS ARE TO BE WATERTIGHT WITH O-RING GASKETS.
- (4) CONCRETE SHALL BE A MIN. 30 MPa, TYPE HS.
- (5) LADDER RUNGS TO BE SPACED AT 400 mm MAX. FIRST TO BE 600 mm MAX. BELOW FRAME. LAST RUNG TO BE MAX. 300 mm ABOVE BOTTOM.
- (6) IF NOT ABOVE GROUNDWATER TABLE, CHAMBER SUMP TO BE DESIGNED TO BE PUMPED TO A STORM OR SANITARY SEWER.
- (7) THIS DETAIL IS FOR GUIDANCE ONLY. SHOP DRAWINGS ARE REQUIRED TO BE SUBMITTED AND APPROVED BY THE CONSULTING ENGINEER PRIOR TO CONSTRUCTION.
- (8) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.
- (9) ALL HARDWARE SHALL BE STAINLESS STEEL.
- (10) VENT PIPE IS OPTIONAL.

TABLE A

WATER COMBINATION AIR VALVE	ISOLATION VALVE	INLET/OUTLET PIPE
25	25 BALL VALVE	25
50	50 BALL VALVE	50
75	75 GATE VALVE	75
100	100 GATE VALVE	100

COMBINATION AIR RELEASE VALVE CHAMBER

REVISION DATE

2024

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STANDARD DETAIL #:

7-700



SPECIFICATIONS:

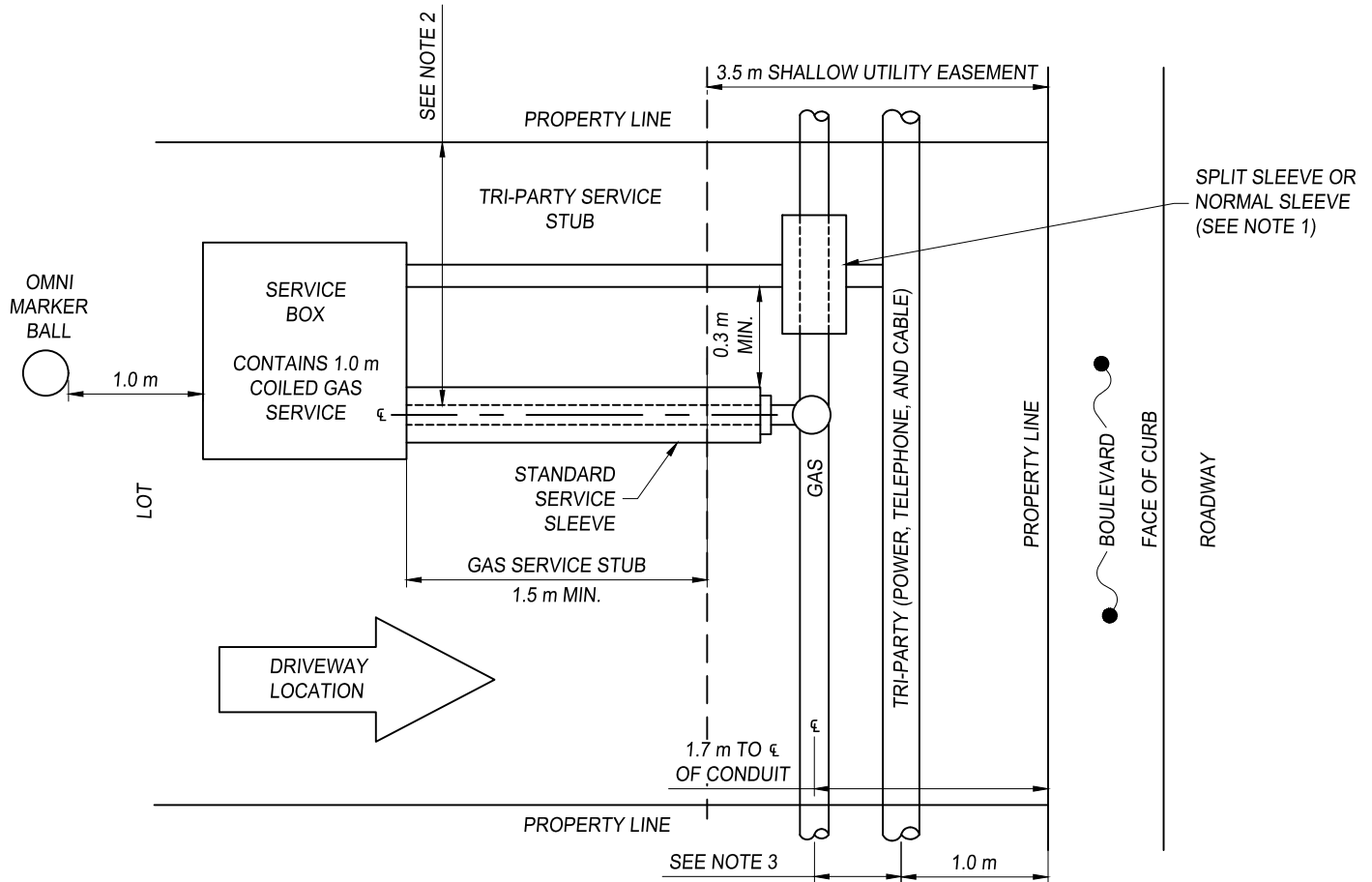
- SIZE: 432 X 305
- MATERIAL: ALUMINUM / ENGINEER GRADE
- BACKGROUND: RED / BLUE / BLACK ON WHITE BACKGROUND AS SHOWN
- CORNERS: ROUNDED, AS SHOWN
- TYPE OF PROCESS: DI-CUT
- BOLT HOLE LOCATIONS: CENTRE OF SIGN, TOP AND BOTTOM

NOTES:

- (1) WARNING SIGNS TO BE INSTALLED ON RURAL / REGIONAL PIPELINES, OR IN LANDSCAPED URBAN AREAS OUTSIDE OF ROAD ROW, AT THE DISCRETION OF THE MUNICIPALITY.
- (2) WARNING SIGNS TO BE MOUNTED ON 4.5 cm X 4.5 cm PRE-PUNCHED GALVANIZED METAL TELESCOPING TUBE. SIGN POST TO BE SET 0.8 m INTO GROUND. BOTTOM OF SIGN TO BE 1.5 m ABOVE FINISHED GRADE.
- (3) WARNING SIGNS SHALL BE SPACED AT A MAX. 500 m INTERVAL. A WARNING SIGN IS REQUIRED AT EACH BEND IN PIPELINE ALIGNMENT.

WATER LINE WARNING SIGN

REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	7-800



NOTES:

- (1) SLEEVE NOT REQUIRED WHEN 300 mm VERTICAL SEPARATION IS ACHIEVED.
- (2) SIDE YARD OFFSET TO BE SHOWN ON UTILITY LINE ASSIGNMENT DRAWINGS.
- (3) 0.3 m MIN. FOR FOUR-PARTY TRENCHING; 0.7 m MIN. OTHERWISE.
- (4) FOUR-PARTY INSTALLATIONS SHALL MEET THE REQUIREMENTS OF THE AUTHORITIES HAVING JURISDICTION.

FOUR-PARTY COMMON TRENCH STUB ALIGNMENT

REVISION DATE

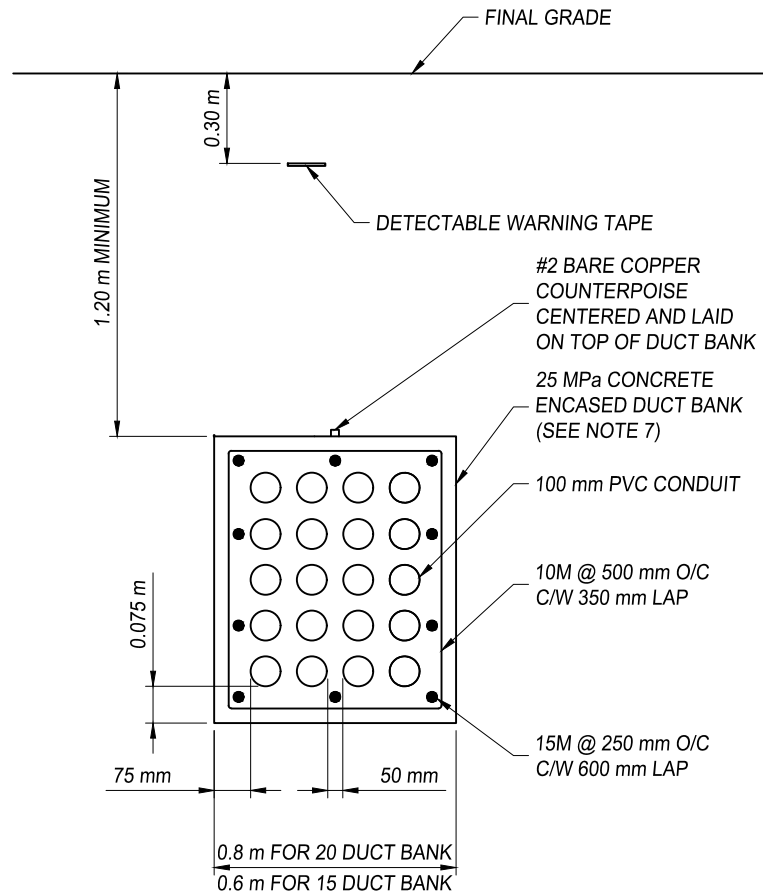
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STANDARD DETAIL #:

8-100



SECTION

NOTES:

- (1) DUCTS SHALL CROSS EXISTING UTILITIES WITH A MINIMUM VERTICAL SEPARATION OF 0.5 m.
- (2) ALL VAULTS TO BE TYPE T - 1.8 m (W) X 3.7 m (L) X 2 m (D). REFER TO STANDARD DETAIL 8-201 FOR DETAILS.
- (3) CONNECTIONS TO EXISTING VAULTS SHALL MEET THE REQUIREMENTS OF THE AFFECTED SHALLOW UTILITY COMPANIES.
- (4) INSTALL UNDERGROUND DUCT SPACERS @ 1500 mm O/C. SUPPORT BOTTOM SPACER ON PRESSURE TREATED WOOD BLOCKS.
- (5) HAND PLACE APPROVED BEDDING MATERIAL COMPACTED TO 95% S.P.M.D.D.
- (6) BACKFILL COMMON DUCT AND VAULT TRENCHES WITH IMPORTED GRANULAR BACKFILL, COMPACTED TO 98% S.P.M.D.D., TO BASE OF PAVEMENT STRUCTURE.
- (7) INSTALLATIONS SHALL MEET THE REQUIREMENTS OF CSA C22.3 NO.7 AND THE AUTHORITIES HAVING JURISDICTION.
- (8) CONDUIT SHALL BE INSTALLED TO SLOPE TOWARD A VAULT.

DUCT BANK

REVISION DATE

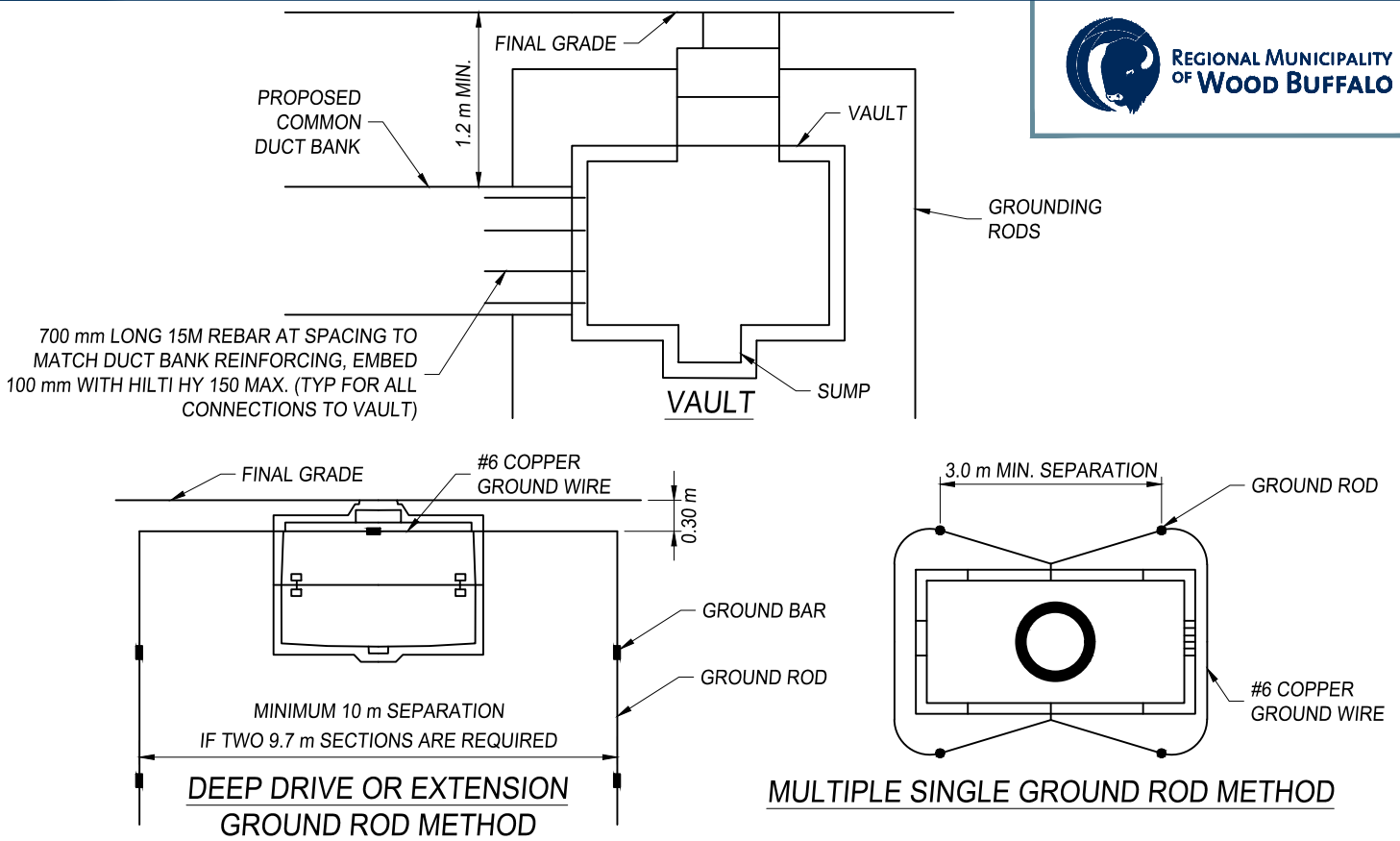
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STANDARD DETAIL #:

8-200



NOTES:

- (1) THE MEASURED GROUND RESISTANCE OF NEW VAULT INSTALLATIONS SHALL BE 5 OHMS OR LESS.
- (2) GROUND VALUES ARE TO BE RECORDED ON FORM #4166, AVAILABLE UPON REQUEST.
- (3) THE FOLLOWING THREE METHODS OF PLACING GROUND RODS ARE ACCEPTABLE.
 - DEEP DRIVE OR EXTENSION GROUND ROD METHOD
 - MULTIPLE SINGLE GROUND ROD METHOD (CONNECTED IN SERIES)
 - MULTIPLE SINGLE GROUND ROD METHOD (CONNECTED IN PARALLEL)
- (4) THE DEEP DRIVE OR EXTENSION GROUND ROD METHOD IS THE FIRST METHOD TO BE USED. THE METHOD CONSISTS OF USING UP TO FOUR 2.4 m SECTIONAL GROUND RODS AND DRIVING ONE ON TOP OF ANOTHER FOR A TOTAL PENETRATION DEPTH OF 9.7 m.
 - THE GROUNDING MEDIUM MUST BE MEASURED FOLLOWING THE INSTALLATION OF EACH 2.4 m GROUND ROD SECTION. A FOUR POINT EARTH RESISTANCE TESTER SHALL BE USED FOR THESE MEASUREMENTS.
 - IF THE RESISTANCE HAS BEEN ACHIEVED AFTER DRIVING THE FIRST SERIES OF GROUND RODS OR PORTIONS THEREOF, CONNECT A #6 COPPER GROUND WIRE FROM THE GROUND ROD TO THE GROUND BAR PROTRUDING FROM THE VAULT WALL. TWO GROUND ROD CLAMPS ARE REQUIRED FOR THIS CONNECTION.
 - IF THE RESISTANCE HAS NOT BEEN ACHIEVED AFTER INSTALLING THE FIRST 9.7 m SECTION, INSTALL A SECOND 9.7 m SECTION A MINIMUM OF 10 m AWAY FROM THE FIRST SECTION AND BOND THE TWO SECTIONS TOGETHER WITH 6 # COPPER GROUND WIRE.
 - THE COMPLETE SECOND 9.7 m SECTION MUST BE INSTALLED AND BONDED TO THE FIRST 9.7 m SECTION BEFORE ANY MEASUREMENTS ARE TAKEN. BEFORE THE INSTALLATION OF ANY GROUND RODS, THE AREA MUST BE INVESTIGATED FOR ANY POSSIBLE BURIED UTILITIES OR OBSTACLES WHICH MAY BE ENDANGERED BY THE INSTALLATION OF THE GROUND ROD(S).
- (5) MULTIPLE SINGLE GROUND ROD METHOD (SERIES)
 - IN AREAS WHERE GREAT DIFFICULTIES ARE ENCOUNTERED IN DRIVING THE FIRST GROUND ROD AND PAVEMENT IS NOT PRESENT, INSTALL UP TO A MAX. OF SEVEN GROUND RODS IN A STRAIGHT LINE, EACH SEPARATED BY 3 m AND BONDED TOGETHER BY 6# COPPER GROUND WIRE. TERMINATION OF THE GROUND WIRE AT THE VAULT GROUND BAR IS ACCOMPLISHED USING A CLAMP GROUND ROD.
 - THE GROUNDING MEDIUM MUST BE MEASURED AFTER INSTALLATION OF EACH 2.4 m GROUND ROD.
- (6) MULTIPLE SINGLE GROUND ROD METHOD (PARALLEL)
 - THIS METHOD IS ALSO REFERRED TO AS A HOLLOW SQUARE FORMATION AND IS ACHIEVED BY INSTALLING UP TO A MAX. OF SEVEN GROUND RODS AROUND THE PERIMETER OF THE VAULT, EACH SEPARATED BY 3 m AND BONDED TOGETHER BY #6 COPPER GROUND WIRE. THE #6 COPPER GROUND WIRE MUST THEN BE CONNECTED TO THE GROUND BARS PROTRUDING FROM THE VAULT WALL USING A CLAMP GROUND ROD.

TYPICAL VAULT CONNECTION AND GROUND
ROD CONNECTION

REVISION DATE

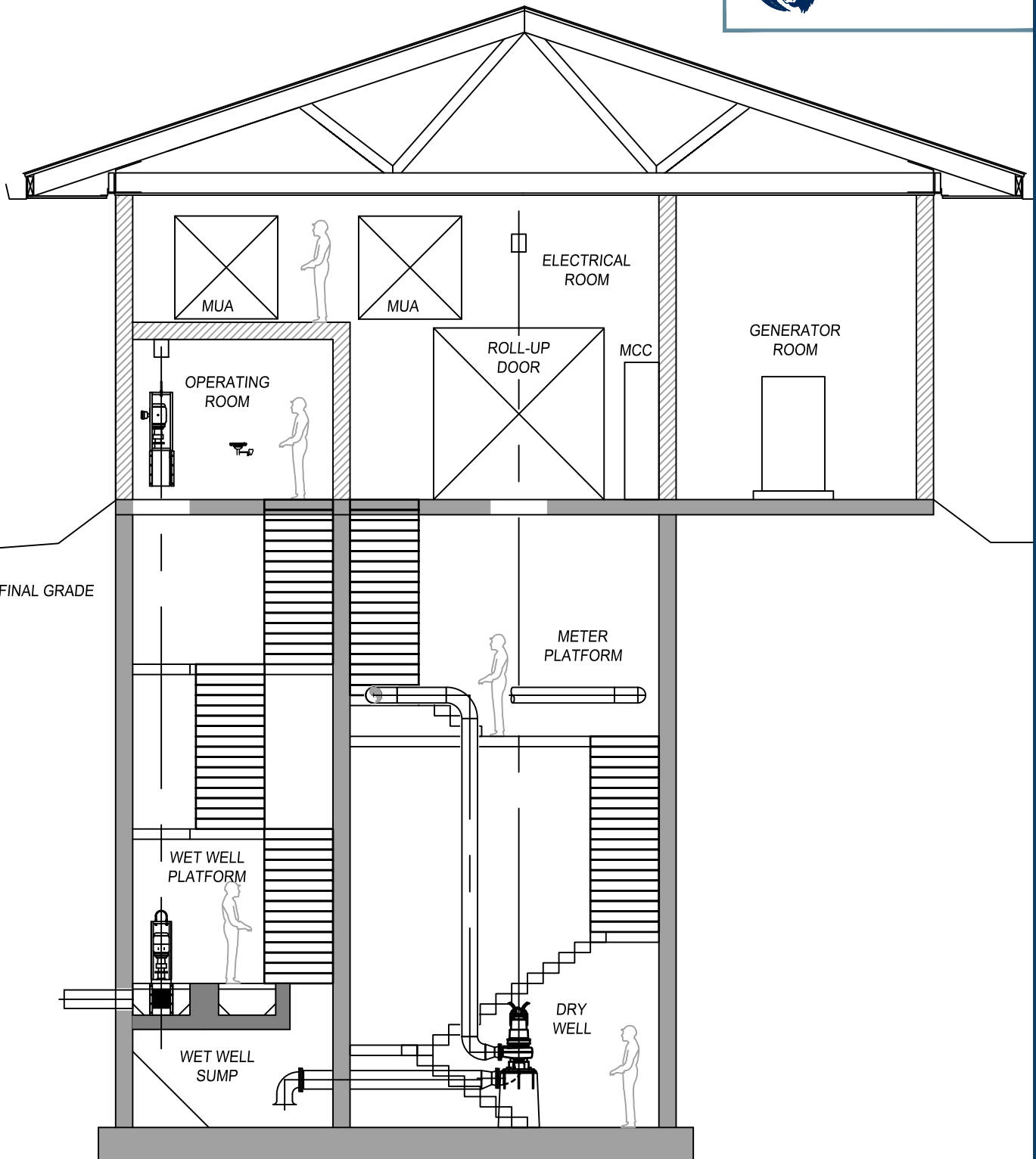
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STANDARD DETAIL #:

8-201



LIFT STATION WET WELL / DRY WELL - ELEVATION VIEW

REVISION DATE

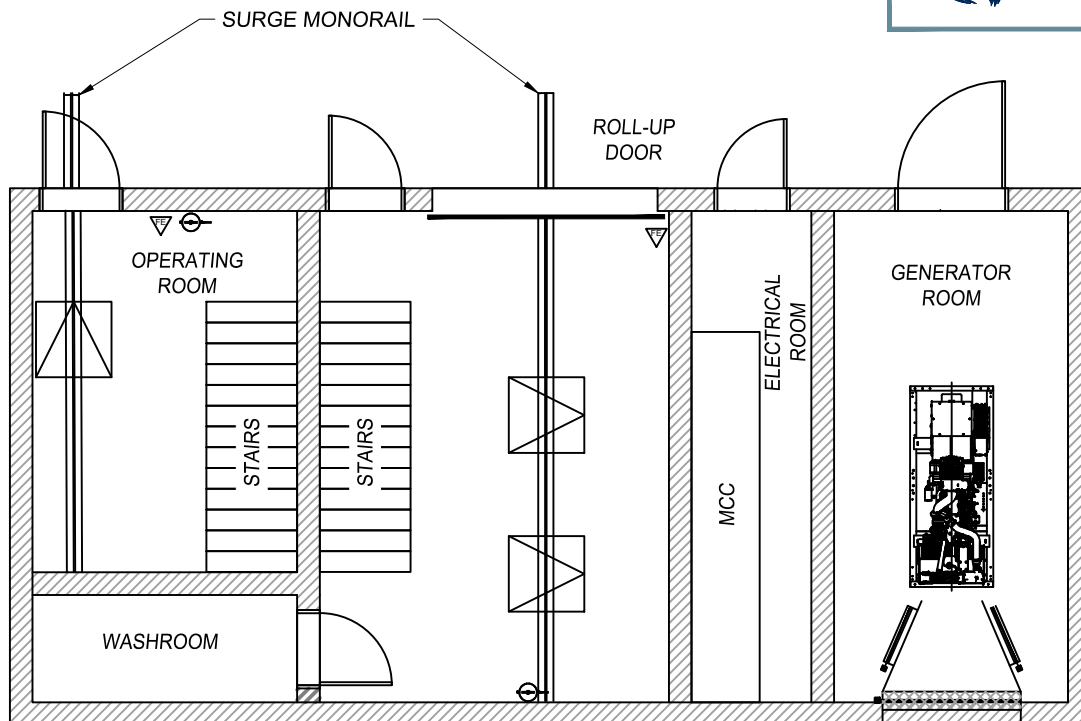
2024

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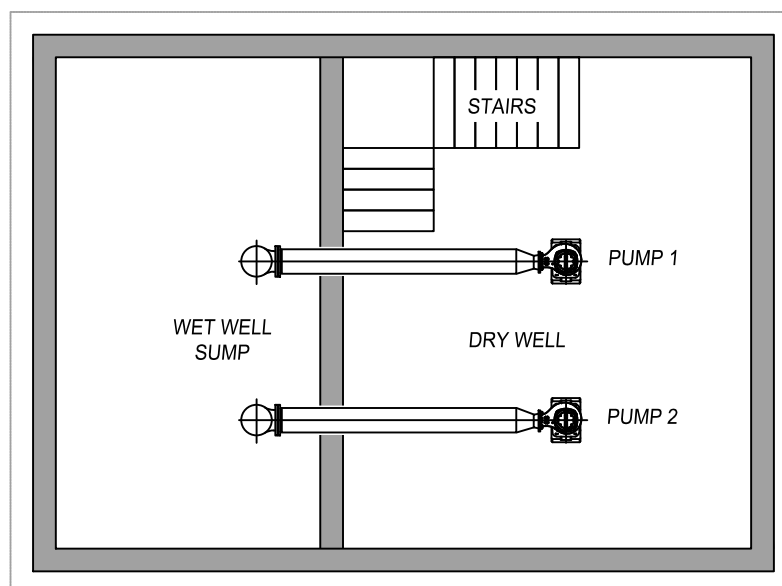
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STANDARD DETAIL #:

9-100



MAIN FLOOR PLAN



WET WELL / DRY WELL PLAN

LIFT STATION WET WELL / DRY WELL - PLAN VIEW

REVISION DATE

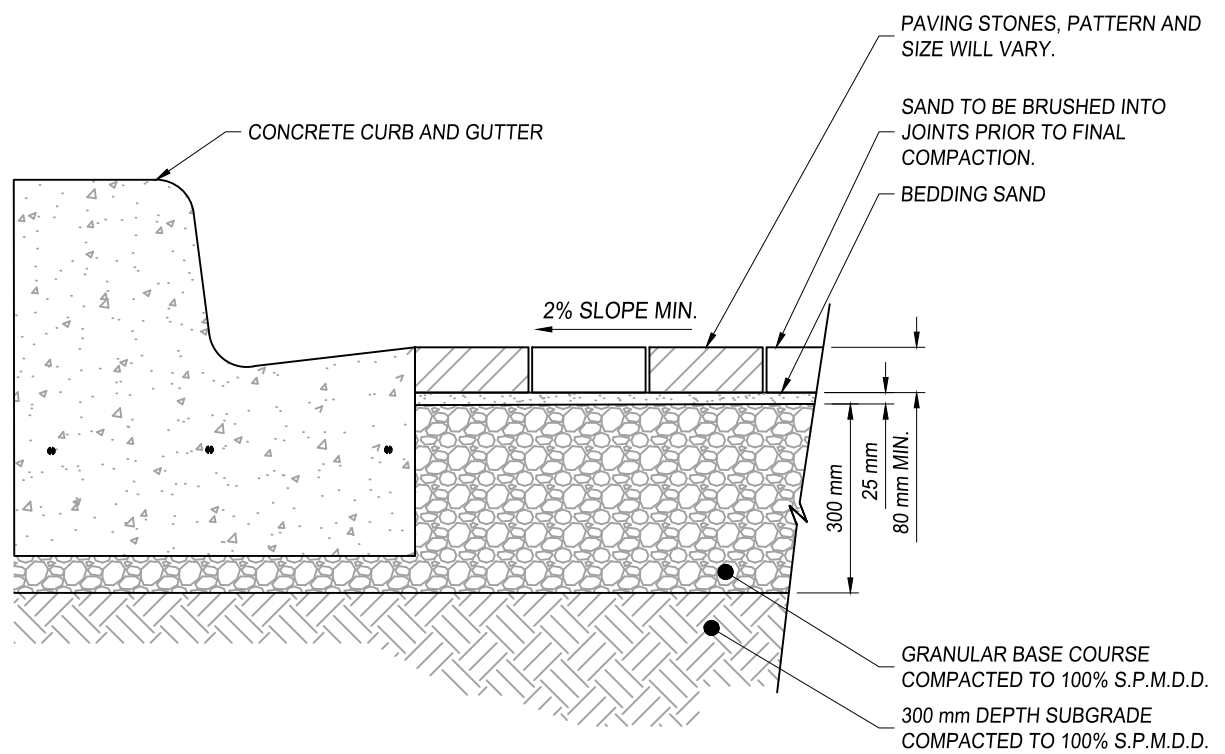
2024

REV.

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STANDARD DETAIL #:

9-101



HEAVY DUTY PAVING STONES

REVISION DATE

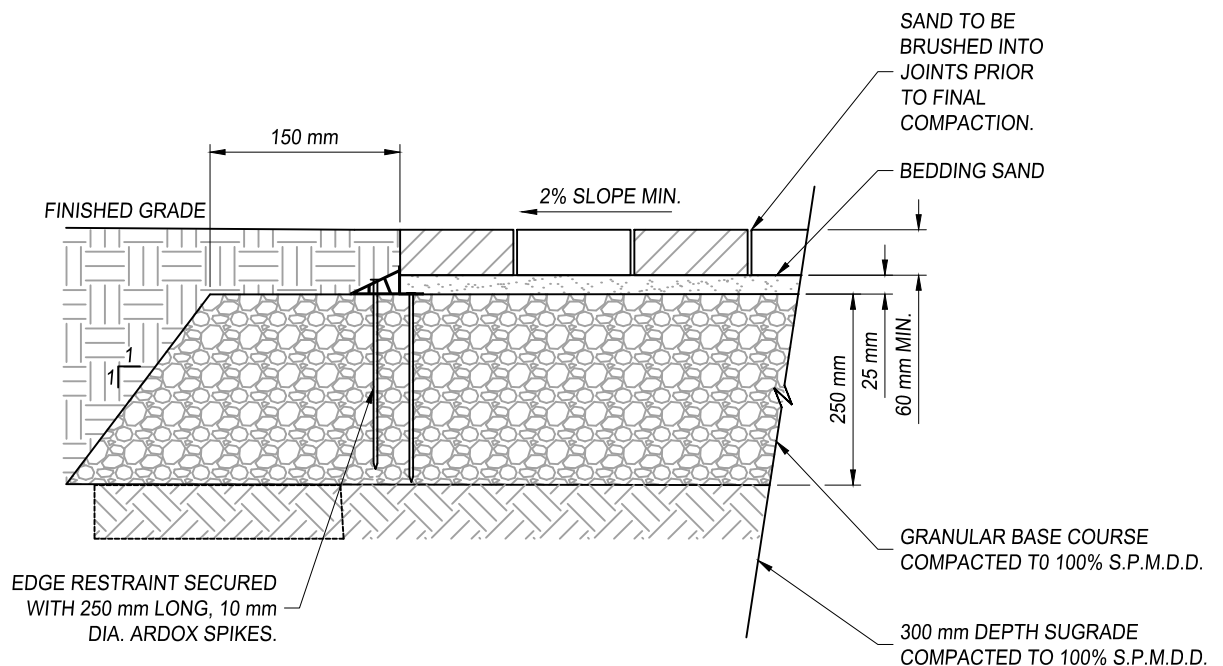
2024

REV.

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STANDARD DETAIL #:

10-100



MEDIUM DUTY PAVING STONES

REVISION DATE

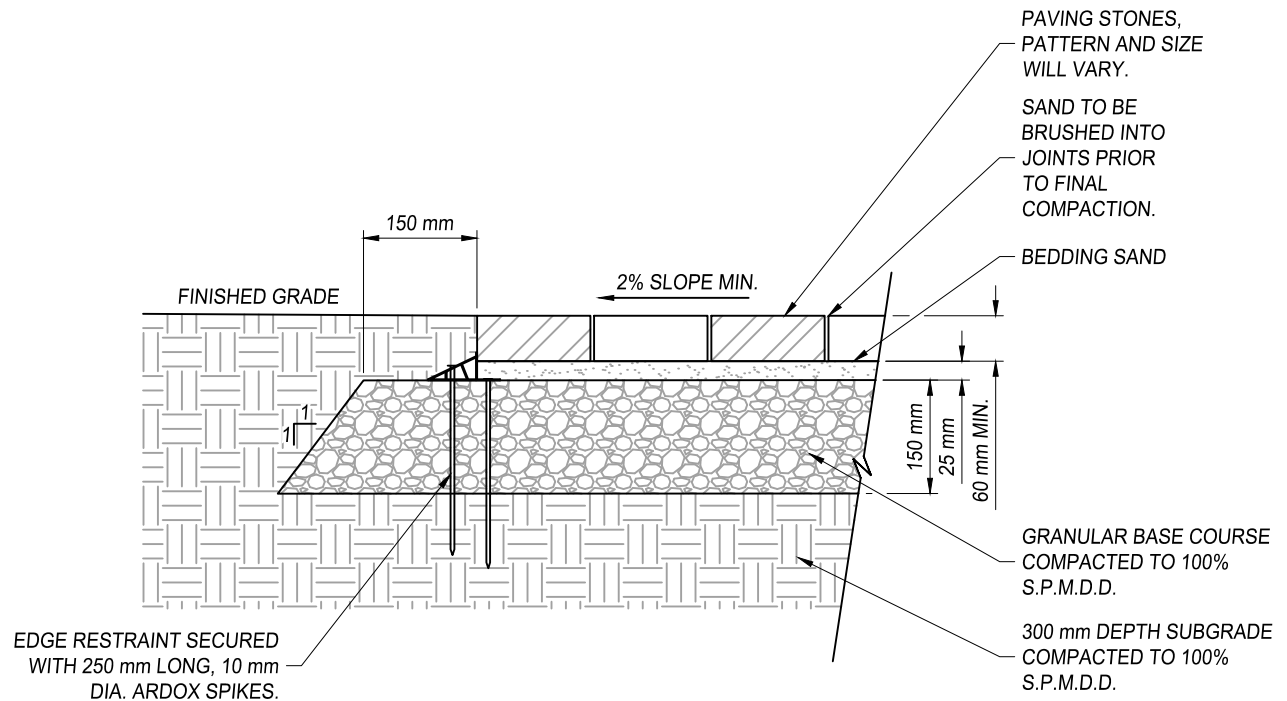
2024

REV.

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STANDARD DETAIL #:

10-101



LIGHT DUTY PAVING STONES

REVISION DATE

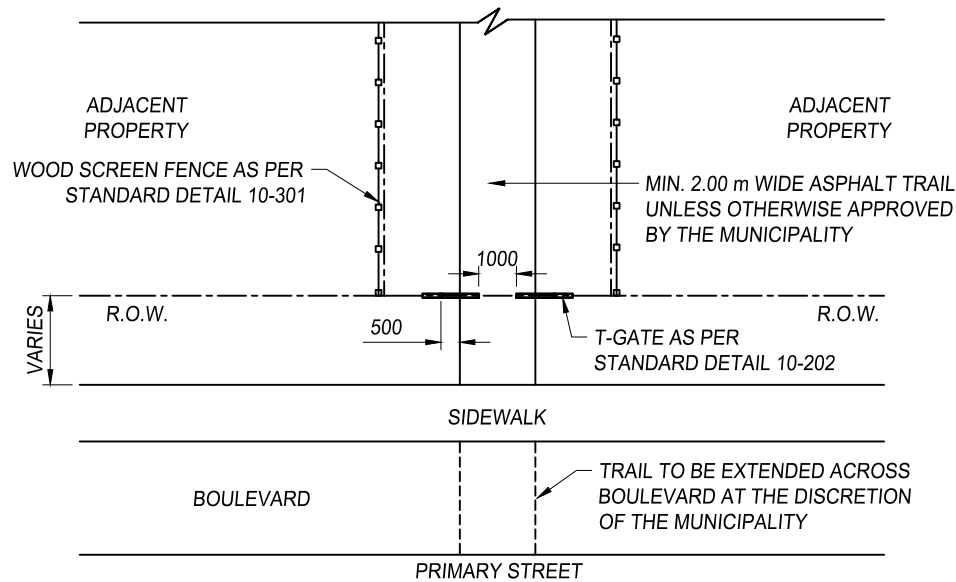
2024

REV.

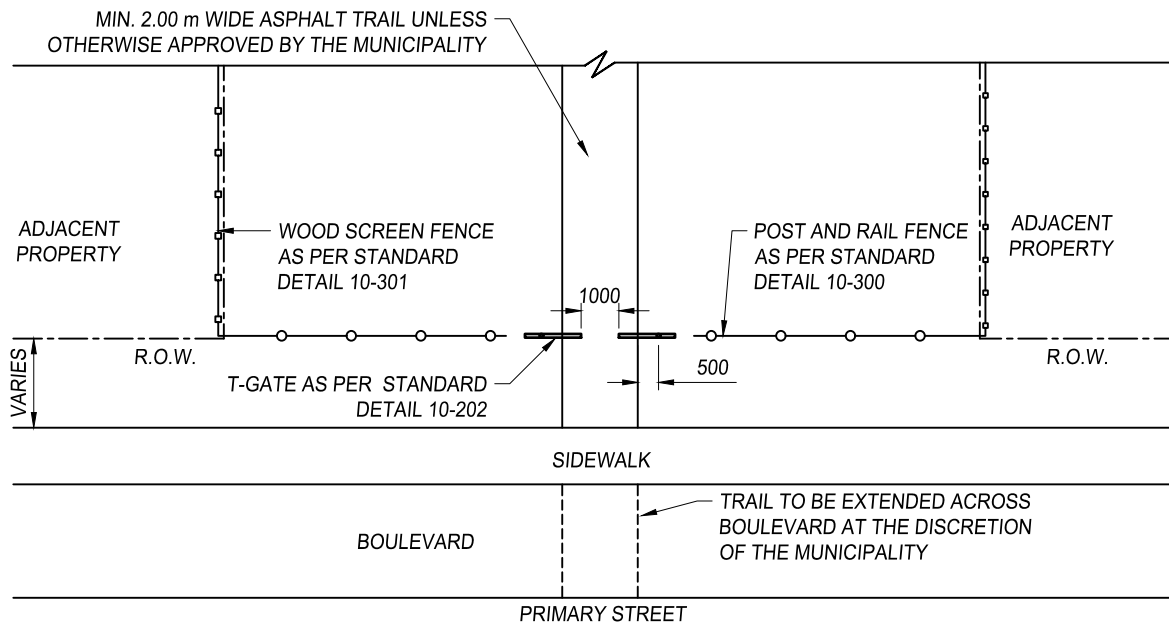
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STANDARD DETAIL #:

10-102



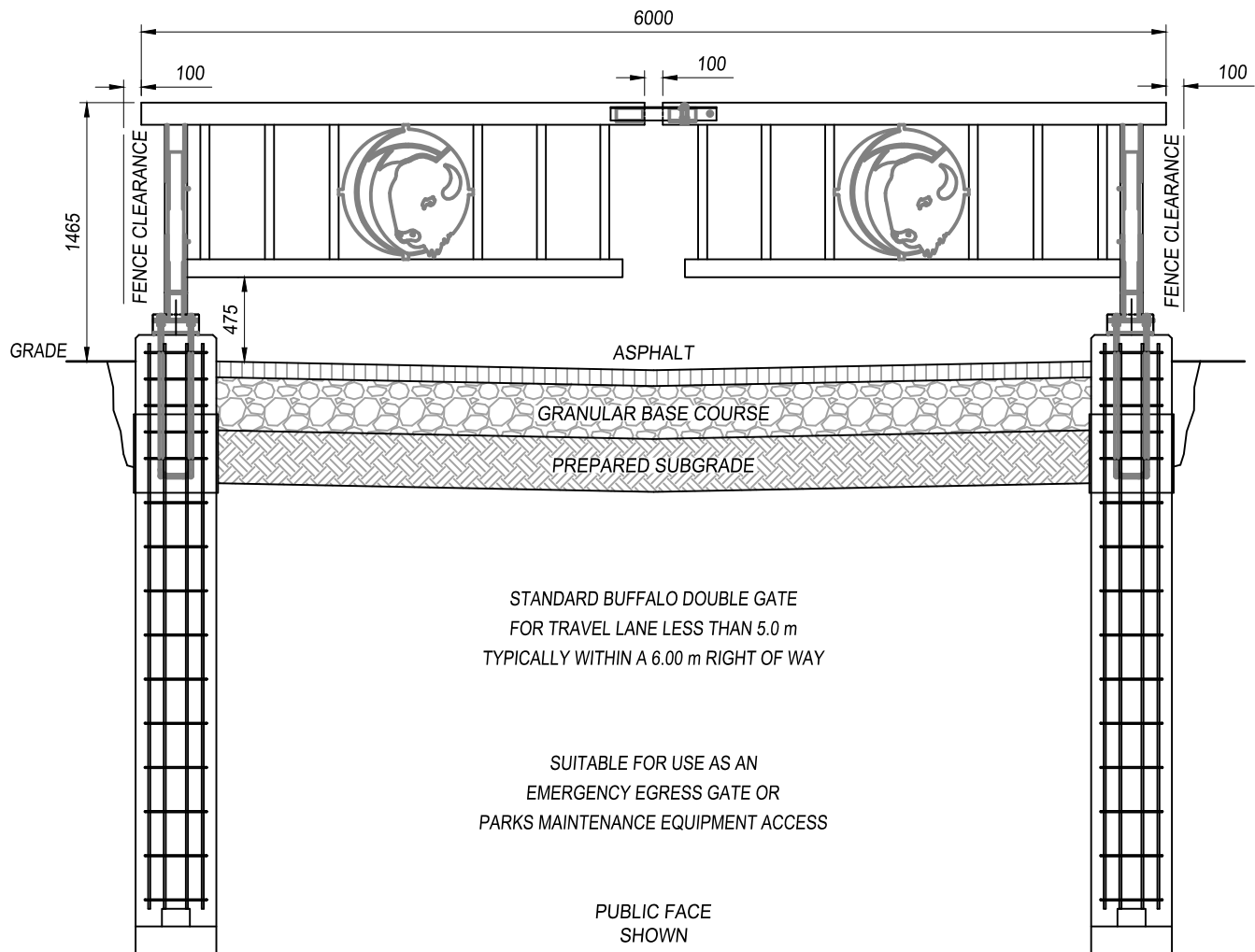
10-200A - P.U.L.s 9 m AND SMALLER IN WIDTH



10-200B - P.U.L.s LARGER THAN 9 m IN WIDTH

NOTES:

- (1) WHEN P.U.L.s HAVE ONLY TWO ACCESS POINTS ONLY ONE ACCESS POINT REQUIRES T-GATES.
- (2) WHEN P.U.L.s HAVE MORE THAN TWO ACCESS POINTS ALL ACCESS POINTS REQUIRE T-GATES.
- (3) TRAILS SHALL BE WIDENED, AS APPROPRIATE, AT ACCESS POINTS AT THE DISCRETION OF THE MUNICIPALITY. ALL TRAIL WIDENINGS ARE TO BE SMOOTH AND SEAMLESS. ACCESS BARRIERS TO BE ALIGNED WITH END OF FENCE.
- (4) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.



NOTES:

- (1) ALL DIMENSIONS IN mm.
- (2) NO ALTERATIONS WITHOUT WRITTEN APPROVAL.

BUFFALO GATES
FULL ASSEMBLY

REVISION DATE

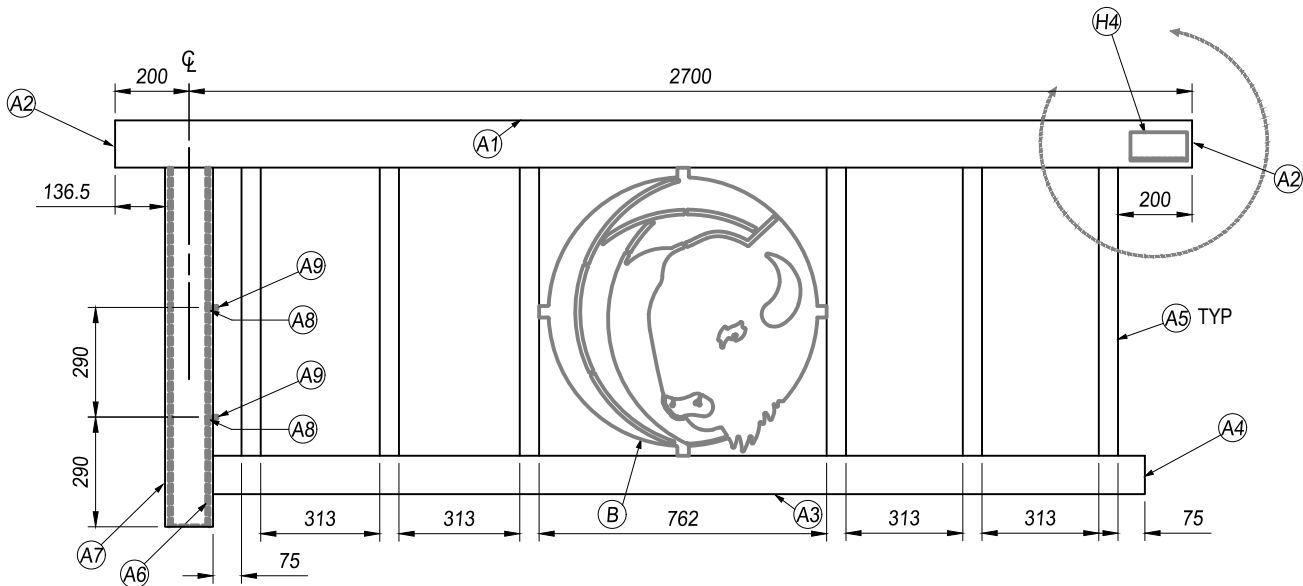
2024

REV.

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STANDARD DETAIL #:

10-250



BILL OF MATERIALS					
ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT
A		LEFT GATE & UPPER POST ASSEMBLY			
A1	1	TOP RAIL	HHS: 127 mm x 127 mm x 4.8 mm - 2900 mm LONG	CSA G40.21 350W	
A2	1	TOP RAIL END CAP	PLATE: 127 mm x 127 mm x 3 mm	CSA G40.21 300W	
A3	1	BOTTOM RAIL	HHS: 102 mm x 102 mm x 4.8 mm - 2466 mm LONG	CSA G40.21 350W	
A4	1	BOTTOM RAIL END CAP	PLATE: 127 mm x 127 mm x 3 mm	CSA G40.21 300W	
A5	6	BALUSTER	HHS: 51 mm x 51 mm x 3 mm - 762 mm LONG	CSA G40.21 350W	
A6	1	OUTER PIVOT SLEEVE	TUBING: 101.6 mm OD x 5.7 mm - 946 mm LONG	AISI TYPE 304 L SS (SEAMLESS)	
A7	1	OUTER POST	HHS: 127 mm x 127 mm x 9.5 mm - 950 mm LONG	CSA G40.21 350W	
A8	2	GREASE TUBE	TUBING: 3.2 mm ID x 19 mm LONG		
A9	2	GREASE NIPPLE	1/8" -27 GREASE ZERK FITTING	N/A	
H		LEFT LATCH ASSEMBLY			
H4	1	LATCH RECEIVER	ANGLE: 75 mm X 15 mm - 150 LONG	CSA G40.21 300W	

NOTES:

- (1) ALL DIMENSIONS IN mm.
- (2) NO ALTERATIONS WITHOUT WRITTEN APPROVAL.

BUFFALO GATES

LEFT GATE AND UPPER POST ASSEMBLY

REVISION DATE

2024

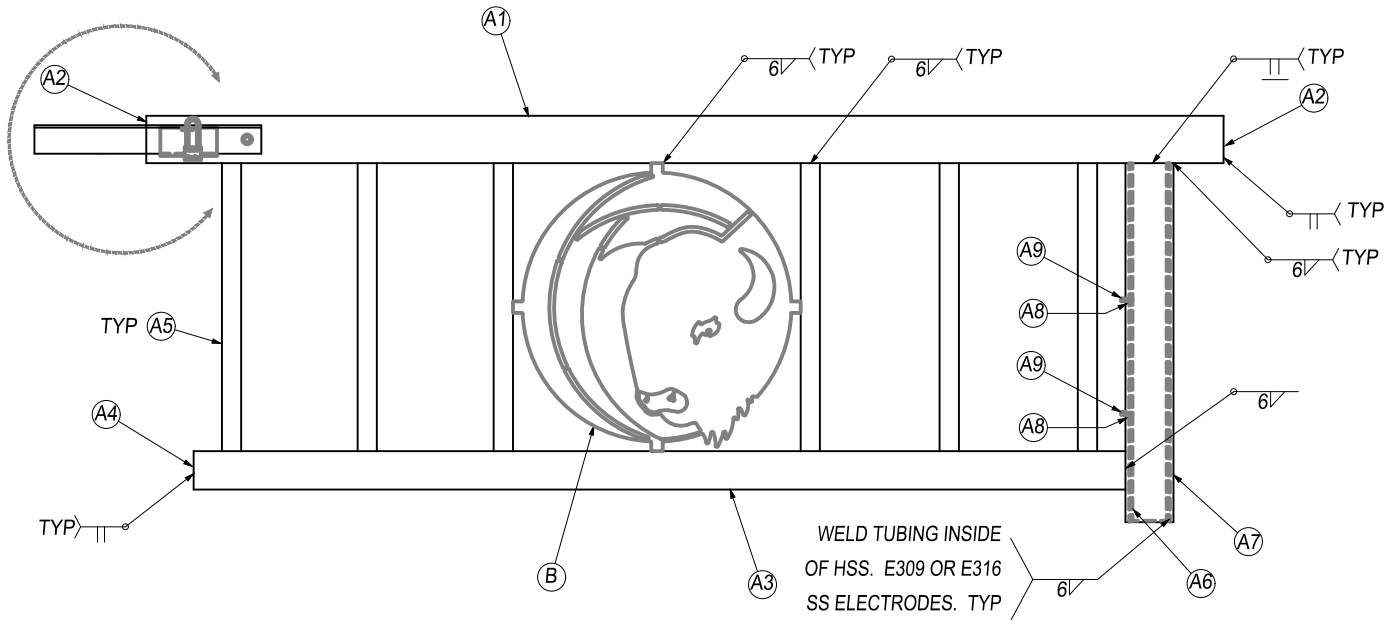
REV.

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STANDARD DETAIL #:

10-251

SEE DWG 10-251 FOR DIMENSION DETAILS
UNLESS OTHERWISE NOTED



BILL OF MATERIALS				
ITEM	QTY	DESCRIPTION	MATERIAL	GRADE
A	1	RIGHT GATE & UPPER POST ASSEMBLY		
A1	1	TOP RAIL	HHS: 127 mm x 127 mm x 4.8 mm - 2900 mm LONG	CSA G40.21 350W
A2	2	TOP RAIL END CAP	PLATE: 127 mm x 127 mm x 3 mm	CSA G40.21 300W
A3	1	BOTTOM RAIL	HHS: 102 mm x 102 mm x 4.8 mm - 2466 mm LONG	CSA G40.21 350W
A4	1	BOTTOM RAIL END CAP	PLATE: 127 mm x 127 mm x 3 mm	CSA G40.21 300W
A5	6	BALUSTER	HHS: 51 mm x 51 mm x 3 mm - 762 mm LONG	CSA G40.21 350W
A6	1	OUTER PIVOT SLEEVE	TUBING: 101.6 mm OD x 5.7 mm - 946 mm LONG	AISI TYPE 304 L SS (SEAMLESS)
A7	1	OUTER POST	HHS: 127 mm x 127 mm x 9.5 mm - 950 mm LONG	CSA G40.21 350W
A8	2	GREASE TUBE	TUBING: 3.2 mm ID x 19 mm LONG	
A9	2	GREASE NIPPLE	1/8" -27 GREASE ZERK FITTING	N/A
H	1	RIGHT LATCH ASSEMBLY		
H1	1	PIVOT BOLT	BAR: 19 mm - 10 LONG + 25 mm - 6 LONG	CSA G40.21 300W
H2	1	LATCH ARM	ANGLE: 75 mm x 75 mm - 600 mm LONG	CSA G40.21 300W
H3	1	LATCH SUPPORT	ANGLE: 75 mm X 10 mm - 150 LONG	CSA G40.21 300W
H5	1	PARKS LOCK	MASTER, COMMERCIAL, LONG SHACKLE	A473 KEY (2)

NOTES:

- (1) ALL DIMENSIONS IN mm.
- (2) NO ALTERATIONS WITHOUT WRITTEN APPROVAL.

BUFFALO GATES
RIGHT GATE AND UPPER POST ASSEMBLY

REVISION DATE

2024

REV.

0

STANDARD DETAIL #:

10-252



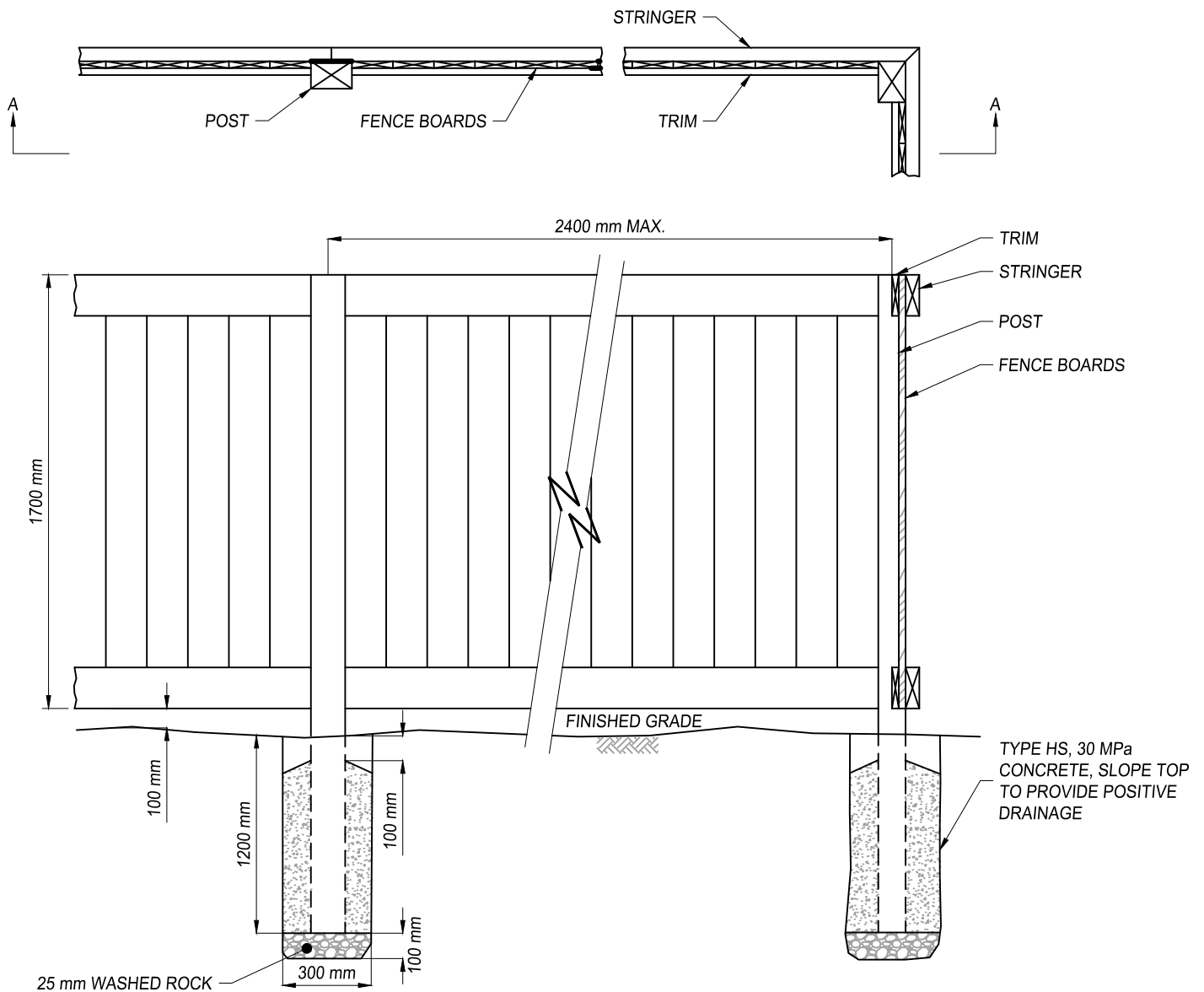
- (1) RAIL AND POST FACE TO LAY FLUSH TO EACH OTHER.
- (2) ALL CUT ENDS TO BE TREATED WITH WOOD PRESERVATIVE.
- (3) WHERE RAIL TERMINATES, CHAMFER CUT END AT 45 DEGREES.
- (4) ALL HARDWARE TO BE GALVANIZED.

REVISION DATE

REV.

STANDARD DETAIL #:

10-300



NOTES:

- (1) POSTS: 100 mm X 150 mm X 3000 mm LONG, ROUGH CUT SPF PRESSURE TREATED TIMBER.
- (2) STRINGERS: 2 - 50 mm X 150 mm X 2400 mm LONG S4S SPF PRESSURE TREATED STRINGERS FASTENED WITH 2-75 mm #10 ZINC SCREWS PER CONNECTION, MOUNT STRINGERS FACING PUBLIC PROPERTY WHERE FENCE TERMINATES. ANGLE CUT STRINGERS END AT 45 DEGREES.
- (3) TRIM: 2 - 25 mm X 150 mm X 2250 mm LONG, S4S SPF TRIM FASTENED WITH 2 - 63 mm #8 ZINC SCREWS PER CONNECTION SPACED AT 600 mm.
- (4) FENCE BOARD: 25 mm X 150 mm X 1700 mm LONG S4S SPF FENCE BOARDS FASTENED WITH 2 - 50 mm LONG GALVANIZED STAPLES PER CONNECTION.
- (5) FINISH: PAINT TO BE APPROVED BY THE MUNICIPALITY PRIOR TO CONSTRUCTION. ALL FENCING TO BE PAINTED PRIOR TO CONSTRUCTION.
- (6) ALL HARDWARE TO BE GALVANIZED UNLESS NOTED OTHERWISE.

WOOD SCREEN FENCE

REVISION DATE

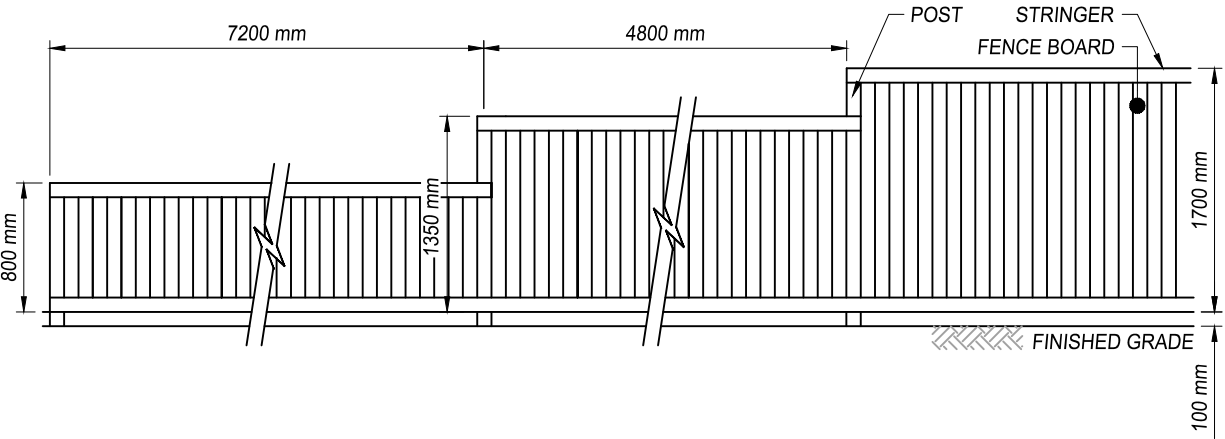
2024

REV.

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STANDARD DETAIL #:

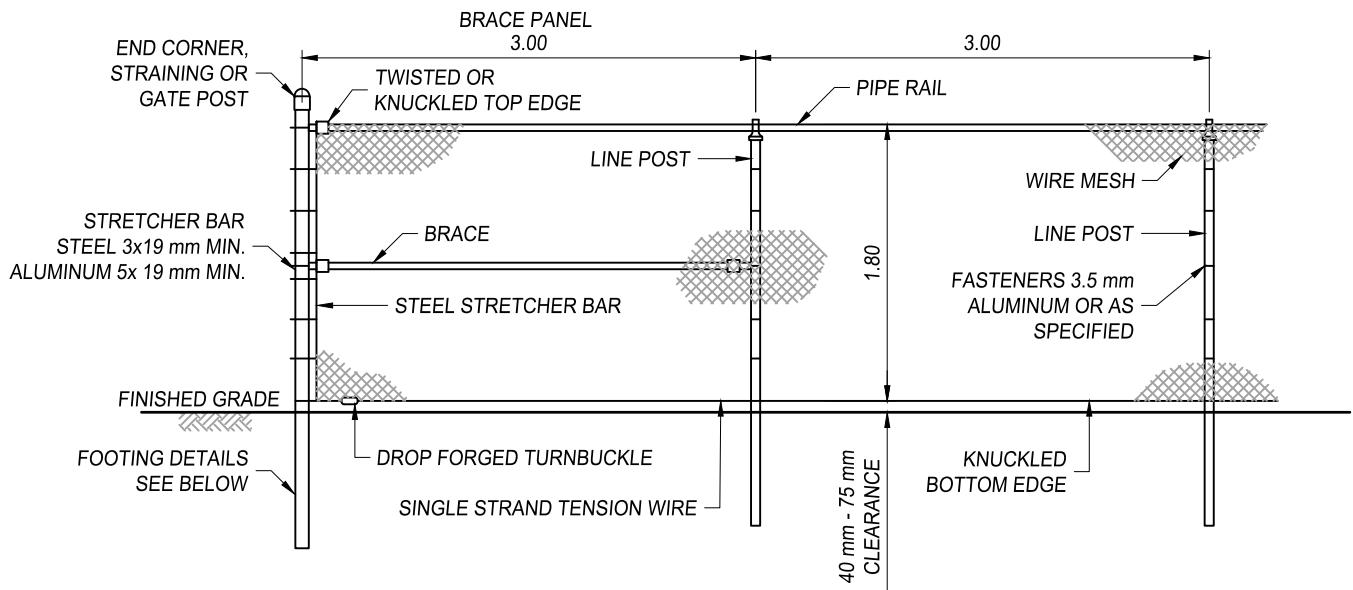
10-301



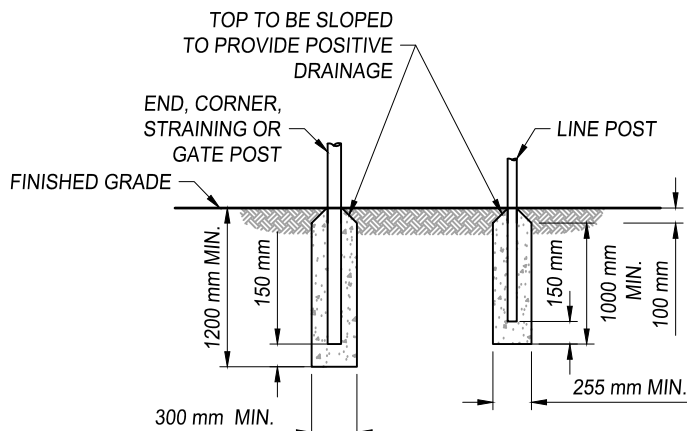
NOTE:
(1) SEE STANDARD DETAIL 10-301 FOR ADDITIONAL INFORMATION.

WOOD SCREEN FENCE
STEP DOWN

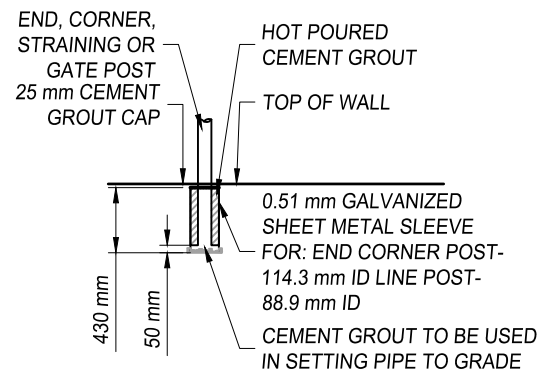
REVISION DATE	
2024	
REV.	STANDARD DETAIL #:
0	10-302



FENCE DETAIL



IN GROUND



ON RETAINING WALL

NOTES:

- (1) ALL COMPONENTS AND WORKSMANSHIP TO CONFIRM TO THE MUNICIPALITY'S STANDARD CONSTRUCTION SPECIFICATIONS.
- (2) ALL DIMENSIONS IN METRES UNLESS SPECIFIED OTHERWISE.

CHAIN LINK FENCE

REVISION DATE

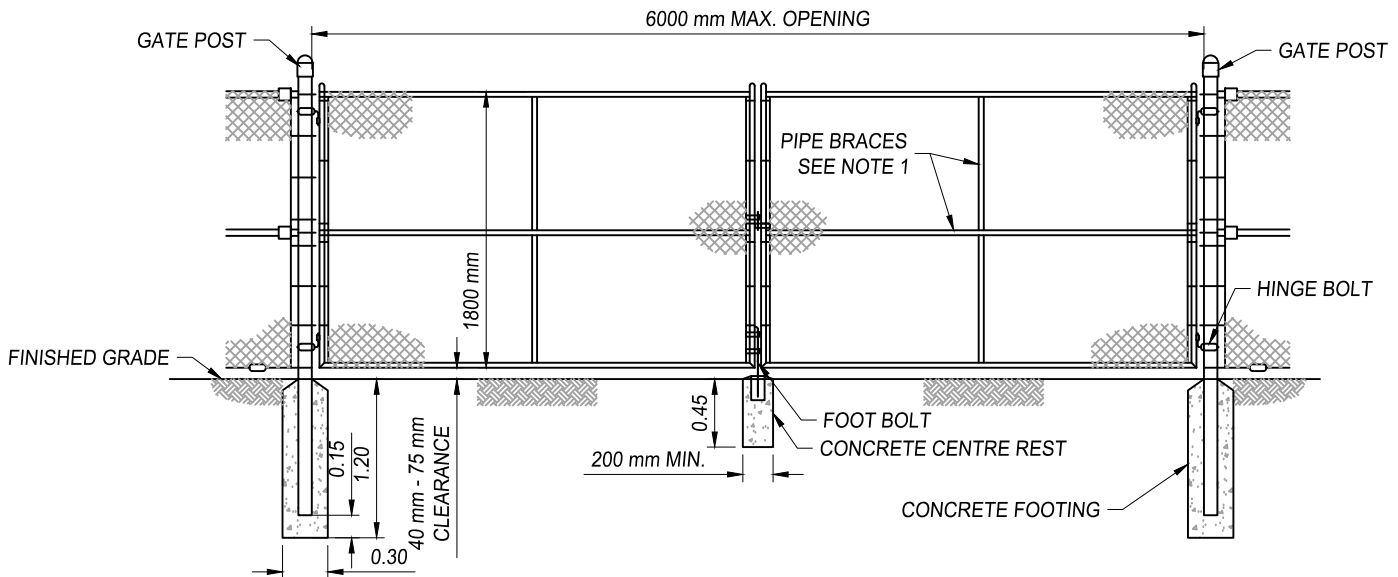
2024

REV.

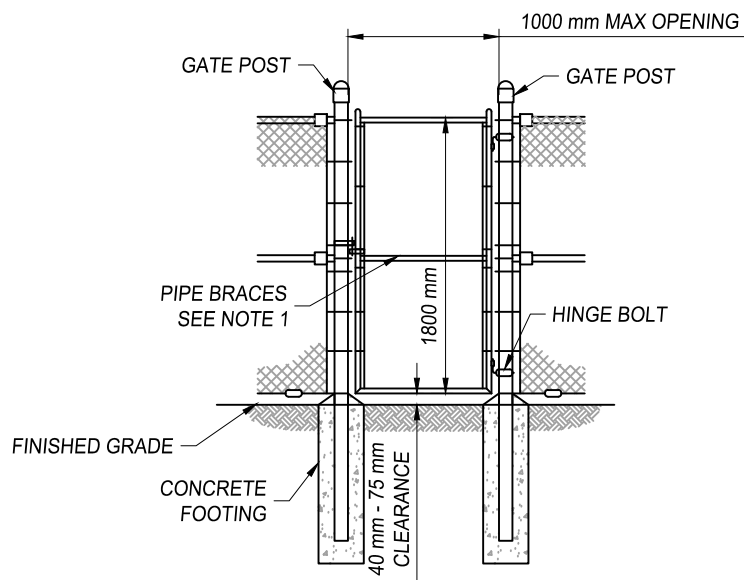
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STANDARD DETAIL #:

10-303



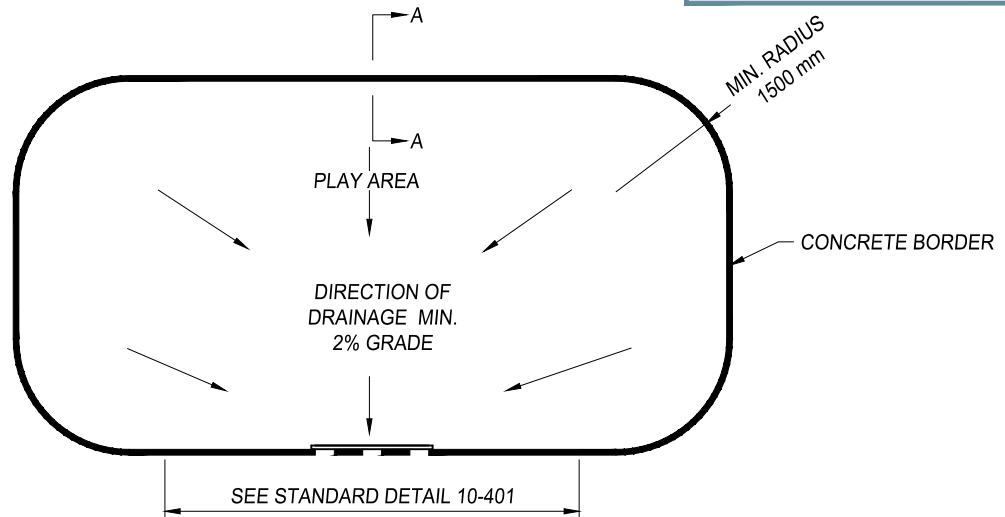
DOUBLE GATE



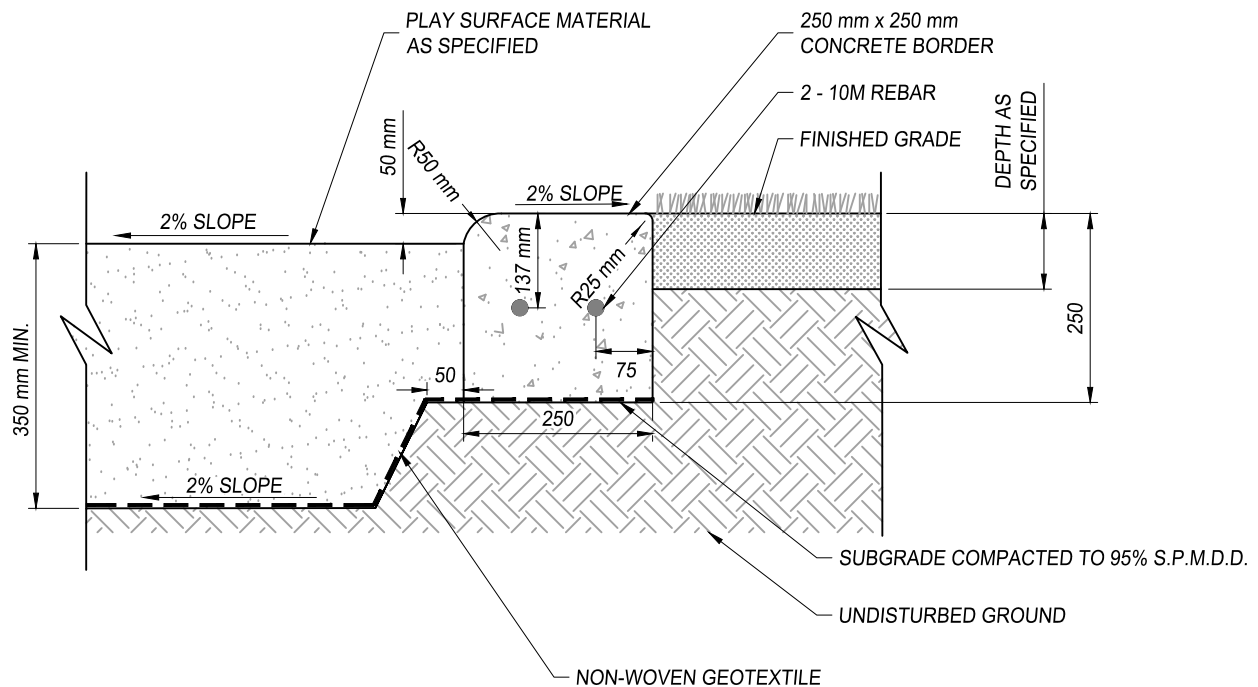
SINGLE GATE

NOTES:

- (1) PIPE BRACES:
GATE LEAVES UP TO 1.8 m WIDE - HORIZONTAL BRACE ONLY.
GATE LEAVES OVER 1.8 m WIDE - BOTH HORIZONTAL AND VERTICAL BRACES.
- (2) ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO THE MUNICIPALITY'S STANDARD CONSTRUCTION SPECIFICATIONS.
- (3) ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.



PLAN VIEW



SECTION A-A

NOTES:

- (1) CONTRACTION JOINTS SHALL BE CUT EVERY 3.0 m. JOINTS SHALL NOT BE LESS THAN 30 mm IN DEPTH AND 6 mm IN WIDTH. THE EDGES OF THE JOINT SHALL BE ROUNDED OFF WITH AN EDGER HAVING A RADIUS OF 6 mm.
- (2) BORDER LOCATION SHALL MEET OR EXCEED EQUIPMENT OFFSETS AND SAFETY ZONES.
- (3) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

CONCRETE BORDER FOR PLAYGROUND

REVISION DATE

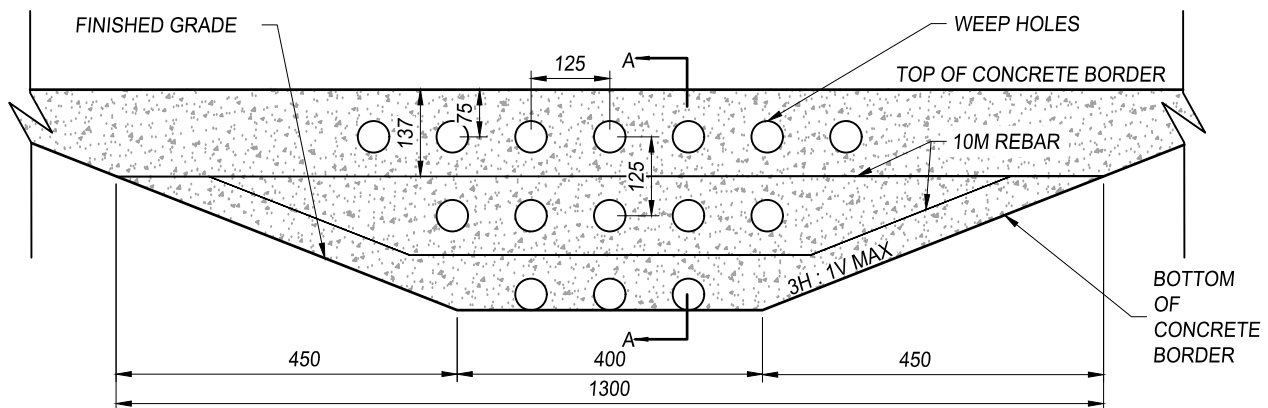
2024

REV.

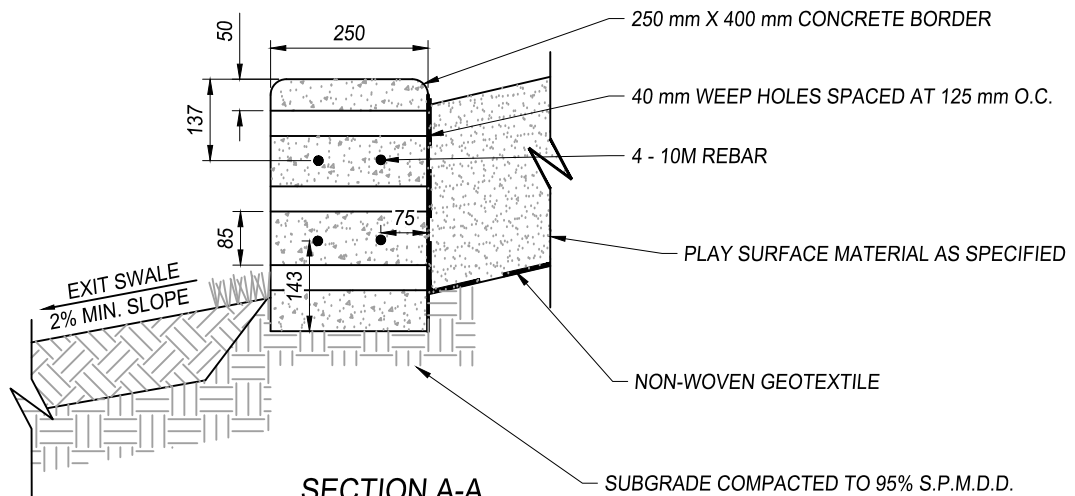
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STANDARD DETAIL #:

10-400



ELEVATION



SECTION A-A

NOTE:

- (1) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

CONCRETE BORDER FOR PLAYGROUND - DRAINAGE

REVISION DATE

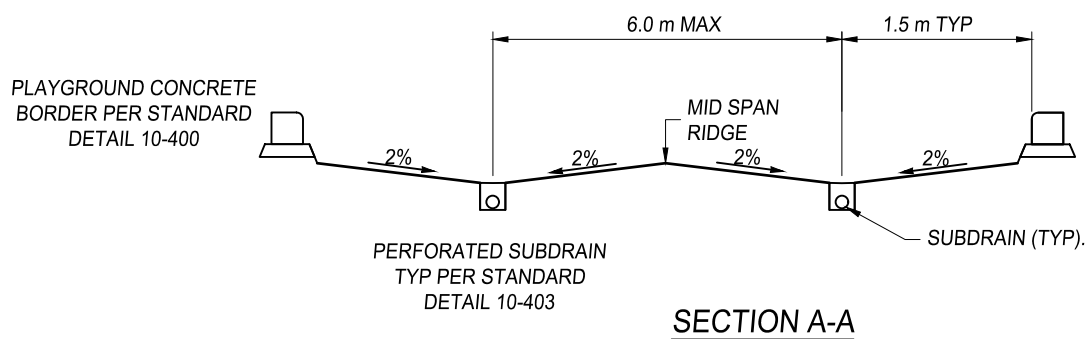
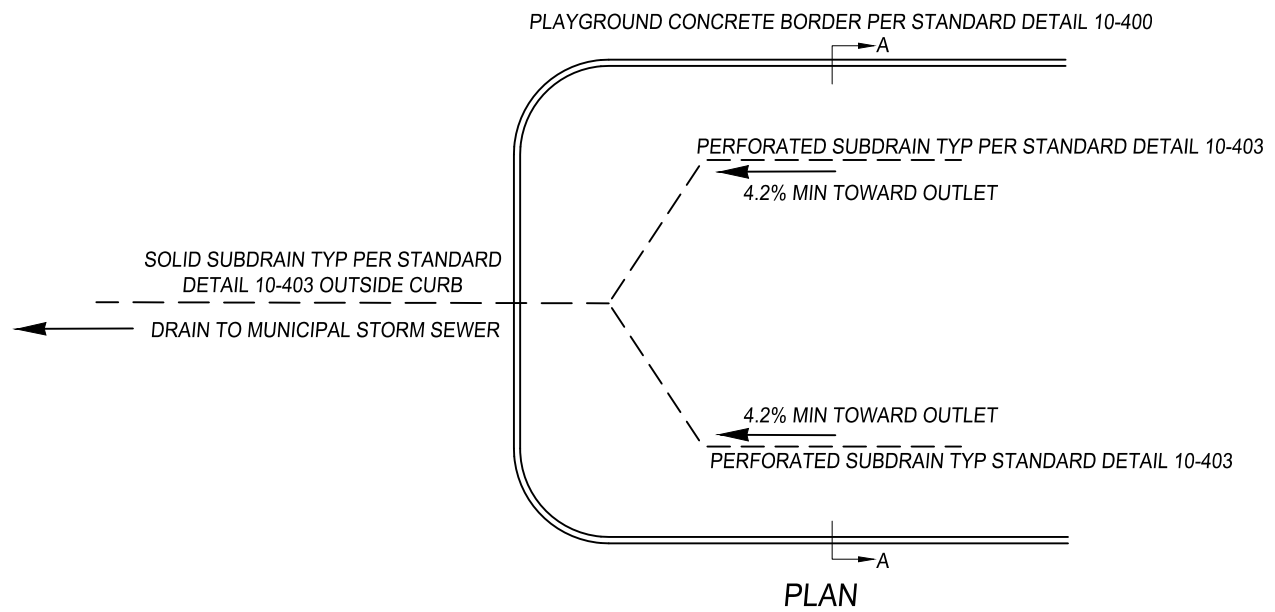
2024

REV.

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STANDARD DETAIL #:

10-401



PLAYGROUND SUBDRAIN

REVISION DATE

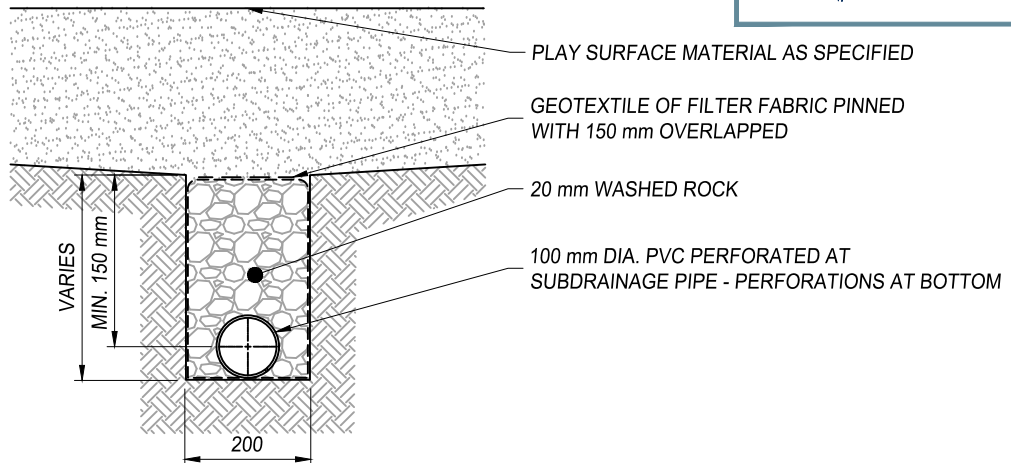
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REV.

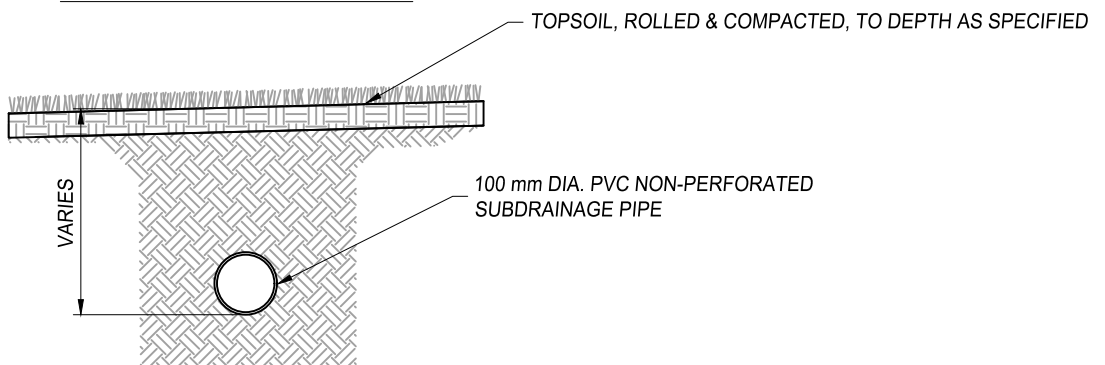
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STANDARD DETAIL #:

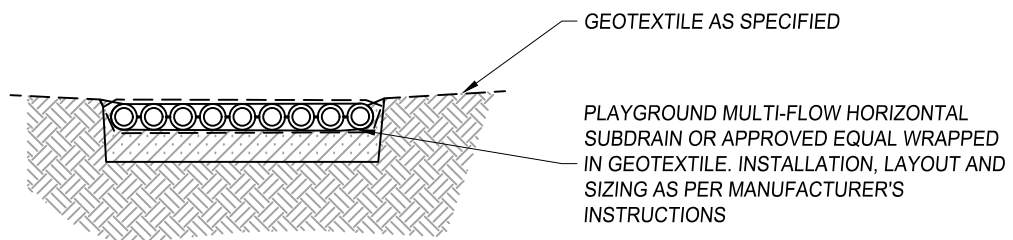
10-402



PERFORATED DRAINAGE



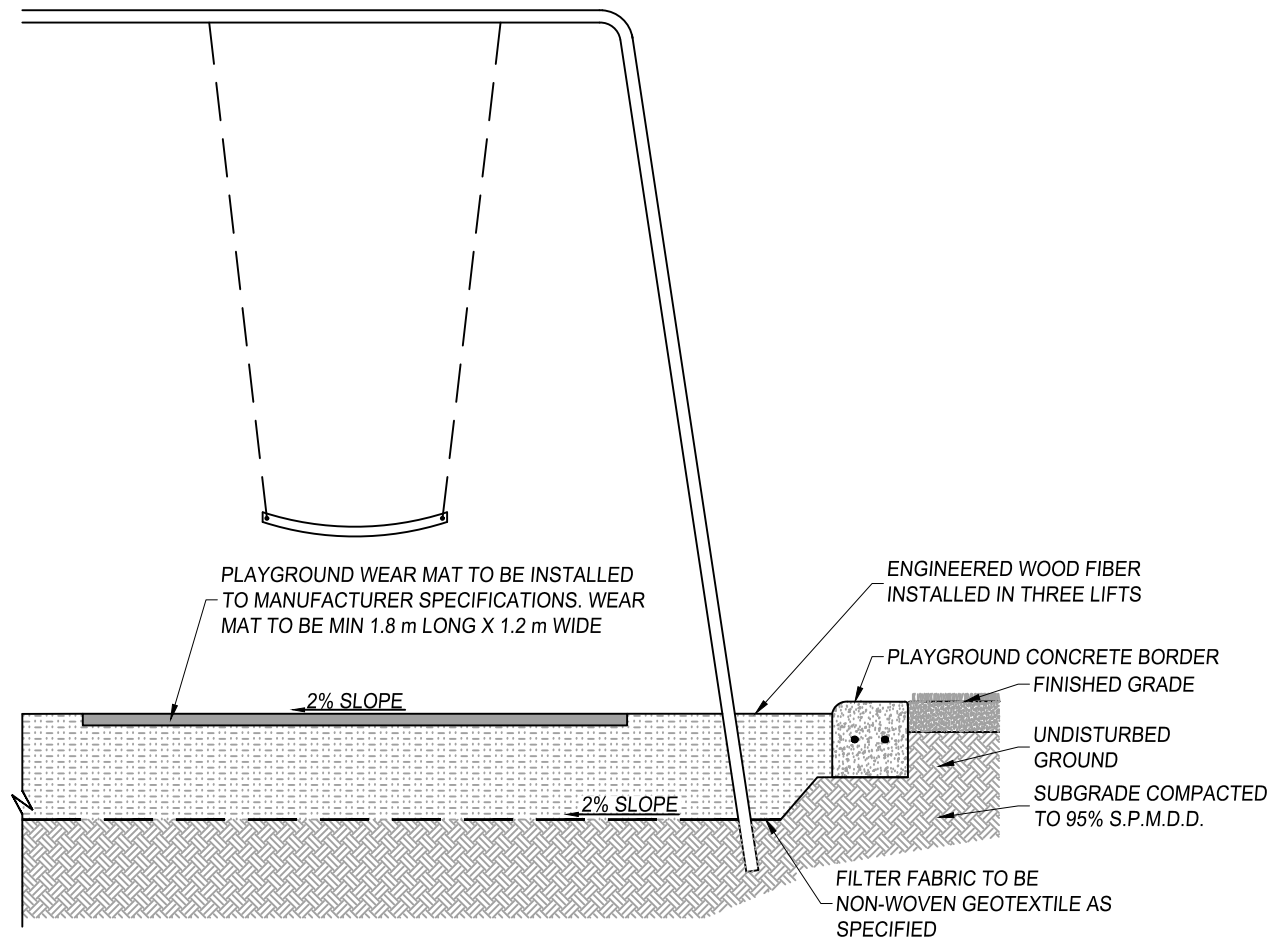
NON-PERFORATED DRAINAGE



MULTIFLOW DRAINAGE

NOTES:

- (1) MINIMUM 4.2% SLOPE ON ALL FRENCH DRAINS.
- (2) ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.
- (3) COMPACT SUBGRADE TO 95% S.P.M.D.D.



NOTES:

- (1) ENGINEERED WOOD FIBER TO BE INSTALLED TO A COMPACTED DEPTH OF 350 mm AND INSTALLED IN 115 mm LIFTS.
- (2) ALL DIMENSIONS IN MILLIMETRES UNLESS NOTED OTHERWISE.

PLAYGROUND WEAR MAT

REVISION DATE

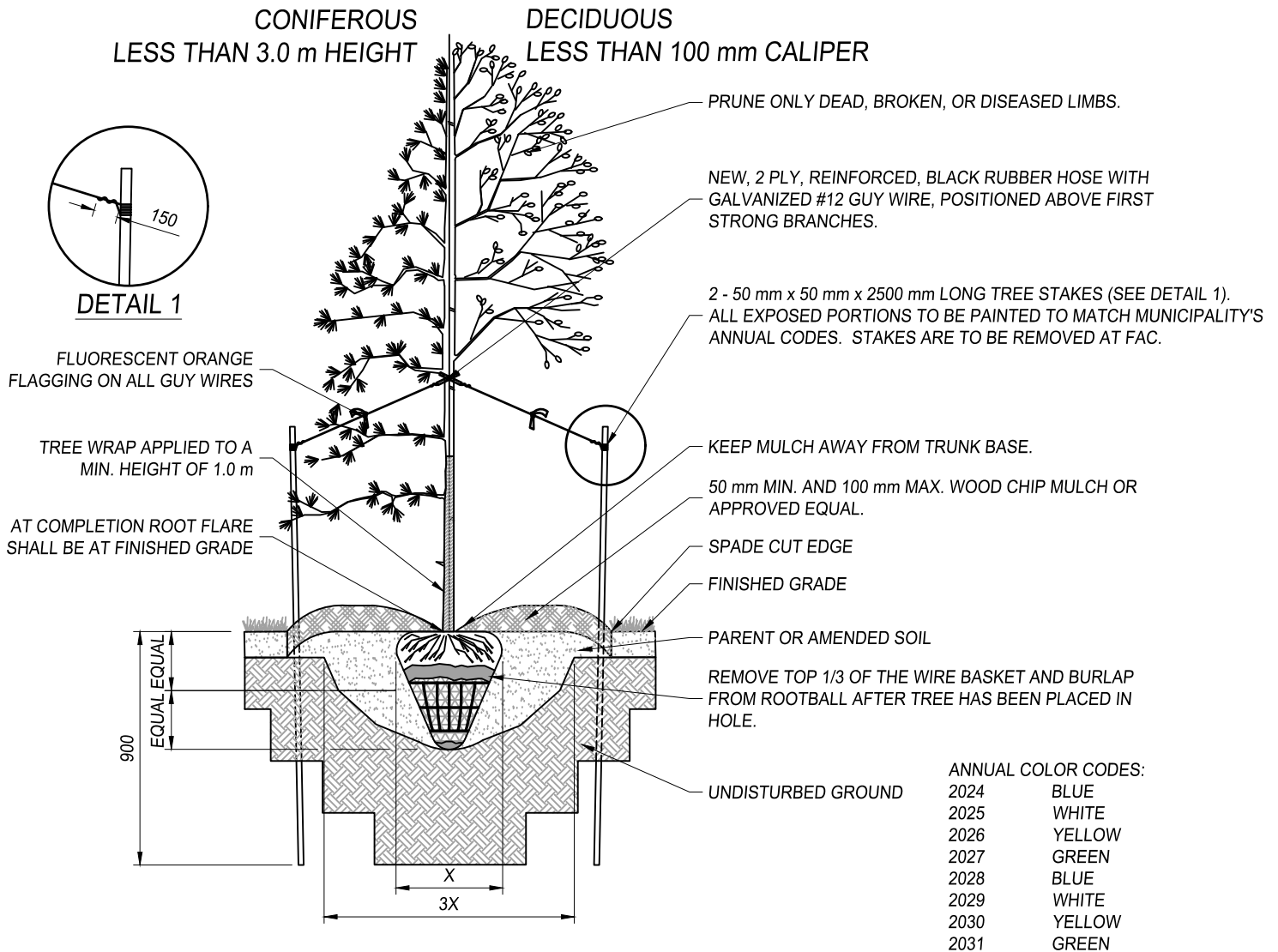
2024

REV.

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STANDARD DETAIL #:

10-404



NOTES:

- (1) IF MIN. UTILITY SETBACKS PERMIT, POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.
- (2) ALL TREES TO MAINTAIN A MIN. CLEARANCE FROM ALL UTILITIES AS SET OUT IN THESE STANDARDS.
- (3) DIG ALL ROOT HOLES BY HAND WHEN TREE PIT IS CLOSER THAN 1 m FROM EDGE OF PIT TO THE STAKED UTILITY LINES.
- (4) TREES LARGER THAN 100 mm CAL. OR 3.0 m HEIGHT REQUIRE 3 TREE STAKES.
- (5) ALL PLANT MATERIAL SHALL MEET THE HORTICULTURAL STANDARDS AND PRACTICES OF THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.
- (6) SITE WITH HEAVY CLAY SHALL HAVE A LARGER THAN NORMAL HOLE AND EQUAL MIX OF SOIL FROM HOLE, ORGANIC MATTER AND SAND.
- (7) AVOID GLAZING THE SIDES OF THE HOLE. SIDES OF HOLE SHALL BE SCARIFIED.

TREE PLANTING

REVISION DATE

2024

REV.

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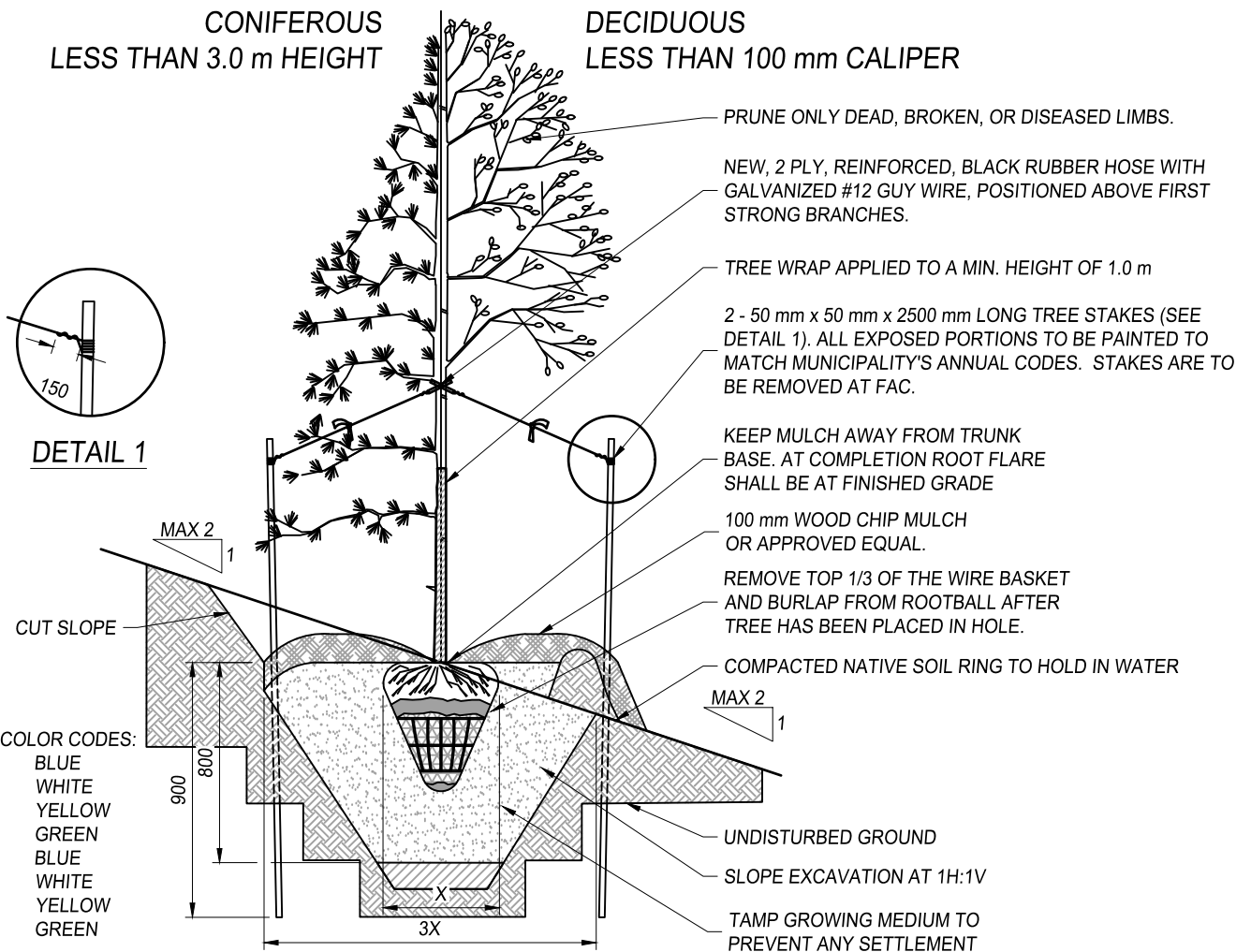
STANDARD DETAIL #:

10-500



CONIFEROUS
LESS THAN 3.0 m HEIGHT

DECIDUOUS
LESS THAN 100 mm CALIPER



NOTES:

- (1) IF MIN. UTILITY SETBACKS PERMIT, POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.
- (2) ALL TREES TO MAINTAIN A MIN. CLEARANCE FROM ALL UTILITIES AS SET OUT IN THESE STANDARDS.
- (3) DIG ALL ROOT HOLES BY HAND WHEN TREE PIT IS CLOSER THAN 1 m FROM EDGE OF PIT TO STAKED UTILITY LINES.
- (4) TREES LARGER THAN 100 mm CAL. OR 3.0 m HEIGHT REQUIRE 3 TREE STAKES.
- (5) ALL PLANT MATERIAL SHALL MEET THE HORTICULTURAL STANDARDS AND PRACTICES OF THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.
- (6) SITE WITH HEAVY CLAY SHALL HAVE A LARGER THAN NORMAL HOLE AND EQUAL MIX OF SOIL FROM HOLE, ORGANIC MATTER AND SAND.
- (7) AVOID GLAZING THE SIDES OF THE HOLE. SIDES OF HOLE SHALL BE SCARIFIED.
- (8) IF POOR DRAINAGE CONDITIONS EXIST, PROVIDE POSITIVE SUB-SURFACE DRAINAGE AWAY FROM PLANTING EXCAVATION.

TREE PLANTING ON SLOPE

REVISION DATE

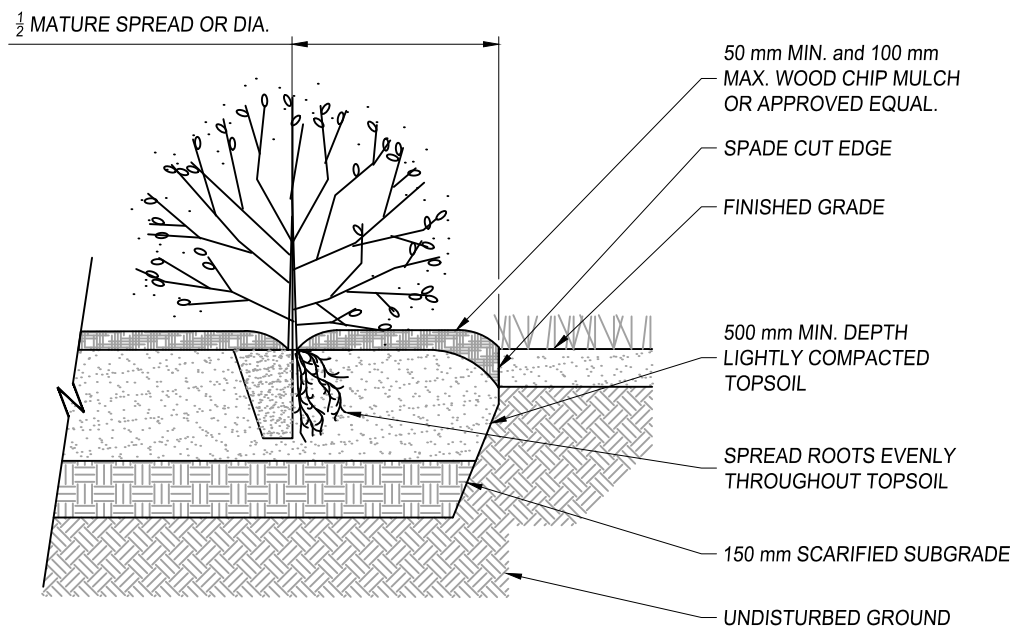
2024

REV.

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STANDARD DETAIL #:

10-501



NOTES:

- (1) DO NOT PLACE MULCH WITHIN 50 mm OF SHRUB BASE.
- (2) PRUNE ALL DEAD OR DAMAGED ROOTS AND BRANCHES.
- (3) MINIMUM SHRUB SIZE AT PLANTING TO BE AS PER THE DEVELOPMENT STANDARDS.
- (4) ALL PLANT MATERIAL SHALL MEET THE HORTICULTURAL STANDARDS AND PRACTICES OF THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.

SHRUB BED PLANTING

REVISION DATE

2024

REV.

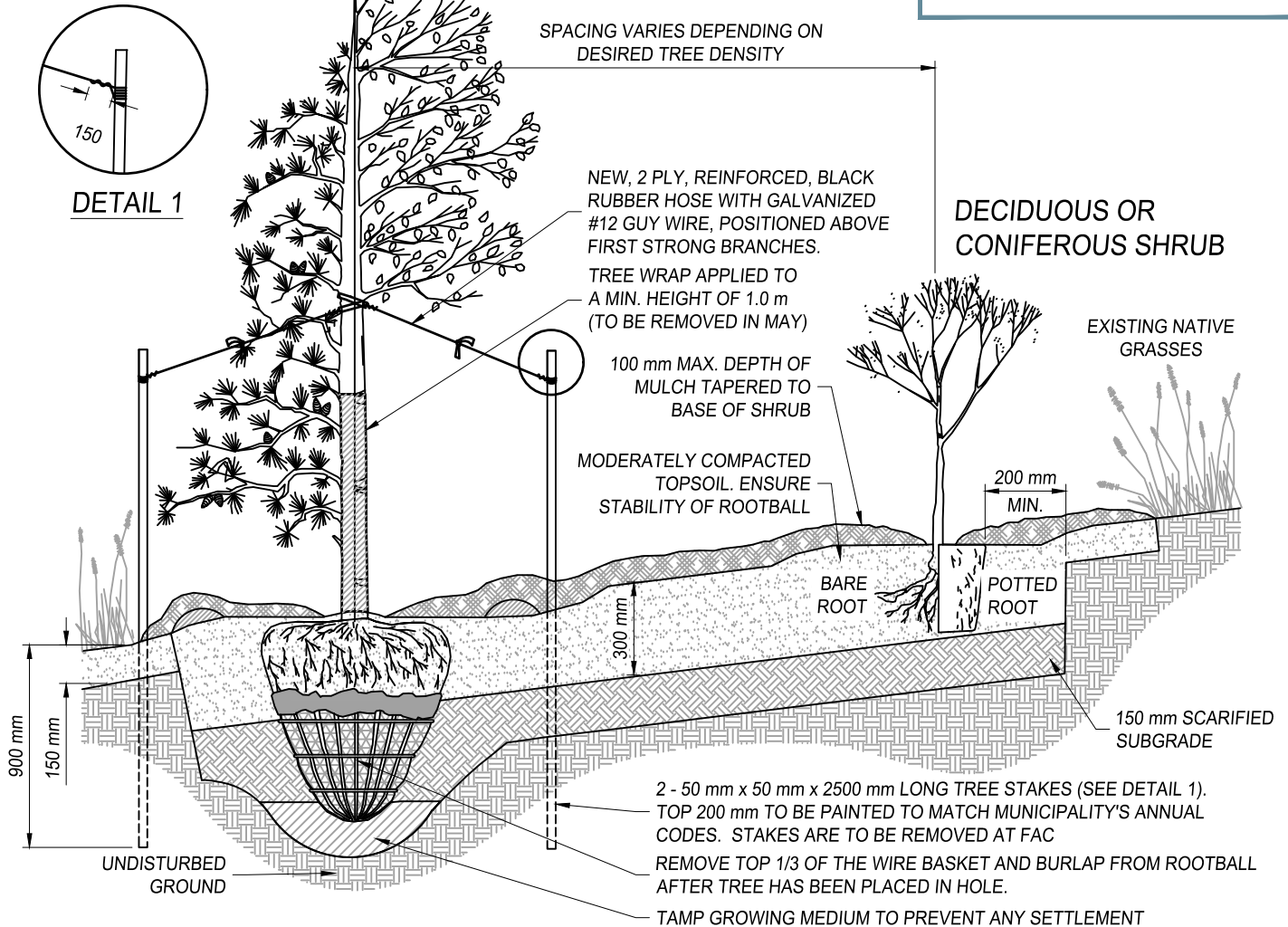
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STANDARD DETAIL #:

10-502

CONIFEROUS
LESS THAN 3.0 m HEIGHT

DECIDUOUS
LESS THAN 100 mm CALIPER



NOTES:

- (1) ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE MUNICIPALITY'S STANDARD CONSTRUCTION SPECIFICATIONS.
- (2) PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM (DECIDUOUS ONLY).
- (3) ALL TREE STAKES TO MAINTAIN A MINIMUM 1.0 m CLEARANCE FROM ALL UNDERGROUND UTILITIES.
- (4) IF MINIMUM UTILITY SETBACKS PERMIT, POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.
- (5) DIG ALL ROOT HOLES BY HAND WHEN TREE PIT IS CLOSER THAN 1 m FROM EDGE OF PIT TO STAKED UTILITY LINES.
- (6) DO NOT PLACE MULCH WITHIN 50 mm OF SHRUB BASE.
- (7) PRUNE ALL DEAD OR DAMAGED ROOTS AND BRANCHES.
- (8) MINIMUM SHRUB SIZES AT PLANTING TO BE 600 mm HEIGHT AND SPREAD.
- (9) ALL PLANT MATERIAL SHALL MEET THE HORTICULTURAL STANDARDS AND PRACTICES OF THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.

ANNUAL COLOR
CODES:

2024	BLUE
2025	WHITE
2026	YELLOW
2027	GREEN
2028	BLUE
2029	WHITE
2030	YELLOW
2031	GREEN

TREE AND SHRUB NATURALIZATION

REVISION DATE

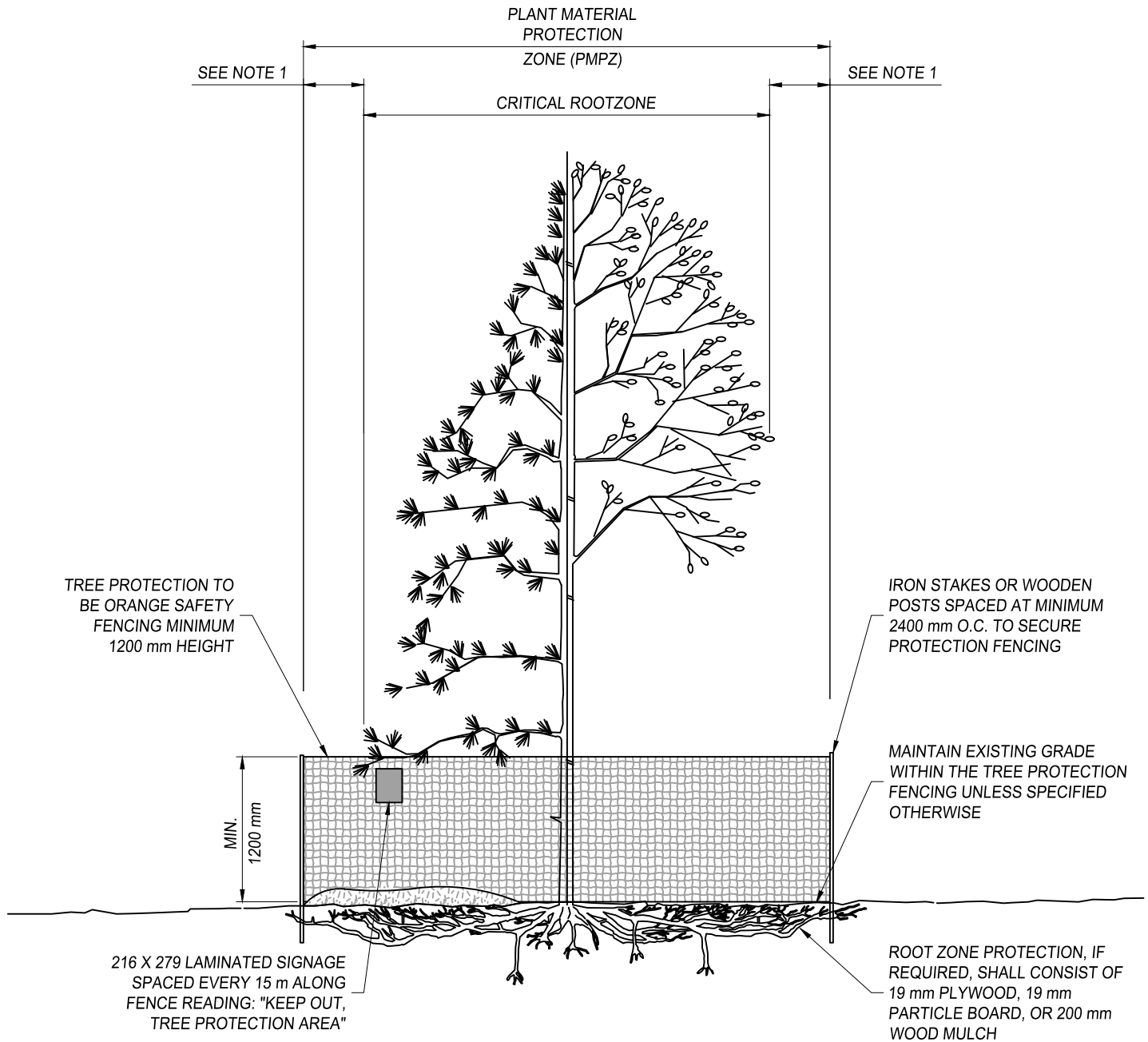
2024

REV.

0

STANDARD DETAIL #:

10-503



NOTES:

- (1) THE LARGER OF 1 m OR 15 cm FOR EVERY 1 cm OF DBH.
- (2) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

TREE PROTECTION

REVISION DATE

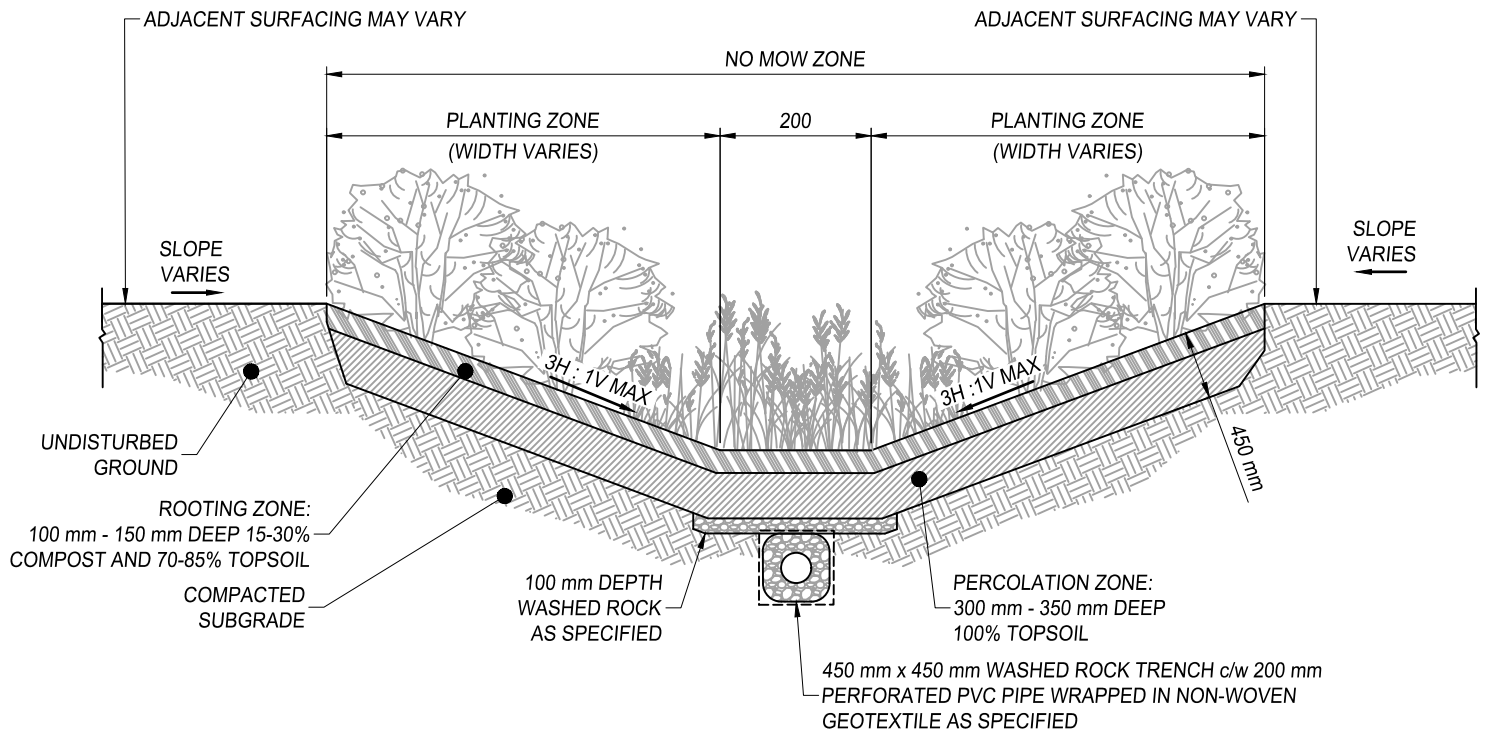
2024

REV.

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STANDARD DETAIL #:

10-504



BIOSWALE CROSS SECTION

REVISION DATE

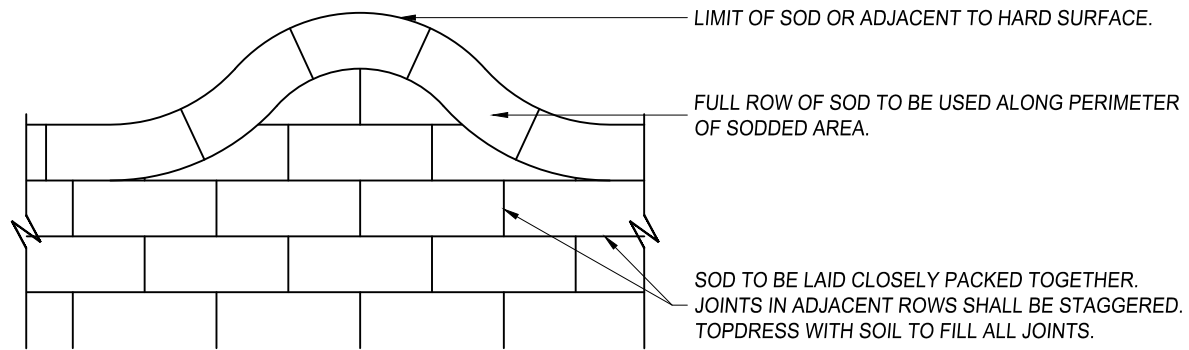
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REV.

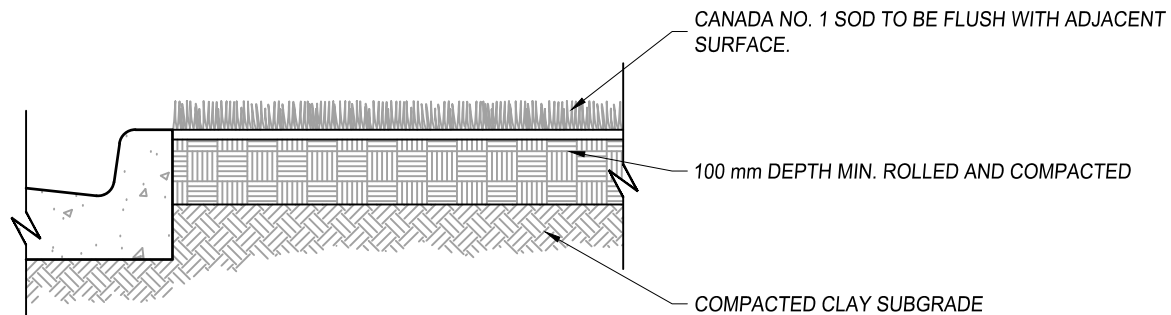
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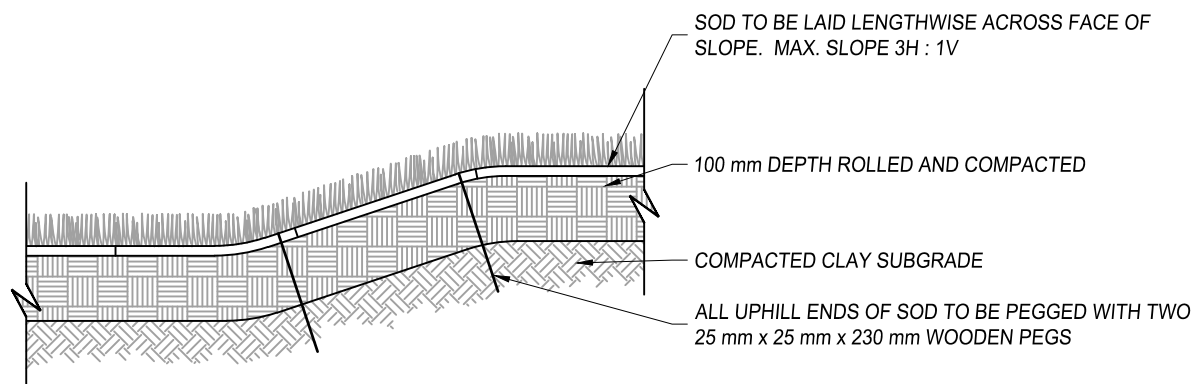
10-505



PLAN VIEW



CROSS SECTION



CROSS SECTION THROUGH SLOPE

NOTES:

- (1) ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO MUNICIPALITY'S STANDARD CONSTRUCTION SPECIFICATIONS.

SOD INSTALLATION

REVISION DATE

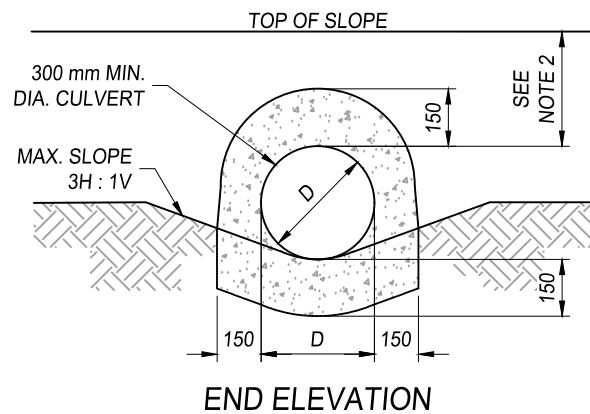
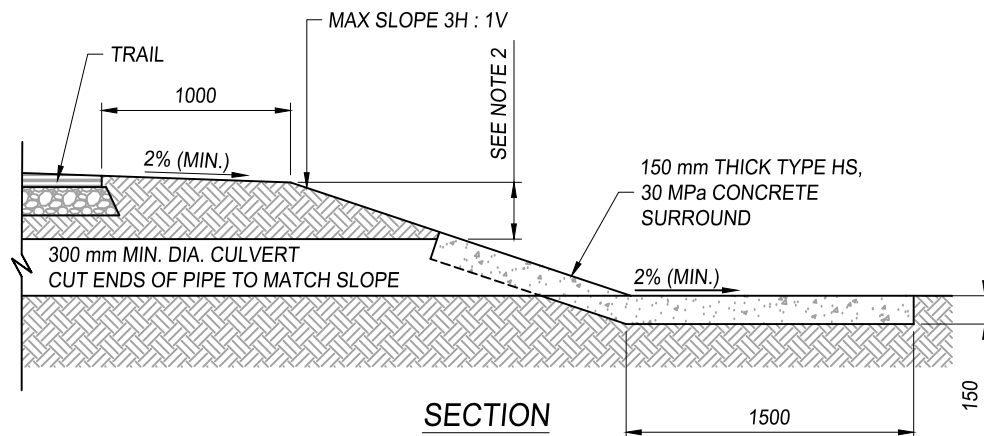
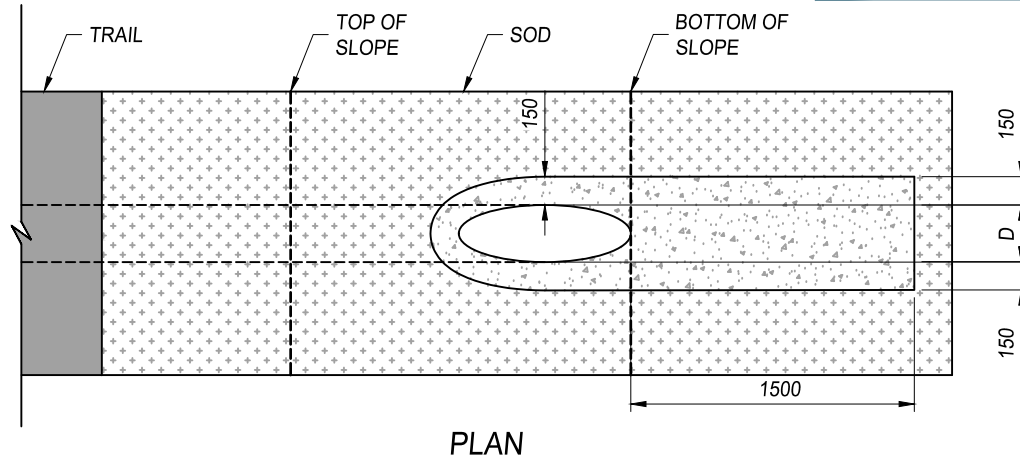
2024

REV.

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STANDARD DETAIL #:

10-600



NOTES:

- (1) SHAPE OR FORM THE SURROUNDING SURFACE TO MATCH THE CULVERT END AND SWALE CROSS SECTION.
- (2) MINIMUM COVER SHALL BE THE GREATER OF HALF THE CULVERT DIAMETER OR 0.5 m.
- (3) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

URBAN PARK CULVERT

REVISION DATE

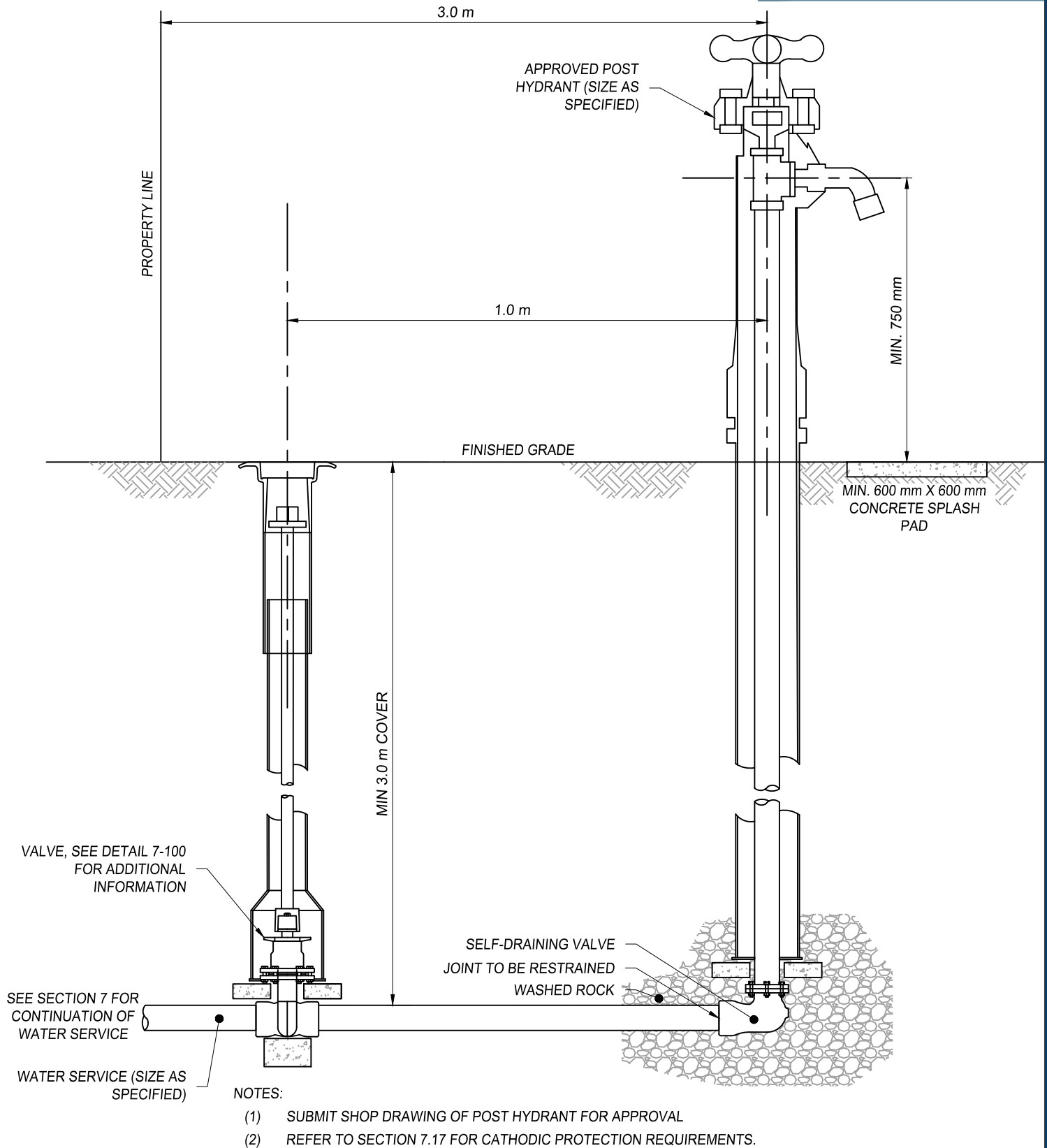
2024

REV.

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STANDARD DETAIL #:

10-700



PARK WATER SUPPLY

REVISION DATE

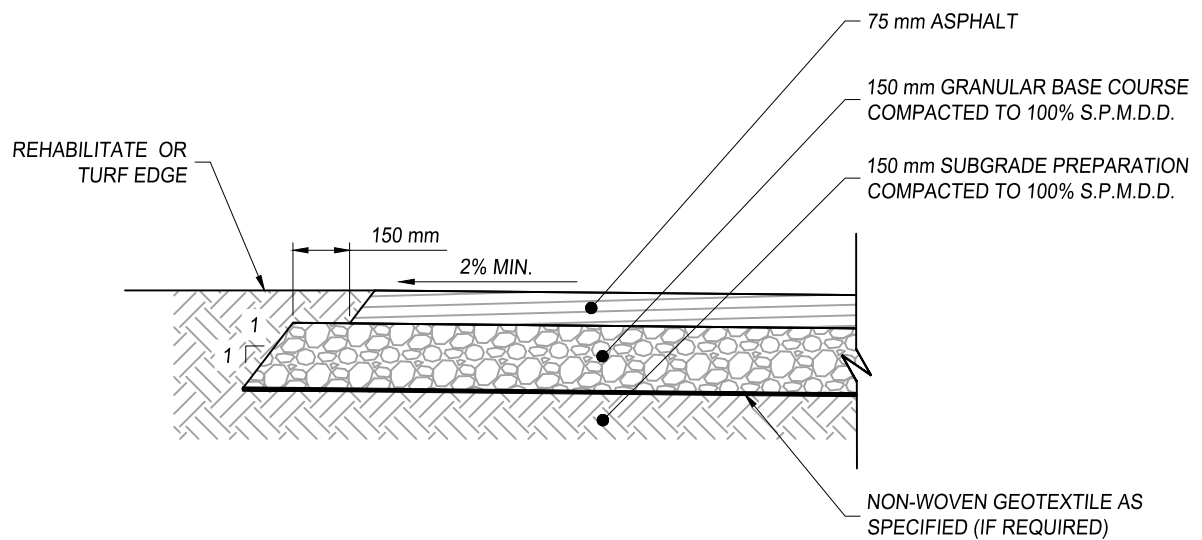
2024

REV.

0

STANDARD DETAIL #:

10-750



NOTES:

- (1) WIDTH VARIES BASED ON CLASS OF TRAIL.
- (2) A MINIMUM HORIZONTAL CLEARANCE OF 1 m SHALL BE PROVIDED FROM THE EDGES OF THE TRAIL SURFACE.
- (3) A MINIMUM VERTICAL CLEARANCE OF 2.4 m SHALL BE PROVIDED ABOVE THE TRAIL SURFACE.
- (4) ADJACENT GRADES ARE TO SLOPE AWAY FROM THE TRAIL.

ASPHALT TRAILS

REVISION DATE

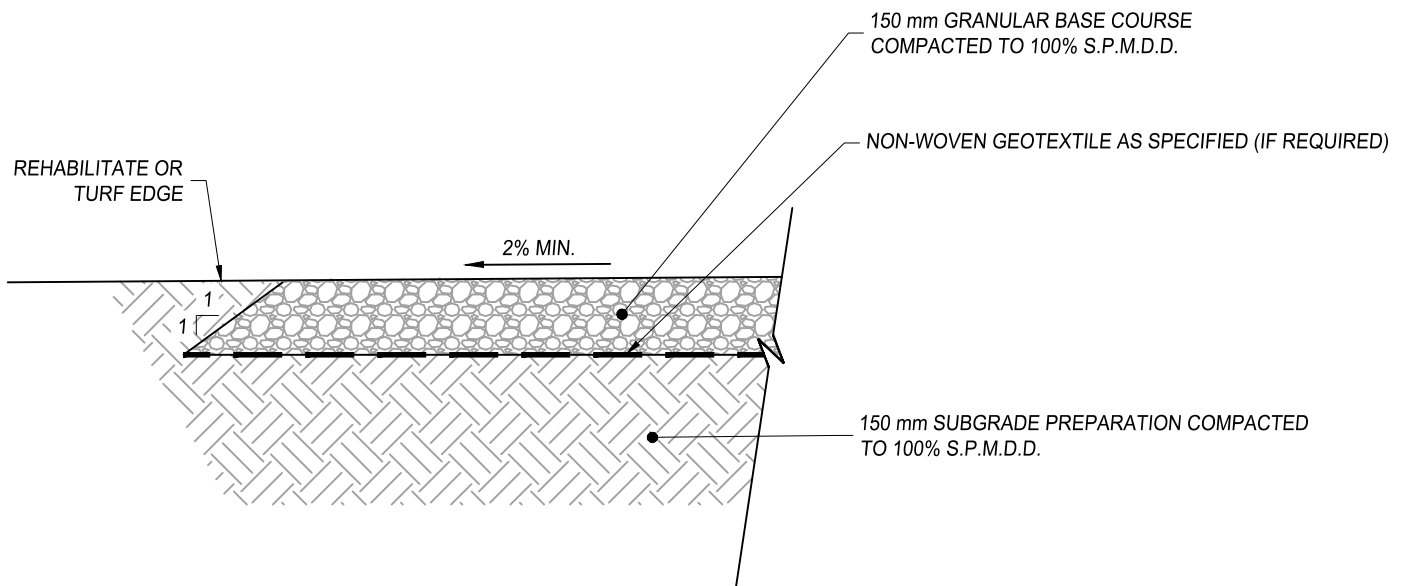
2024

REV.

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STANDARD DETAIL #:

10-800



NOTES:

- (1) WIDTH AS SPECIFIED.
- (2) A MINIMUM HORIZONTAL CLEARANCE OF 1 m SHALL BE PROVIDED FROM THE EDGES OF THE TRAIL SURFACE.
- (3) A MINIMUM VERTICAL CLEARANCE OF 2.4 m SHALL BE PROVIDED ABOVE THE TRAIL SURFACE.
- (4) ADJACENT GRADES ARE TO SLOPE AWAY FROM THE TRAIL.

GRAVEL TRAILS

REVISION DATE

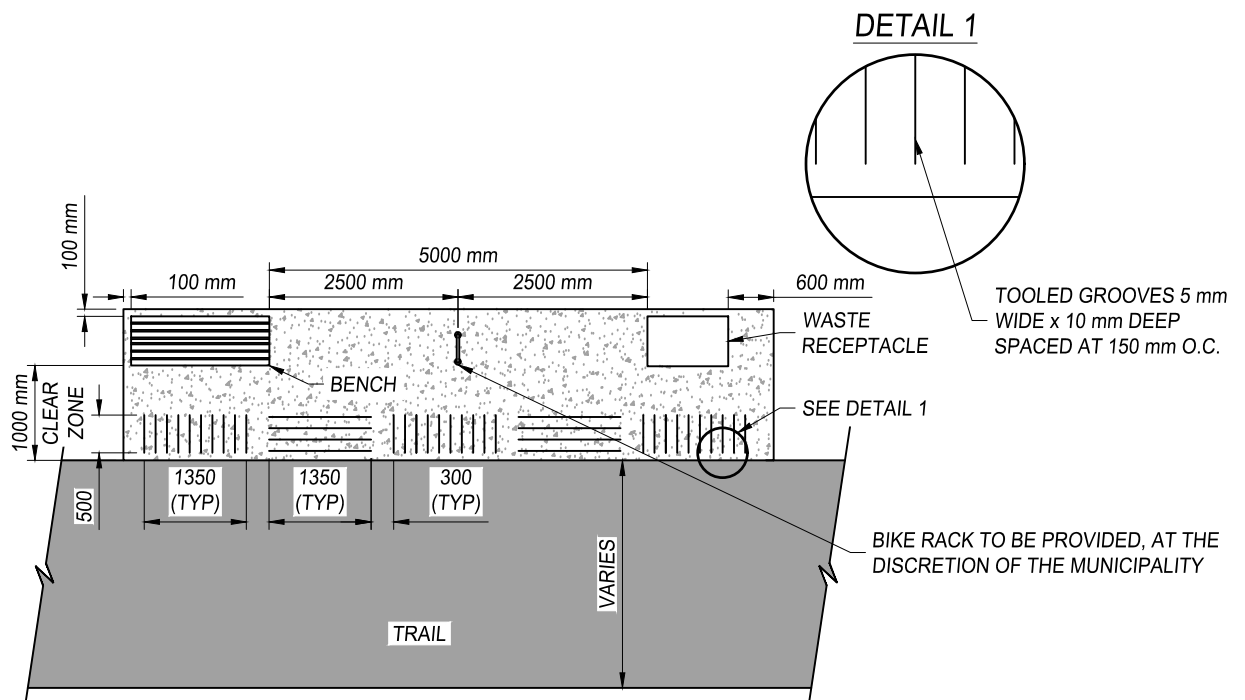
2024

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STANDARD DETAIL #:

10-801



NOTES:

- (1) CONCRETE BENCH NODES REQUIRED EVERY 500 m ON CLASS 1 AND 2 TRAILS.
- (2) WASTE RECEPTACLES ARE ONLY TO BE PLACED AT NODES ALONG TOP OF BANK TRAILS WHERE THEY CAN BE EASILY ACCESSED AND EMPTIED.
- (3) DIMENSIONS ARE IN MILLIMETRES UNLESS SPECIFIED OTHERWISE.

BENCH NODE

REVISION DATE

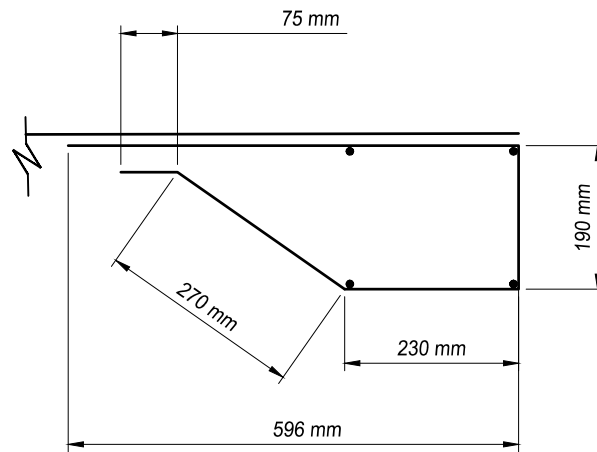
2024

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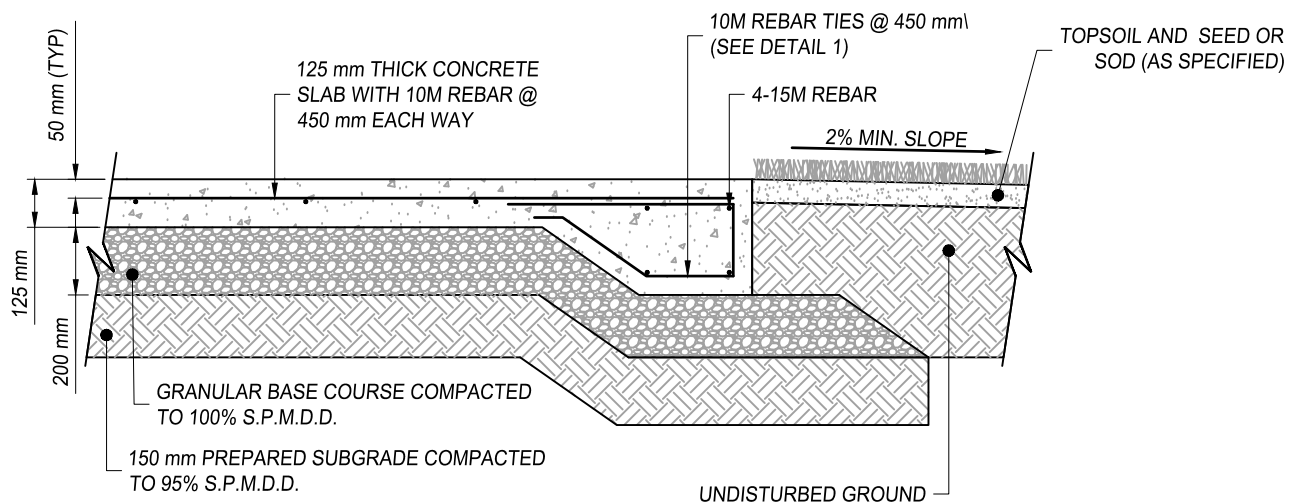
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STANDARD DETAIL #:

10-850



DETAIL 1



SECTION AT EDGE OF SLAB

NOTES:

- (1) CONCRETE SHALL BE TYPE 30 MPa, TYPE HS.
- (2) SAW CUTS TO BE 25 mm DEEP WITH A SPACING OF 4.5 m TO 6.0 m EACH WAY (EVEN SPACING DESIRED). FILL SAW CUTS WITH SIKAFLEX 2CSL.
- (3) CROWN CENTRE OF RINK SLAB WITH A MINIMUM SLOPE OF 0.5% TO EACH SIDE.
- (4) CROWN CENTRE OF MULTI-PURPOSE PAD WITH A MINIMUM SLOPE OF 0.5% TO EACH SIDE.

CONCRETE FOR MULTI-PURPOSE PAD

REVISION DATE

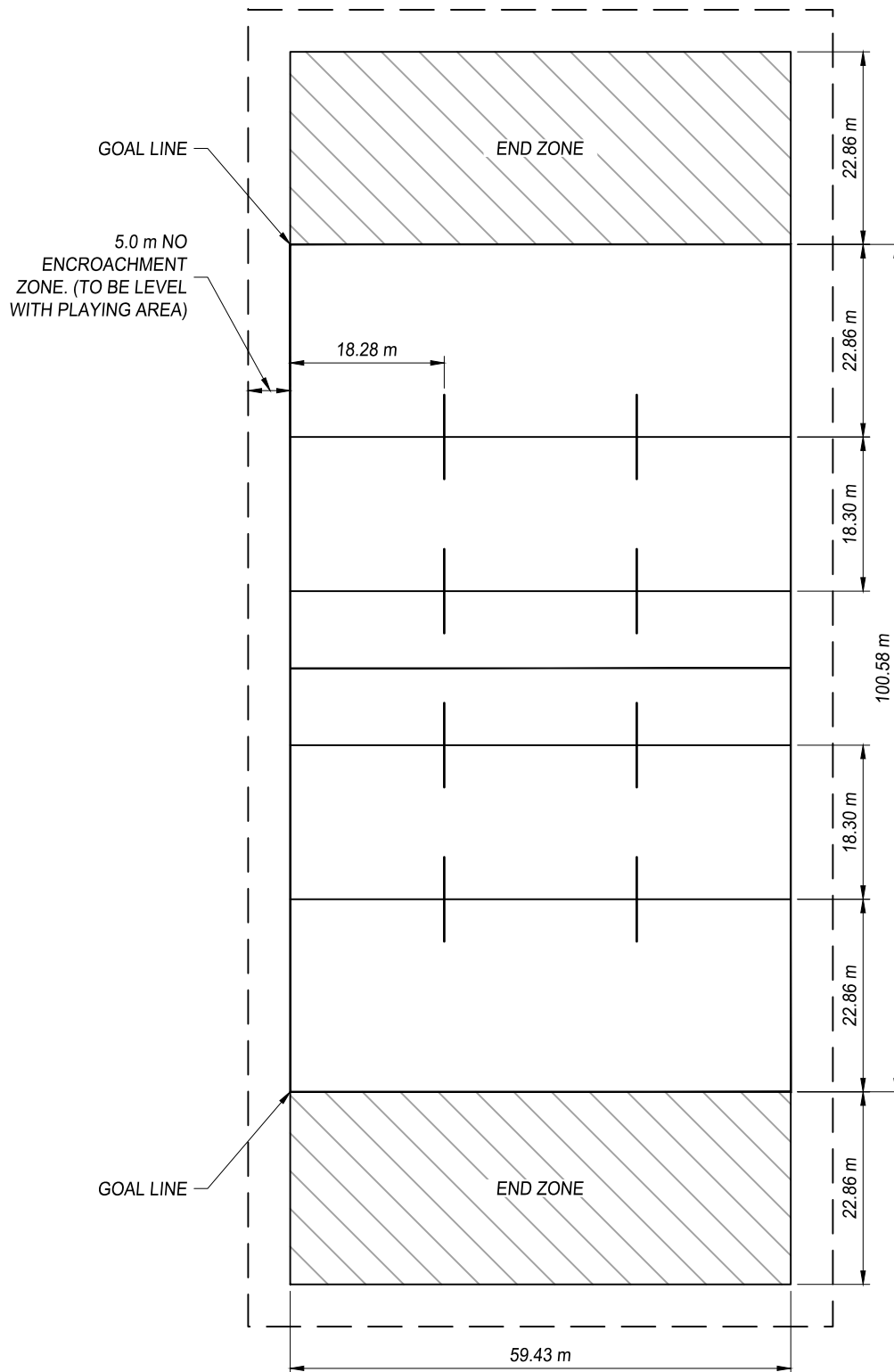
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STANDARD DETAIL #:

10-851



FOOTBALL FIELD LAYOUT

REVISION DATE

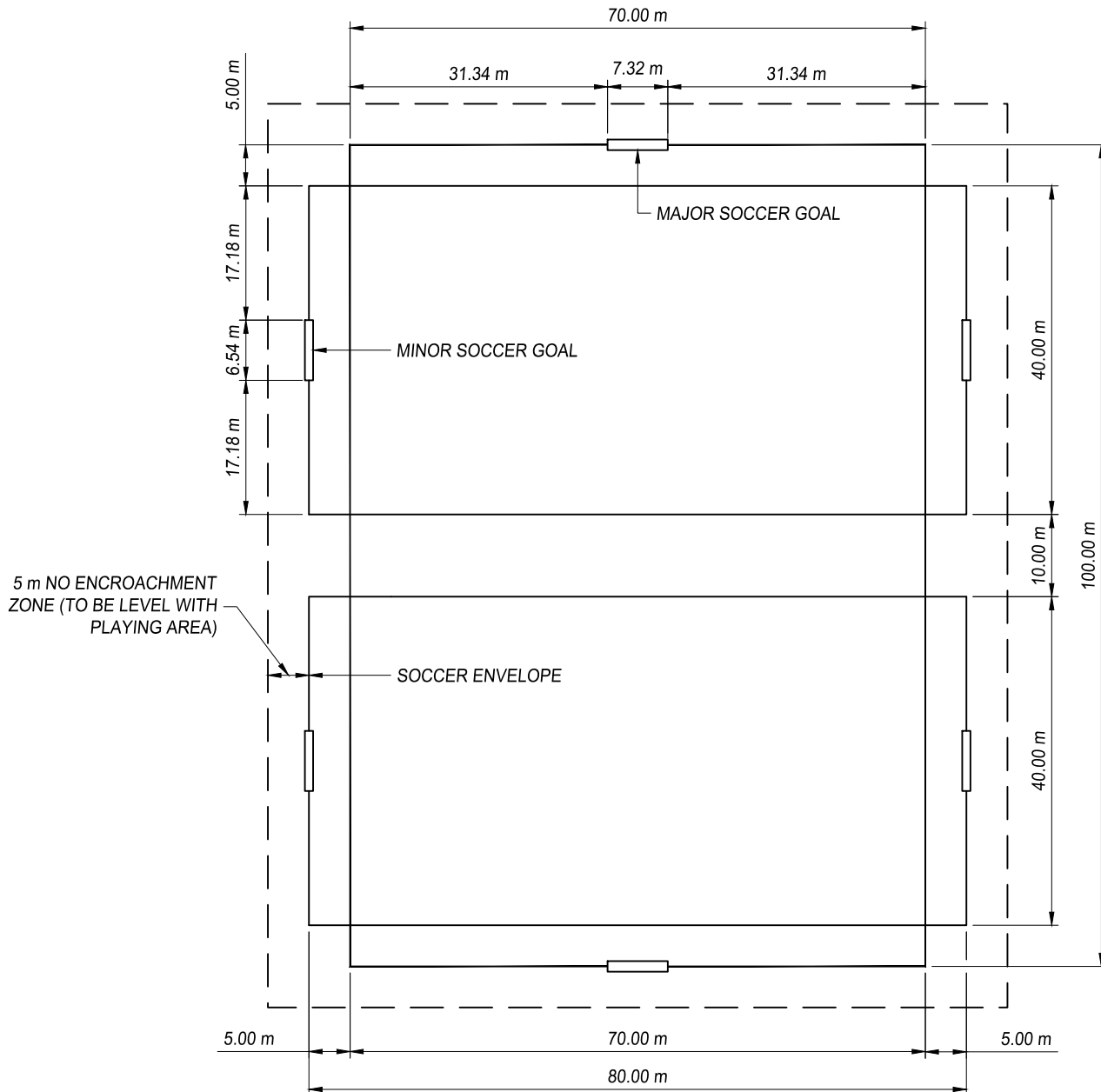
2024

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STANDARD DETAIL #:

10-900



NOTE:

(1) 2% GRADE IN ALL DIRECTIONS.

SOCCER FIELD LAYOUT

REVISION DATE

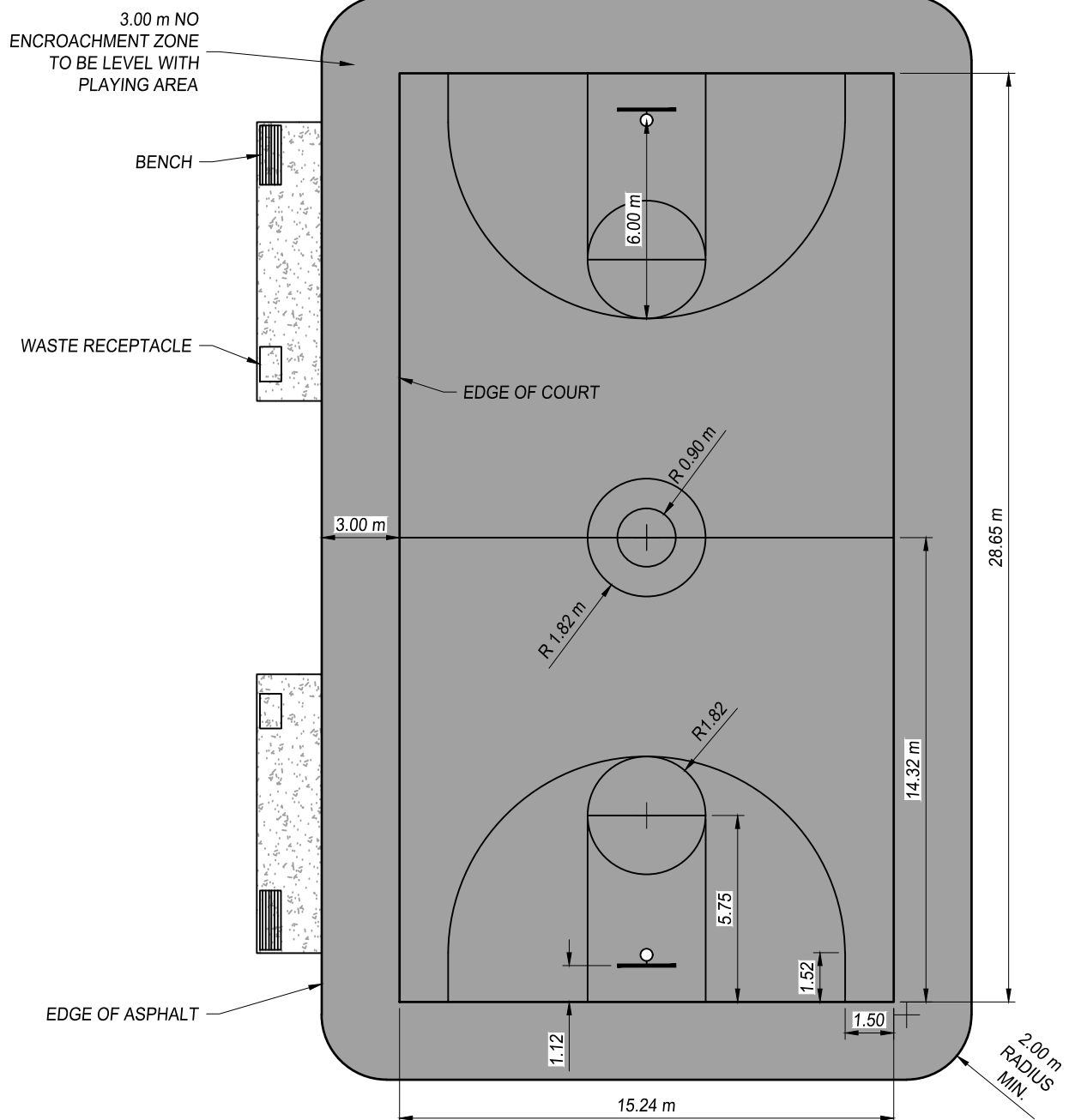
2024

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STANDARD DETAIL #:

10-901



NOTES:

- (1) REFER TO STANDARD DETAIL 10-800 FOR ASPHALT CROSS SECTION.
- (2) REFER TO STANDARD DETAIL 10-850 FOR BENCH NODE DETAILS.
- (3) ALL COURT LINES TO BE 75 mm WIDE AND WHITE.
- (4) MEASURE TO INSIDE EDGE OF COURT BOUNDARY LINES.

BASKETBALL COURT LAYOUT

REVISION DATE

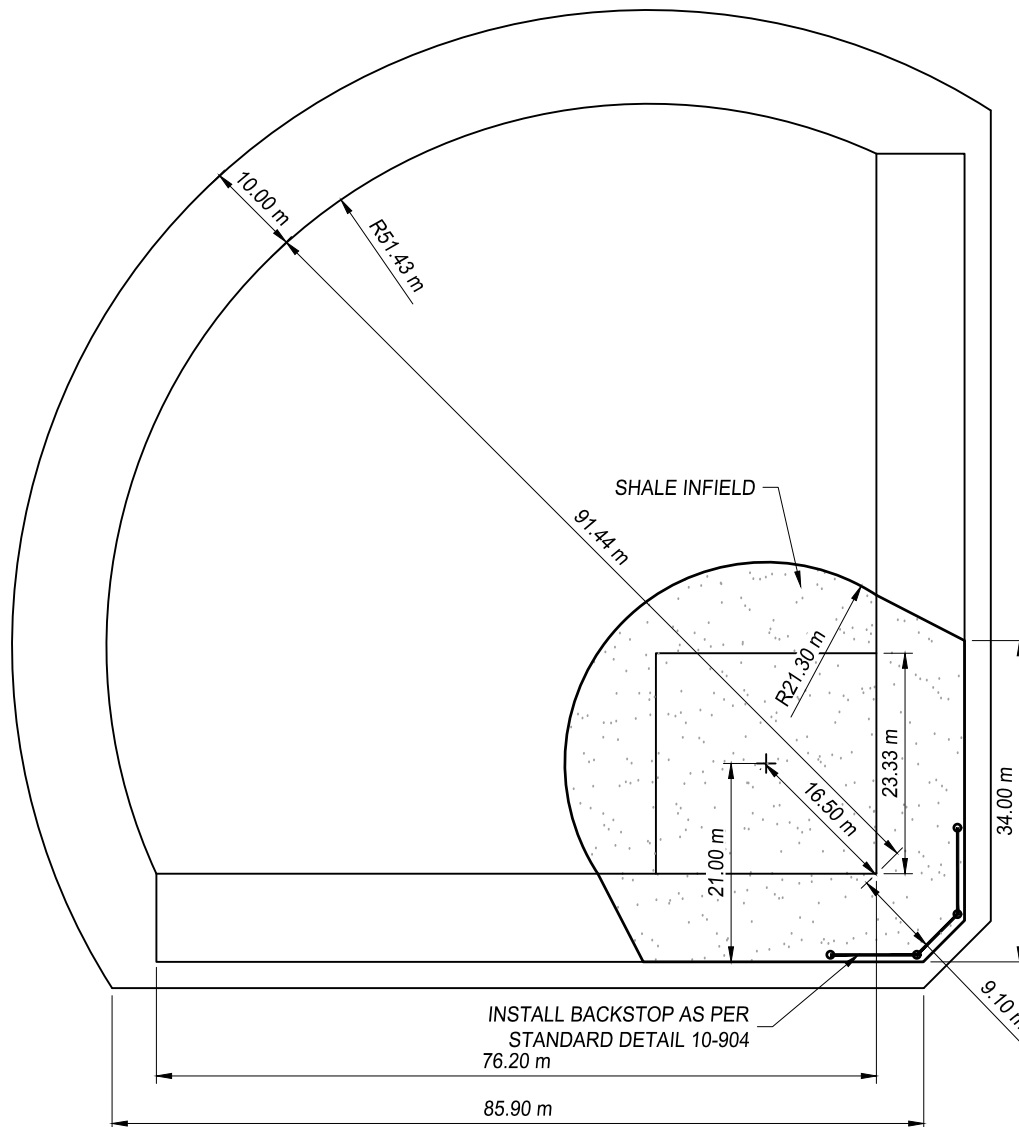
2024

REV.

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STANDARD DETAIL #:

10-902



NOTES:

- (1) SOFTBALL ENVELOPE:
3.0 m BUFFER, UNLESS NOTED OTHERWISE.
2% GRADE IN ALL DIRECTIONS.
TOTAL AREA INCLUDING BUFFER EQUALS $9,475\text{ m}^2$.
- (2) SHALE INFIELD:
150 mm MIN. DEPTH OF 6 mm RED SHALE WITH FILTER FABRIC.

BALL DIAMOND LAYOUT

REVISION DATE

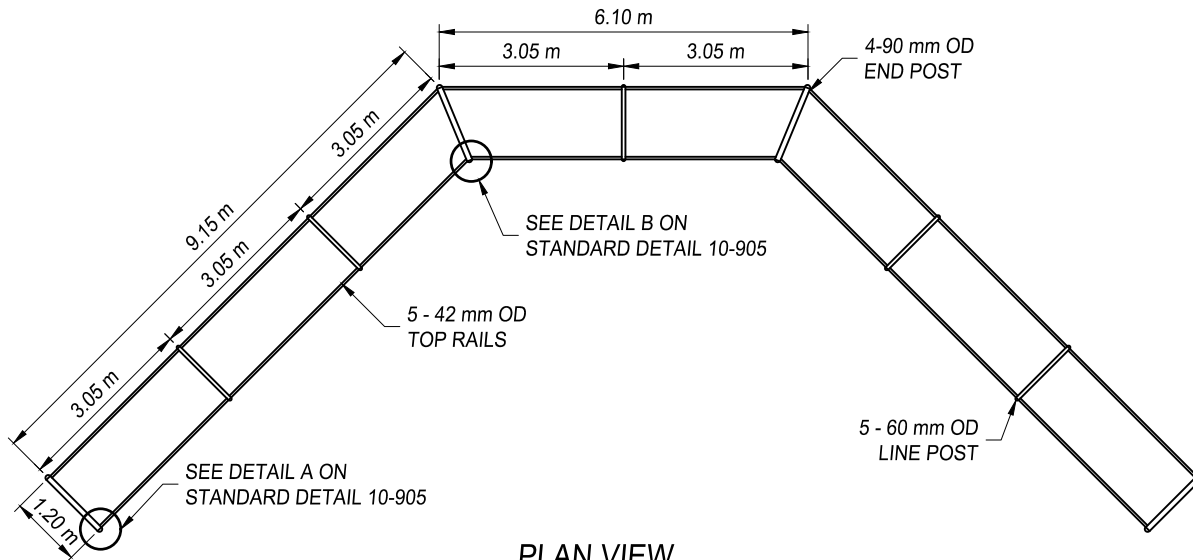
2024

REV.

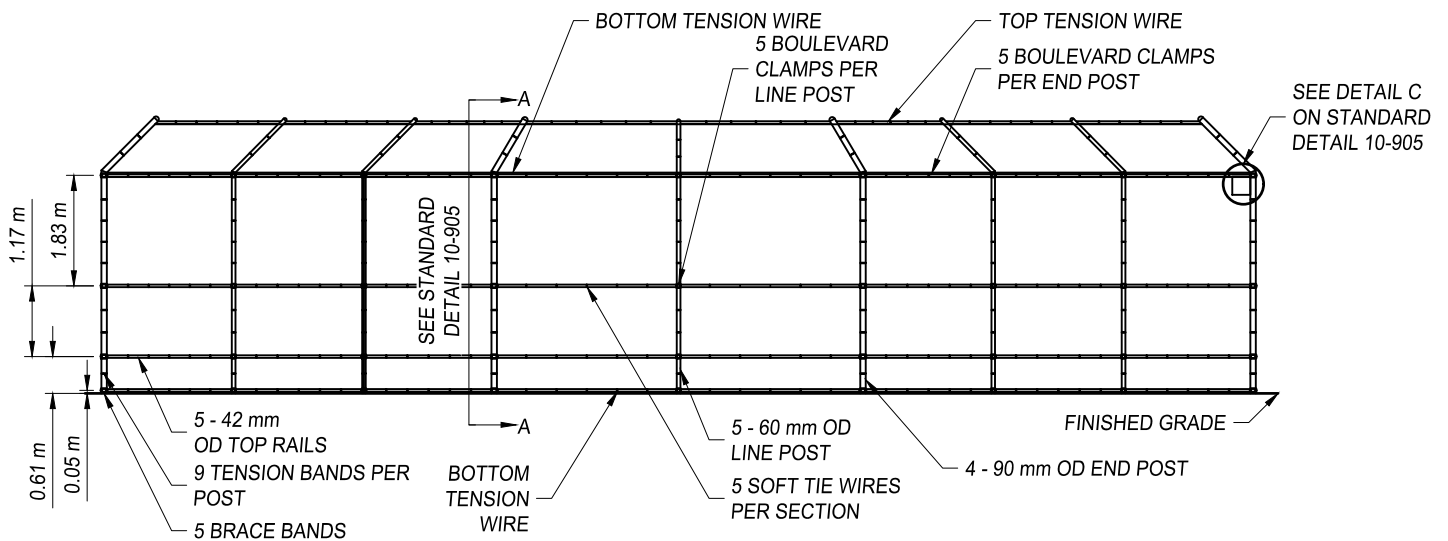
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STANDARD DETAIL #:

10-903



PLAN VIEW



ELEVATION VIEW

BACKSTOP LAYOUT

REVISION DATE

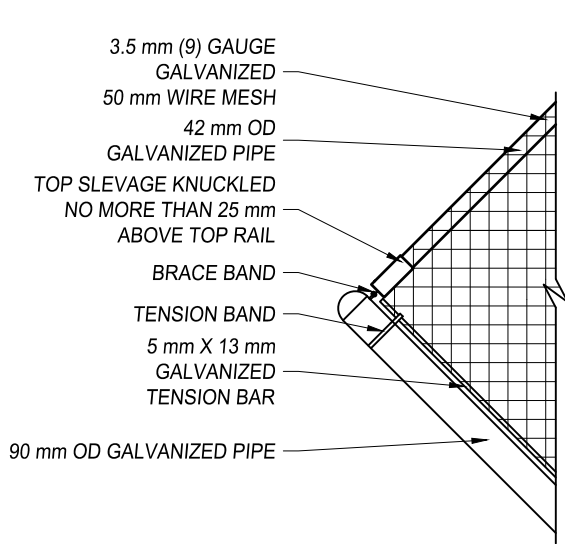
2024

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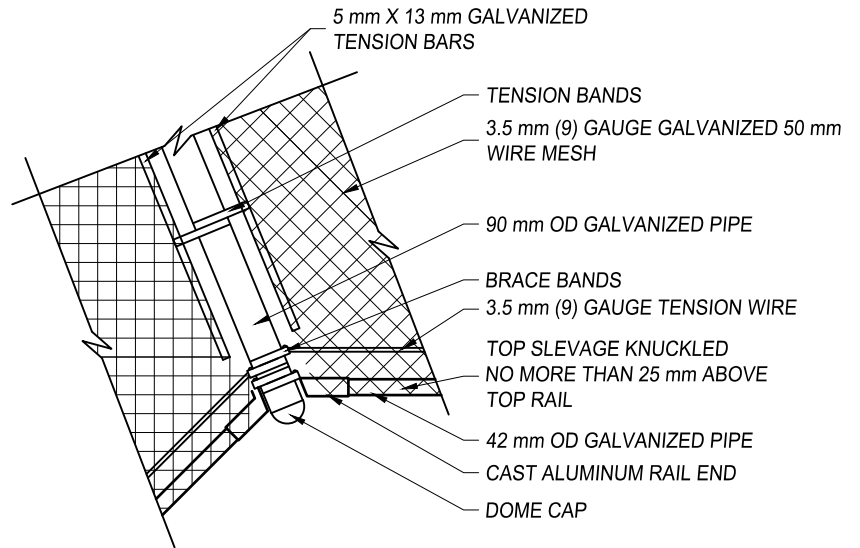
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STANDARD DETAIL #:

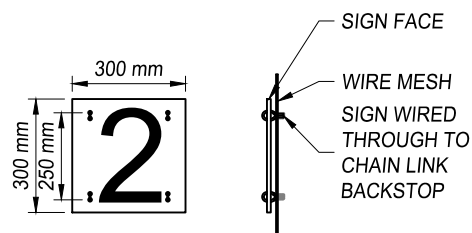
10-904



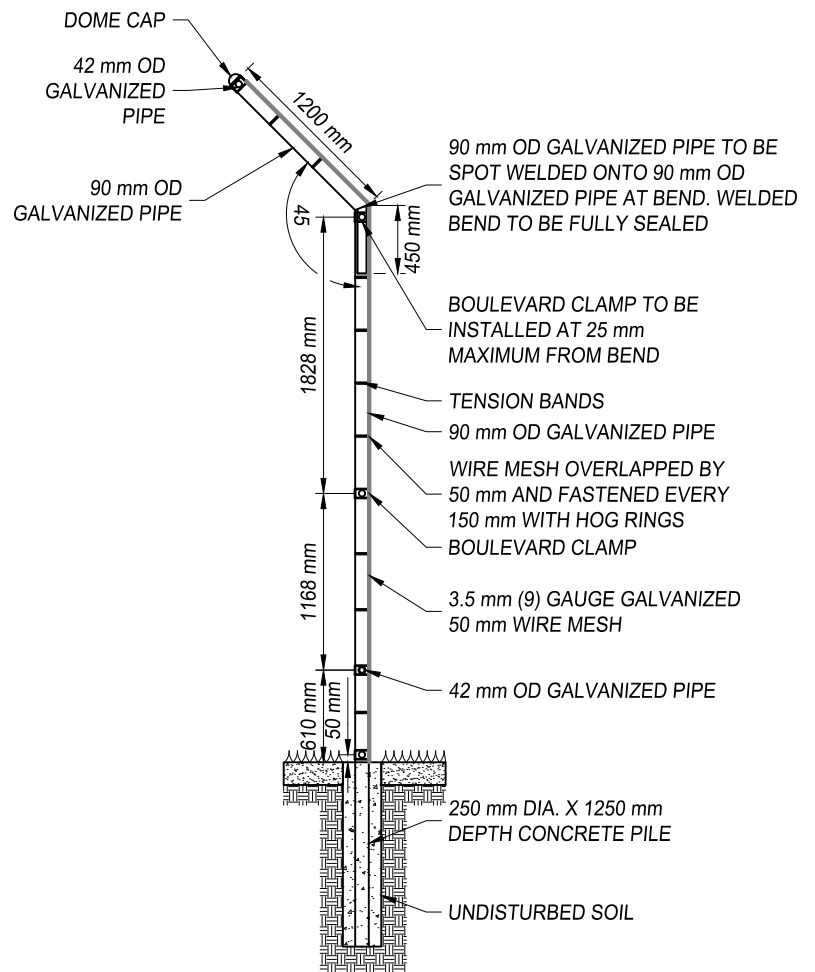
DETAIL A



DETAIL B



DETAIL C



SECTION A-A

BACKSTOP ASSEMBLY

REVISION DATE

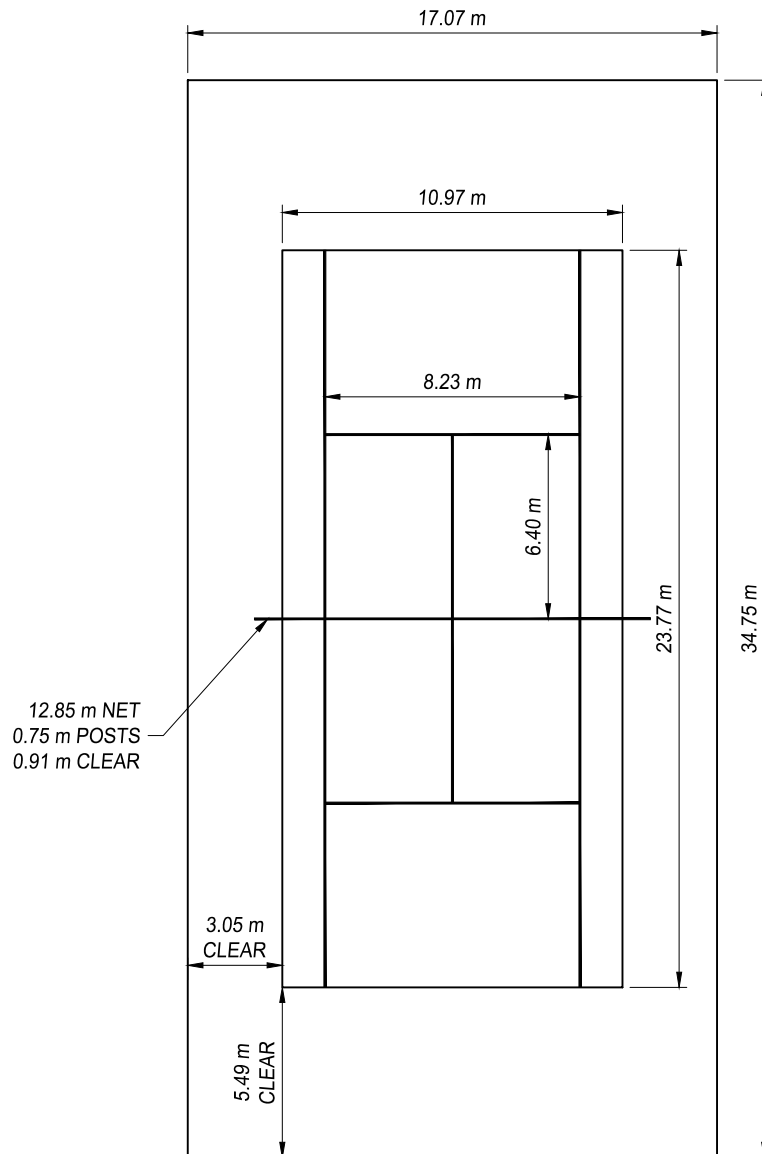
2024

REV.

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STANDARD DETAIL #:

10-905



NOTES:

- (1) ALL DIMENSIONS ARE TO CENTERLINE OF LINE MARKING.
- (2) ALL LINES TO BE WHITE, 50 mm WIDE.
- (3) NET TO BE 1.07 m HIGH AT POSTS AND 0.91 m HIGH AT CENTER.

TENNIS COURT LAYOUT

REVISION DATE

2024

REV.

0

STANDARD DETAIL #:

10-906



- (1) ALL DIMENSIONS ARE TO CENTERLINE OF LINE MARKING.
- (2) ALL LINES TO BE WHITE, 50 mm WIDE.
- (3) NET TO BE 1.07 m HIGH AT POSTS AND 0.91 m HIGH AT CENTER.

PICKLEBALL COURT LAYOUT

REVISION DATE

2024

REV.

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STANDARD DETAIL #:

10-907