REGIONAL MUNICIPALITY OF WOOD BUFFALO

ENGINEERING SERVICING STANDARDS AND DEVELOPMENT PROCEDURES

MARCH 2021

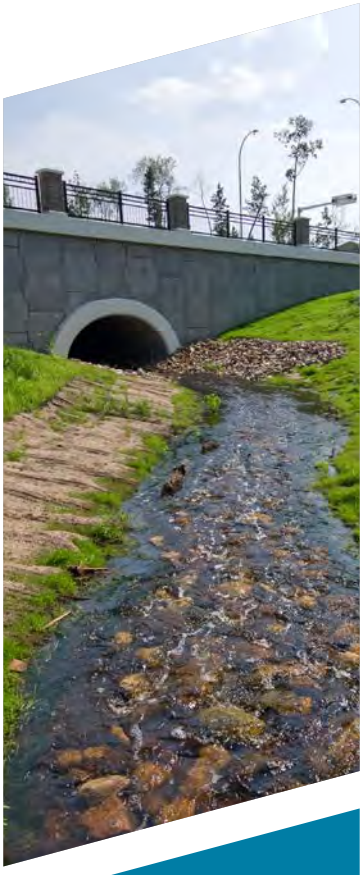





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1 Introduction to Standards

1.1 FORWARD

This document is an amalgamation of the Regional Municipality of Wood Buffalo *Engineering Servicing Standards and Development Procedures (June 2017),* Regional Municipality of Wood Buffalo *Drafting Standards (November 2011)* and the Regional Municipality of Wood Buffalo *Contractor Guide to Best Practices for GIS Data Submissions to the Regional Municipality of Wood Buffalo (August 2019).* Its objective is to ensure that all work in the Regional Municipality of Wood Buffalo (the Municipality) is constructed to a consistent standard.

This document is applicable to both the Municipality capital works projects and private land development projects and is intended to provide information to Developers, Engineering Consultants, Geotechnical Consultants, Contractors, Utility Companies and Regional Municipality of Wood Buffalo departments regarding standards and guiding the design, preparation and submission of plans and specifications for public and private infrastructure.

It is the responsibility of 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.

These Standards also serve as a guide for the exploration of implementing viable and economic alternatives that meet the intent of the Standards. Proposed alternatives must be reviewed and approved through an application for a Deviation prior to implementation. Refer to Chapter 2 for more information.

This manual will be reviewed and updated periodically to stay current with the Municipal Development Plan and related strategic plans, industry best practices, and to remain in compliance with regulatory requirements. Through this regular update process, the Municipality strives to provide a duty of care in the standard of expectation of public and private infrastructure, for safeguarding the public and protecting the environment.

Persons using this document are to ensure they have the latest version. This document can be accessed online at: https://www.rmwb.ca/en/permits-and-development/engineering-servicing-standards.aspx

1.2 SCOPE

These Standards and Procedures apply to the preparation and submission of Design Briefs, Conceptual Development Plans, Area Structure Plans, Outline Plans, Preliminary and Detailed Engineering Drawings and the Construction of the following municipal services in both rural and urban residential, commercial, and industrial developments within the Municipality:

- The roadways, sidewalks, curb and gutter, and lanes.
- The sanitary and storm sewerage collection systems and related appurtenances, lot grading, and lot service connections.
- The water distribution systems for drinking water and fire protection, and lot services.
- Shallow (franchised) utilities (i.e. gas, power, telephone and cable)
- Design and construction of facilities including reservoirs, pumphouses, and sewage lift stations and storm water management facilities.
- Landscaping requirements including hard and soft elements and walkway systems.

These Standards apply to new infrastructure and rehabilitation of existing infrastructure. Modifications to these guidelines may be required in older neighbourhoods (e.g., right of way restrictions) which the Municipality acknowledges and typically does not consider this as a deviation to the guidelines. Where a unique situation arises that requires a deviation to these Standards, a written request must be submitted in advance to a Manager in the Engineering or Planning and Development Department. Refer to Chapter 2.

1.3 DEFINITIONS

In this manual, the following words shall have the meaning hereinafter assigned to them:

NAME	MEANING
Applicant	Refers to Developer, Consulting Engineers, Contractors, and Residents applying to undertake infrastructure work or develop land in the Municipality.
Certificate of Compliance	A certificate provided by the Consulting Engineer to the Municipality upon submission of design drawings to confirm that the plans, reports, specifications, and figures provided are in accordance with the Engineering Servicing Standards, the Area Structure Plans, and all other applicable standards and regulations.
Consulting Engineer	The Professional Engineer responsible for the design drawings and design specifications of public infrastructure, the supervision of the work, the certification that the materials and installation are in accordance with the standards, recording and reporting of as-constructed information, and performing those duties with the standard of care prescribed by the Association of Professional Engineers and Geoscientists of Alberta (APEGA).
Construction Completion Certificate (CCC)	A certificate 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 has commenced. (Also see Section 2.24).
Contractor	Any person, persons or corporation who shall undertake the installation of municipal infrastructure and services in the Municipality.
Developer	A person, persons or corporation who 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.
Developable Area - Gross	Gross Developable Area refers to the total land area of a development application, including developed and undeveloped land, less Environmental Reserve (ER). Gross Developable Area includes populated and occupied land, roadways, storm water management facilities, parks and school space.
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 and school space.

NAME	MEANING
Deviation	A departure or alternative to these Standards, made through a formal request that must include a recommendation from the Consulting Engineer, and approved by the Engineering Department, prior to implementation. A written request must be submitted in advance to a Manager in Engineering and/or Planning and Development. Refer to Chapter 2.
Easement	An easement, interest or right held by the Municipality for the purpose of providing utilities, access or drainage.
Environmental Reserve (ER)	Land owned by the Municipality to be preserved in its natural state. Environmental Reserve includes wetlands, swamps, gullies, ravines, natural drainage courses, flood plains, steep slopes and shorelines as described in Section 664(1) of the Municipal Government Act.
Final Acceptance Certificate (FAC)	A certificate issued by the Municipality, confirming that the work is complete and acceptable to the Municipality, that all deficiencies and maintenance work has been resolved to the satisfaction of the Municipality, and that the warranty period for the work has expired. (Also see Section 2.28).
Franchise(d) Utilities	Utilities that are provided by an independent service provider who pay franchise fees to the Municipality for access to municipal land and the exclusive right to provide distribution, through a Franchise Agreement. In the Regional Municipality of Wood Buffalo, this includes gas, electrical power, and street lighting. As these utilities can be installed within the frost zone, the term is interchangeable with “Shallow Utilities.”
Landscape Consultant	The Landscape Architect responsible for the design, layout and supervision of installation of landscape and related work, recording of as-constructed information, certifying the material and installation is in accordance with the standards, design drawings and design specifications, and performing those duties with the standard of care prescribed by the Alberta Association of Landscape Architects.
Municipal, Municipality, City, RMWB, or the Municipality	The Regional Municipality of Wood Buffalo.
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 Municipal Government Act.
Engineering Department	The Department that represents the municipality for internal and external review and approval of various development applications.

NAME	MEANING
Municipal Reserve (MR)	Land owned by the Municipality for the development of parks and school grounds pursuit to Section 666 and Section 667(1) of the Municipal Government Act.
Open Space or Public Open Space	Any parcel of land or body of water that is set aside and reserved for public use, including Municipal and Environmental Reserve.
Owner	The owner of the land, the leaseholder and/or permit holder where work is taking place.
Parks, or Parks Department	The department, or an individual, appointed by the Municipality to represent the Municipality in park or landscape related improvements.
Public Utility Lot (PUL)	Land designated for a public utility.
Rural Services	A level of service that entails individually owned and operated water and sewage systems.
Shallow Utilities	See Franchise Utilities, in addition this can include utilities that do not pay franchise fees to the Municipality such as communication services.
Strategic Plan	A council-approved planning document that sets priorities, directions and desired outcomes to meet the goals set out in the MDP.
Urban Services	A level of service that includes a municipally owned water distribution system and sanitary collection system.
Warranty Period	A minimum two-year period of time commencing with the issuance of a Construction Completion Certificate and ending with the issuance of a Final Acceptance Certificate, during which time the Developer shall be responsible for the maintenance in accordance with the Development Agreement and/or Contract Documents, and reparation of any deficiencies. See Section 2.27

1.4 MUNICIPAL PLANNING DOCUMENTS

The following documents, or the latest published iterations thereof, provide guidance to the planning of municipal growth, and provide further requirements for public infrastructure.

- Municipal Development Plan
- Outline Plans
- Municipal Strategic Plans
- Land Use By-Law
- Area Structure Plans
- Regional Transportation Plan
- Area Redevelopment Plan
- Transportation Master Plan
- Active Transportation Plan
- Transit Master Plan
- Water Master Plan
- Wastewater Master Plan
- Storm Water Master Plan
- Parks and Outdoor Recreational Master Plan

1.5 REFERENCE MATERIALS

Reference will be made throughout the Standards to other regulatory agencies, standards and documents. These include, but are not limited to:

1. Alberta Environmental Protection, Standards for Municipal Works, Waterworks, Wastewater and Storm Drainage Systems.
2. Alberta Environment and Parks Publication “Stormwater Management Guidelines for the Province of Alberta”
3. Safety Codes Council, Alberta Private Sewage Systems, Standard of Practice (2015).
4. Alberta Occupational Health and Safety Rules and Regulations.
5. Transportation Association of Canada (TAC) (www.TAC-ATC.ca)
    a. Manual of Uniform Traffic Control Devices for Canada (MUTCDC)
    b. Geometric Design Guide for Canadian Roads
    c. Turning Vehicle Template
    d. TAC/ITE Canadian Guide to Traffic Calming (Second Edition)
    e. Canadian Roundabout Design Guide
6. Alberta Transportation (www.transportation.alberta.ca)
    a. Highway Geometric Design Guide (AT-HGDG)
    b. Roadside Design Guide (AT-RDG)
7. Institute of Transportation Engineers (ITE) (www.ite.org)
    a. Transportation Impact Analysis Guidelines for Site Development

8. Transportation Research Board, National Cooperative Highway Research Program (http://www.trb.org/NCHRP/NCHRP.aspx)
    a. NCHRP Report 672 – Roundabouts: An Informational Guide, Second Edition
9. RMWB Guidelines for the Design and Installation of Traffic Signals
10. Global Age-Friendly Cities: A Guide, by the World Health Organization
11. Winter City Design Guidelines, City of Edmonton
12. FireSmart: Protecting your Community from Wildfire
13. National Fire Protection Association
14. Canadian Standards Association
15. Alberta Building Codes and Standards
16. Barrier-Free Design Guide, Alberta Safety Codes Council
17. NFPA 1141 “Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural and Suburban Areas”

In all cases, the higher standard between the reference standard and the current version of this document shall apply.

1.6 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT

The Freedom of Information and Protection of Privacy Act is in effect for the Municipality and it gives any person a right of access to the records in our 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.

While the Municipality will endeavour to use Sections 15 and 16 of the Freedom of Information and Protection of Privacy Act to protect the confidentiality of the information identified by the Developer or his representatives as confidential, other sections of 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

This section describes the overall process for managing growth within the Regional Municipality of Wood Buffalo. This section describes the processes and procedures in place to ensure that public infrastructure meets these Standards, for the benefit of current and future residents.

The following figure 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 contributed public infrastructure, and the long-term operation and maintenance by the Municipality.

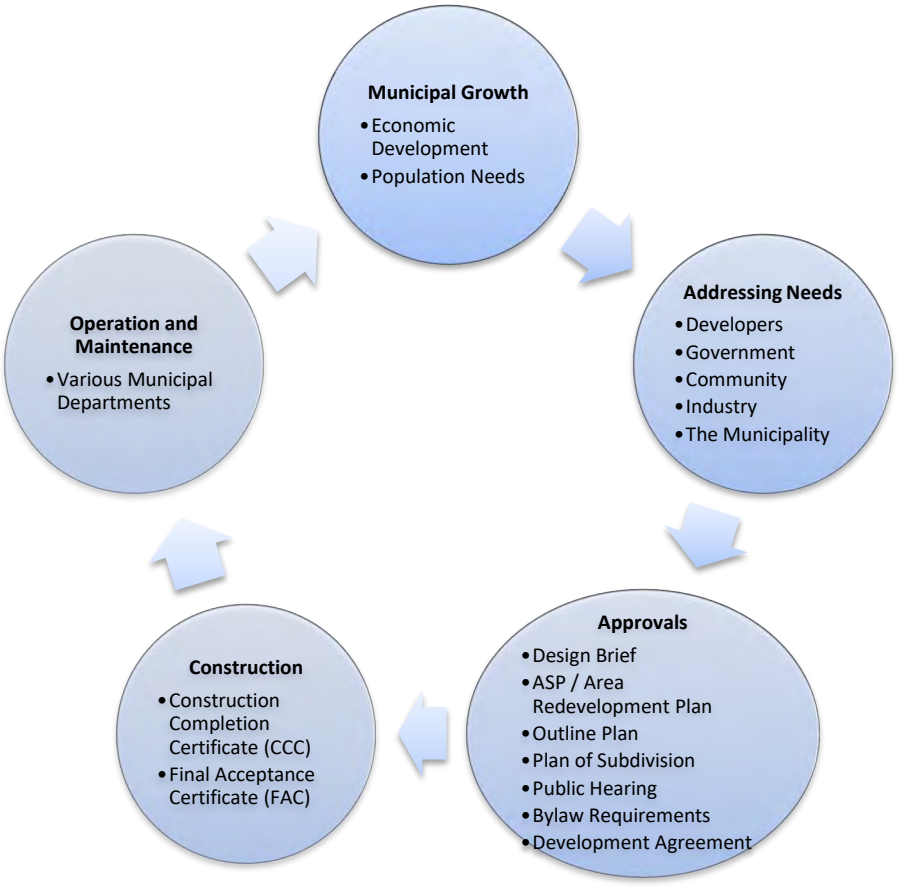


Figure 2.1 Development Cycle in the Regional Municipality of Wood Buffalo

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 Engineering Standards and the procedures described here-in, ensure that public infrastructure will meet or exceed the minimum acceptable standards so that the municipal services can be efficiently and safely provided for the benefit of the municipal population.

The Municipality involvement, review, inspection, and approval are therefore required in all aspects of the 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 LAND DEVELOPMENT PROJECTS

An outline of the major steps and development procedures from subdivision approval to final acceptance is displayed in Figure 2.2. Some of the key steps are listed below:

1. A Pre-Application meeting may assist the Applicant in clarifying the procedures and may in fact be required depending on the nature and scale of the Development.
2. Amendments to the Land Use Bylaw and Area Structure Plan/Outline Plan, if necessary.
3. Submit a design brief showing conformity to the Municipal Development Plan, Strategic Plan, Land Use Bylaw, Area Structure Plan, and other Municipal planning documents.
4. Preparation and approval of the conceptual plans and supporting documents.
5. Subdivision plan and supporting documents.
6. Development and finalization of easement and Municipal Reserve Agreements.
7. Preparation of detailed Engineering Drawings and Specifications and Landscape Plans and Specifications.
8. Approval of Engineering and Landscape drawings and specifications.
9. Notification and Approval from Alberta Government departments, Department of Fisheries and Ocean (DFO), Heritage Canada and Transport Canada, and other Third Parties as required.
10. Negotiation and finalization of a Development Agreement or Site Servicing Agreement.
11. Collect Financial Securities and municipal fees.
12. Apply for and obtain any permits which may be required. These may include:
    a. Clearing and Grading Permit (Engineering)
    b. Utility Installation and Street Occupation Permit (Engineering)
    c. Boulevard Crossing Permit (Engineering)
    d. Utility Line Assignment approval (Engineering)
    e. Development Permit (Planning and Development)
    f. Utility Connection/Disconnection Permit (Planning and Development)
    g. Water Meter Permit (Underground Services)
    h. Route Haul Permit (Roads)
    i. Others (railway, pipeline, etc.)

13. Tender and Award by Developer.
14. Complete construction activities in accordance with the Engineering Servicing Standards and the approved plans and specifications.
15. Submission of Record Drawings and related data.
16. Joint inspection by Municipality and issuance of Construction Completion Certificate(s).
17. Preparation and registration of the Legal Plan of Subdivision.
18. Partial Release of Financial Securities
19. Two (2) year warranty period(s).
20. Final overlays, installation of permanent line marking, and correction of deficiencies.
21. Joint Inspection by Municipality and issuance of Final Acceptance Certificate, end of warranty and takeover by the Municipality.
22. Release of Financial Security.

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 Municipal website for E-Permitting Information.

E-permitting can be accessed at: https://acaprod.rmwb.ca/citizenaccessprod/Default.aspx

Current Land Use Bylaw Section 20 prescribes when Development Permits are exempt.

Note: Subdivision construction work excluding clearing and grading shall not be started before signing of the Development Agreement/Development Permit. A clearing and grading permit is required before this type of work can proceed.

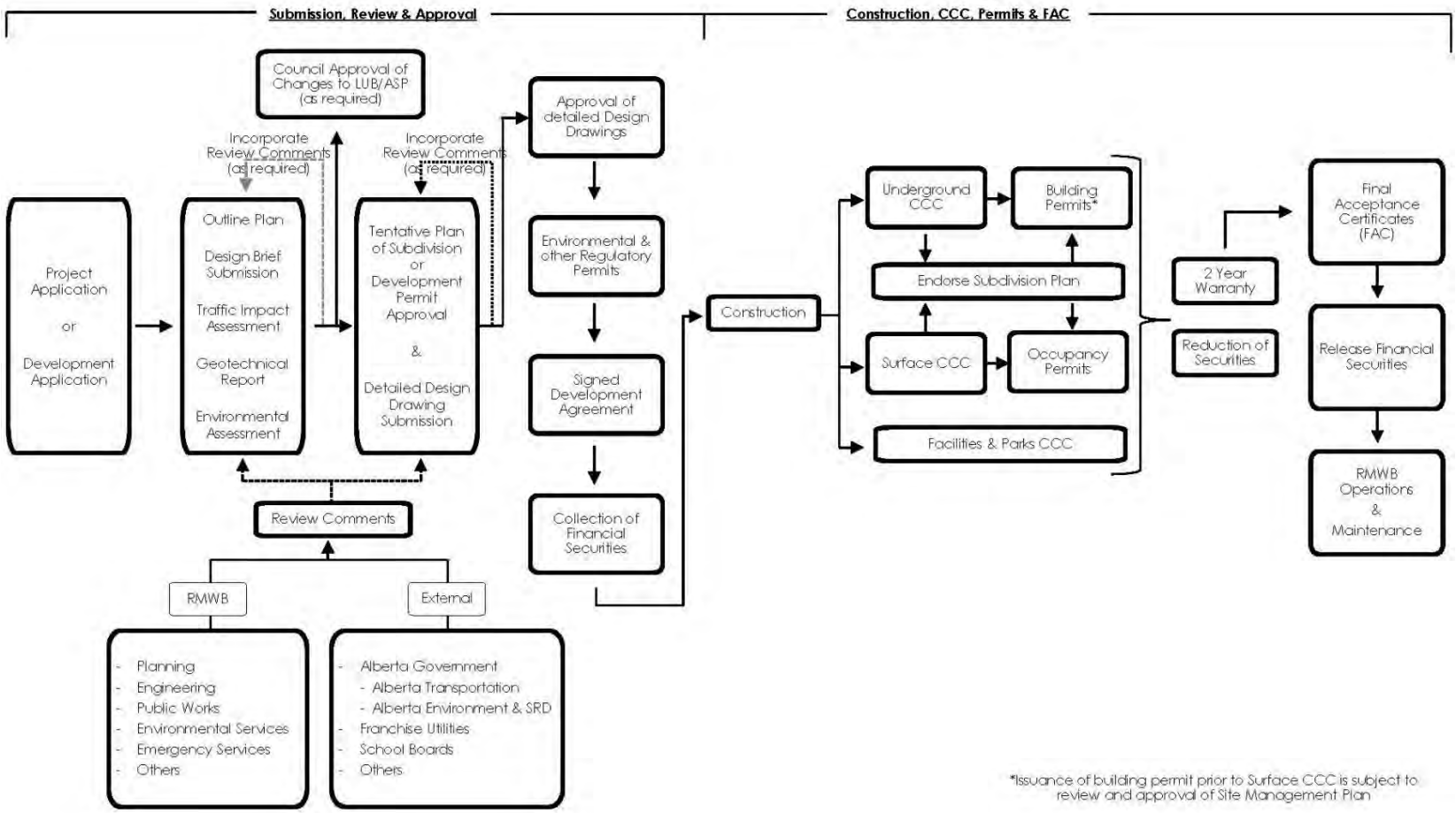
2.3.1 Development Approval Deviation Process

This document deals with Development Procedures, and Development Standards. Deviation from the Standards is a defined process, as described in Section 2.5. For any deviation from the Development Approval Procedures, or the Development Approval Process as described in Figure 2.2, it shall be incumbent on the Director of Planning and Development to seek Municipal Council approval, at his or her discretion.

2.3.2 Roadway Cross Section Deviations

Typical Municipal roadway cross section details are described in Section 4 Transportation, Roads and Sidewalks. In some developments or redevelopment areas there may be unique roadway cross sections that are not defined in this document. Where a roadway cross section has been approved through approval in a statutory plan (i.e. Area Structure Plan or Area Re-Development Plan) the cross section shown in those documents to supersede the cross sections in Section 4 Transportation, Roads and Sidewalks.

Figure 2.2 – Development Approval Process



2.4 PROCEDURES FOR A CAPITAL WORKS PROJECTS

An outline of the major steps from project initiation to final acceptance is displayed in Figure 2.3. Some of the key steps are listed below:

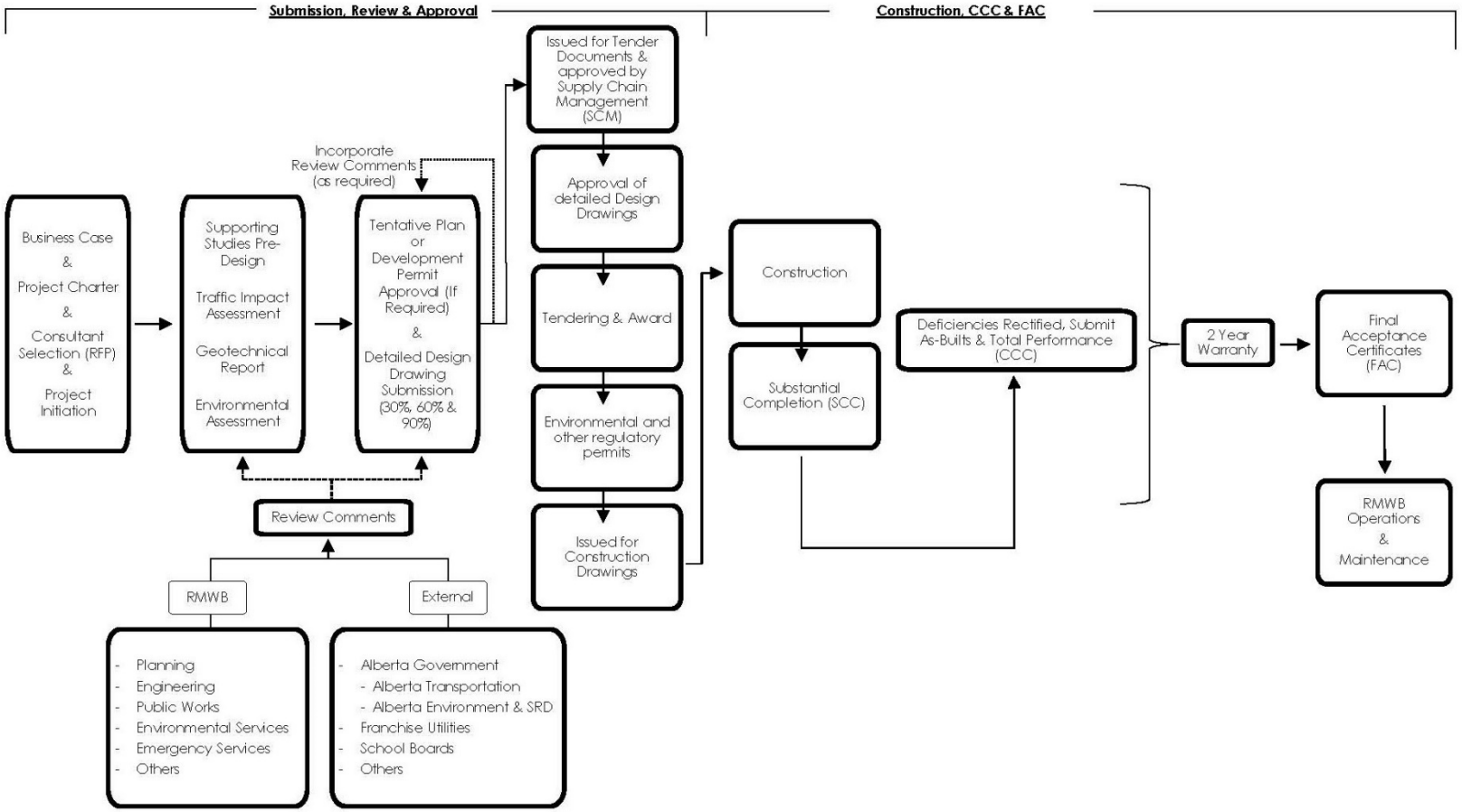
1. The Municipality prepares a Business Case, once a need is established the project moves onto a Project Charter.
2. The Project Charter gets reviewed and approved internally.
3. Consultant/Contractor section process typically through the Municipalities request for proposal (RFP) procurement process.
4. Project start-up meeting (project design initiation).
5. Preparation and approval of conceptual design (30%), pre-design (60%), supporting studies, etc.
6. Preparation and approval of detailed engineering (90%), landscape drawings, and specifications.
7. Notification and approval from Alberta Government departments, Department of Fisheries and Ocean (DFO), Heritage Canada and Transport Canada and other Third Parties as required.
8. Issued for Tender (IFT) documents reviews and approved by Supply Chain Management (SCM) and all stakeholders.
9. Construction tendering and award.
10. Apply for and obtain any permits which may be required. These may include:
    a. Clearing and Grading Permit (Engineering)
    b. Utility Installation and Street Occupation Permit (Engineering)
    c. Boulevard Crossing Permit (Engineering)
    d. Utility Line Assignment approval (Engineering)
    e. Development Permit (Planning and Development)
    f. Utility Connection/Disconnection Permit (Planning and Development)
    g. Water Meter Permit (Underground Services)
    h. Route Haul Permit (Roads)
    i. Others (railway, pipeline, etc.)
11. Complete construction activities in accordance with the Engineering Servicing Standards and the approved plans and specifications.
12. Walkthrough with the appropriate Municipality departments, Contractors, and Consultant, deficiencies identified.
13. Substantial Completion Certificate (SCC) issued as per Alberta Builders Lien Act requirements
14. Deficiencies to be rectified and Total Performance (CCC) to be issued within 30 days of SCC.
15. Submission of Record Drawings and related data within 60 days of CCC
16. Typical two (2) year warranty period.

17. Joint inspection by appropriate Municipality departments, Contractor and Consultant and issuance of Final Acceptance Certificate (FAC).

2.4.1 Design Approval Deviation Process

For a Capital Works project a Consultant or a Contractor may apply for a deviation from the municipal standards through the process outlined in Section 2.5.

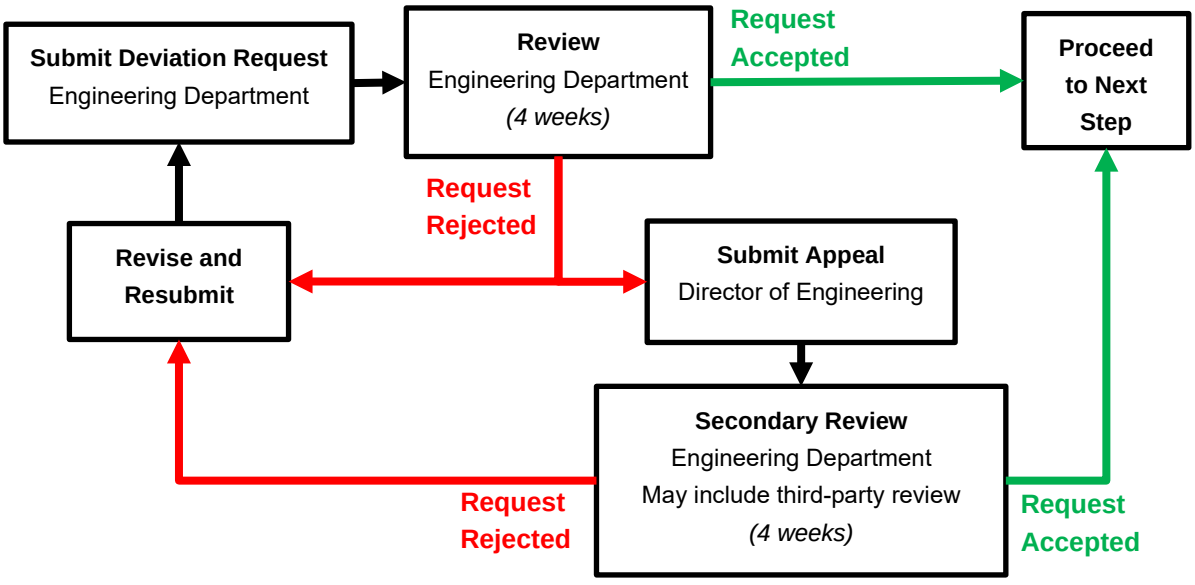
Figure 2.3 – Capital Works Projects



2.5 ENGINEERING DESIGN STANDARDS DEVIATION PROCESS

1. The Municipality encourages creativity and innovation in design of public infrastructure, subject to provincial and federal standards, building codes, and accepted industry best practice applicable to the region. Notwithstanding the above statement, the Municipality has the ultimate authority with regards to setting the minimum standards of public infrastructure.
2. The application process for a deviation to the Engineering Servicing Standards is described in Figure 2.4, below. This figure includes an opportunity for an appeal process to the Manager of Engineering.
3. The Engineering Consultant or Developer shall identify and provide justification for any proposed deviations from the Engineering Servicing Standards. All applications for deviation shall be supported with a stamped letter of recommendation from a Professional Engineer.
4. For private land development projects, extraordinary costs incurred by the Municipality for review of submissions, and re-submissions on appeal, shall be the responsibility of the Developer. This may include third-party review of a proposed deviation.
5. Upon the approval of an accepted deviation to the Standards, the Engineering Department will forward a copy of the approval, including the supporting documentation, to the Planning Department.
6. The application form to be used for Deviation Request is included at the end of this Chapter.

Figure 2.4 – Engineering Standards Deviation Review Process



2.6 PRE-APPLICATION MEETINGS FOR LAND DEVELOPMENT PROJECTS

At the discretion of the Municipality, a pre-application meeting will be held for any new land development project proposed in the Regional Municipality of Wood Buffalo.

The primary purpose of the pre-application meeting is to provide the Developer with specific information on application process requirements. The pre-application meeting is intended to provide an opportunity for the Developer to receive preliminary feedback from the following Municipal Departments and agencies:

- Planning and Development (Including Safety Codes Branch)
- Public Works
- Engineering
- Transit
- Environmental Services (including Solid Waste Branch)
- Regional Emergency Services
- Wood Buffalo Economic Development Corporation
- First Nation & Metis Nation Relations Department
- Franchise Utilities
- School Boards
- Alberta Government

A pre-application meeting is required for any of the following types of developments:

- Multi-lot subdivisions
- Multi-family residential
- Commercial / Industrial
- Institutional
- Projects requiring a Traffic Impact Assessment (TIA)
- Projects requiring an offsite laydown area
- Projects requiring a Geotechnical Investigation or Environmental Site Assessment
- Developments within the areas identified by the Province of Alberta as being in the Floodway or Flood Fringe zones.

The Developer shall contact the respective Development Officer for the scheduling and coordination of the pre-application meeting.

Regular consultation with the Planning & Development Department and Engineering Departments throughout the approvals process may also expedite the time for approval.

2.7 DEVELOPMENT BRIEF

1. The Developer is required to submit a Development Brief to the Planning and Development Department for the purpose of providing a planning and development 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 will be the basis for the preliminary discussion of the project between the Developer and the Municipality and may avoid the expenditure by the Developer and their Agents of time, effort and money on concepts and plans that are unacceptable to the Municipality. The Development Brief is to include, but not be limited to the following:
    a. Site conditions and topography including man-made and natural constraints to development.
    b. Existing land uses and building conditions.
    c. Future land uses, lot sizes and density.
    d. Proposed population and housing types, if applicable.
    e. Adequacy of schools, parks, open spaces, and community services to accommodate the proposed development.
    f. Provision for development levies, if required.
    g. Transportation requirements including upgrades to roadways, noise attenuation and pedestrian connectivity in accordance with the Active Transportation Plan
    h. Requirements for upgrading water, sanitary, and stormwater servicing infrastructure including proposals for financing these upgrades.
    i. Architectural controls, if required.
    j. Indication of how issues and opportunities raised during the community consultation process are to be addressed.
    k. Wildfire Risk Assessment including vegetation management per FireSmart, if applicable.
    l. Other requirements deemed appropriate by the Approving Authority/Agency.
4. 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 documents.

2.8 OUTLINE PLAN

2.8.1 General

As a pre-condition for the re-designation of land and/or subdivision of larger land areas into multiple lots, Developers are responsible for preparing an Outline Plan that conforms to the Municipal Development Plan (MDP) and the applicable Area Structure Plan or Area Re-Development Plan. If an Area Structure Plan/Area Re-development Plan does not exist for the Outline Plan area, the Developer may be required to prepare one.

The Outline Plan will address land use, transportation and servicing issues and establish a framework for the development.

This section discusses the process for preparing and submitting an Outline Plan and discusses the studies and supporting documents that the Developer may need to submit with an Outline Plan.

2.8.2 Process

1. Pre-Application Meeting

   The Developer and Consultant(s) are required to have a pre-application meeting with the Municipality to discuss their proposal or interest in development of land. Issues of concern, as well as major steps and general timing will be discussed. The Municipality will highlight the statutory documents and key planning policies that apply to the property based on the type of development being considered. The Municipality will also outline what supporting studies may be required with the Outline Plan submission. These studies, depending on the scope of the development and the characteristics of the land parcel, may include:

   - Biophysical Assessment
   - Traffic Impact Study
   - Slope Stability Geotechnical Study
   - Geotechnical Report
   - Engineering Servicing Brief
   - Wildfire Risk Assessment
   - Historical Resource Impact Assessment
   - Storm Water Management Report
   - Wetland Assessment
   - Environmental Site Assessment
   - Other supporting reports

2. Prepare and Submit an Outline Plan

   The Developer shall prepare the Outline Plan and all required information. The developer shall include participation from all landowners in the proposed Outline Plan area to ensure all parties' interests are considered.

   The Developer shall submit the Outline Plan along with required studies, supporting documents, and applicable fees to the Municipality. The Municipality will review the submission for thoroughness and ensure it complies with all existing policies and bylaws. The Municipality will compile comments from internal agencies, external agencies, and adjacent landowners outlining any necessary changes and provide comments to the Developer.

   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 Consultation

   Typically, public consultation will consist of the Developer hosting a public meeting to describe the development and seek input. Municipality staff may attend to observe and assist with any questions the public may have regarding municipal policies. Following the meeting, the developer shall create a summary of the comments and submit to the Municipality.

4. Approval of an Outline Plan

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

5. Re-Designation of Land

   Re-designation of land occurs after Outline Plan approval and prior to subdivision approval.

2.8.3 Submission

The Municipality will not review the Outline Plan until applicable fees, an application form, a recent certificate of title, a phase one Environmental Site Assessment (ESA) submitted as one package and any other supporting studies required by the Municipality.

The Municipality will provide direction on items that must be addressed in the Outline Plan but at a minimum, the following items are to be included:

1. Comply with all statutory planning documents and policies and identify any required amendments.
2. Provide land ownership information.
3. Identify the owners of all lands adjacent to the outline plan area.
4. Define the outline plan area, including legal description, location in relation to the Municipality and a map clearly identifying the boundary.

5. Identify all existing site conditions, including but not limited to:
    a. Existing land uses within and adjacent to the site.
    b. All relevant biophysical site information.
    c. Contaminated soil or well sites including required setbacks.
    d. Existing infrastructure including roads, railways, utilities, right-of-ways, etc.
    e. Existing utility boundaries, capacities, and constraints.
    f. Isolated land parcels neighbouring the site which require “shadow planning” for possible future development, if applicable.
6. List the gross area and net area of the development.
7. Provide a detailed land use plan showing all proposed land uses by type and location, as listed in the Municipality’s current Land Use Bylaw.
8. Provide a tabular summary of all land use statistics.
9. Identify location of parks and open spaces and all proposed reserved land indicating the type of reserve.
10. Identify and locate the proposed enhanced/optional neighbourhood amenities including identification signs.
11. Provide a proposed roadway system identifying road types, lanes, public utility lots, layouts and road widening and identify proposed traffic calming measures.
12. Provide proposed cross-sections of roadways showing carriage way, sidewalks, and street trees when variations from standard Municipality cross-sections are proposed.
13. Identify location of sidewalks and pathways within the plan area as well as point of connection to the existing pedestrian network.
14. Provide a walkability plan showing both a 400 metre and 800 metre walking shed.
15. Identify all proposed utility right-of-ways.
16. Identify location of all proposed utility systems including water and sanitary servicing alignments, surface drainage, stormwater management facilities (SWMFs) and storm sewer.
17. Provide a proposed development phasing plan. Base the proposed sequence of development on the logical extension of deep utilities, shallow utilities, and roadway access. Construction of temporary access roadways may be required for interim access to proposed development.

2.9 ENGINEERING DESIGN BRIEF AND SUPPORTING DOCUMENTS

1. After the conclusion of or in conjunction with the approval of the Development Brief or Outline Plan process, the Developer shall prepare an Engineering Design Brief for submission to the Municipality that will contain all of the technical documentation supporting the project as described in the Development Brief.
2. The Engineering Design Brief may require the following supporting information if not previously completed as part of the Outline Plan process. After reviewing the scope of the project, the Municipality will provide the developer with a list of requirements for the Engineering Design Brief.
    a. Supporting design calculations
    b. Geotechnical Report
    c. Traffic Impact Assessment
    d. Slope Stability Geotechnical Report
    e. Wildfire Risk Assessment
    f. Conceptual plans of the roadway network, including road classifications and typical cross-sections.
    g. Intersection designs, with consideration for the movements of municipal operations and emergency response vehicles.
    h. Water Network Analysis (WNA)
    i. Sanitary Sewer Analysis
    j. Stormwater Management Report
    k. Environmental Impact Assessment
    l. Biophysical Assessment (BIA)
    m. Historical Resource Impact Assessment
    n. Preliminary Clearing and rough Grading Plans
    o. Estimates for Oversized and Cost Shared Infrastructure
    p. Wetland Assessment
3. 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.

4. At a minimum the Engineering Design Brief to illustrate preliminary alignments of proposed onsite and offsite infrastructure improvements required for the development. This is to include proposed alignments of roadways and lanes, watermains, sanitary sewers, storm sewers, and shallow utilities. The Design Brief to also show any connections to existing infrastructure. At the discretion of the Municipality, typically on larger or more complex projects, the Engineering Design Brief (Servicing Study) to include the following:
    a. A Roadway Grading Plan showing proposed roadway classification complete with roadway cross sections and preliminary roadway grades.
    b. A Water Distribution Plan showing proposed main sizes and preliminary hydrant locations.
    c. A Sanitary Sewer System Plan showing proposed mains sizes, manhole inverts elevations, grades between manholes, and proposed manholes depths.
    d. 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.
    e. A Minor Storm Sewer System Plan showing proposed mains sizes, manhole invert elevations, grades between manholes, and proposed manhole depths.
5. For new “greenfield” developments and any “infill” development (multifamily/commercial) which will increase the density on a land parcel requires a Sanitary System Analysis, unless otherwise approved by the Municipality. The purpose of this analysis is to confirm the downstream system has sufficient capacity to accommodate the new development area or the increased flow from an infill development. The municipality will provide the Engineering Consultant with a copy of their most up to date sanitary model to complete this analysis. The Engineering Consultant is to include both the proposed dry weather flow as well as the peak wet weather flow. The Modeling results to be summarized in a report and provided to the Engineering Department for their review and approval.

2.10 SUBDIVISION

2.10.1 General

Proposed subdivisions must follow the Municipality’s approved Municipal Development Plan (MDP) and any relevant approved Area Structure Plan, Area Redevelopment Plan, Outline Plan, as well as the Municipality’s Land Use Bylaw. 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.

2.10.2 Process

1. Prepare and Submit Subdivision Package

   The Developer shall prepare and submit a complete application package for subdivision. The submission to be done through the E-Permitting system. The Municipality will review the submission for thoroughness and ensure it meets all Municipality requirements. The application will be referred to the Municipality's internal and external stakeholders, any other applicable stakeholders the Municipality deems relevant to the application, and adjacent landowners (if required), for comment on the proposal. The Developer will be informed of any issues that result from the referral process.

2. Presentation of Subdivision

   The Municipality will prepare a report and present the proposed subdivision plan to the Subdivision Authority, for decision.

3. Conditionally Approved Subdivision

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

4. Final Endorsement

   The developer must meet all conditions of the subdivision approval prior to final endorsement of the subdivision plan. The developer shall submit a subdivision endorsement package including all applicable fees to the Municipality prior to being endorsed within the timeframe referred to in the Municipal Government Act (MGA).

2.10.3 Submission

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 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 Professional. If the drawing is unclear or otherwise unsuitable for circulation and review, the application will be returned as incomplete. Plan drawn in accordance with the Province of Alberta's Provincial Subdivision Development Regulations, latest edition, typically including the following information:
    a. Scale and north arrow.
    b. Dimensions of the title area(s) and the sizes and dimensions of the proposed lots, including environmental reserves (ERs), municipal reserves (MRs) and public utility lots (PULs).
    c. Location use and dimensions of existing buildings and structures and their distances from property lines.
    d. Location and dimensions of utility right-of-ways or easements on or adjacent to the property.
    e. Location and name of existing roadways.
    f. Location of proposed roadways, accesses and utility right-of-ways or easements.
    g. 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 slops to water bodies or valleys.
    h. 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 of the certificates of land.
6. Depending on the type and location of subdivision proposal, other information may be required to determine subdivision conditions as legislated by the Municipal Government Act. Costs associated with obtaining the required information will be borne by the subdivision applicant. If there is no approved Outline Plan and/or an approved Engineering Design Brief in place for the subject parcel then, at the discretion of the Municipality, there may be a requirement to complete additional studies to support the application. Some of the studies that may be required to support the application are list in section 2.8.2.1.

2.11 DETAILED DESIGN APPROVALS

2.11.1 Detailed Engineering Drawings and Landscape Plans

1. Upon acceptance of the conceptual engineering and landscape plans (if required), the Developer shall submit for approval to the Planning and Development Department a PDF copy of the detailed design drawings. The submission to be done through the E-Permit system.
2. At the discretion of the Municipality, a Preliminary design submission may be required to be submitted for review and approval in advance of the Final design submission.

3. The review by the Municipality is for the sole purpose of ascertaining conformance to the Engineering Servicing Standards, the Municipal Development Plan, Land Use Bylaw and other Municipal Plans, FireSmart Guidelines, and Engineering Master Plans. Approval of the submission does not relieve the Developer of his responsibility for errors or omissions or of his responsibility of meeting all requirements of the Engineering Servicing Standards and other Federal and Provincial Rules and Regulations.
4. Engineering drawings, diagrams and reports must be sealed by a Professional Engineer who is registered in the Province of Alberta. Landscape plans are to be submitted with the Engineering Drawings and signed by a Landscape Consultant who is a member in good standing of the Alberta Association of Landscape Architects.
5. Detailed engineering design drawings for a standard, multi-lot land development project is to be prepared in accordance with drafting procedures outlined in Section 3 Engineering Drafting & Data Submission Standards.
6. Other information required to be submitted in the approval process includes, but is not limited to:
    a. Geotechnical and Environmental Reports applicable to the Construction stage.
    b. Detailed sanitary service, stormwater management and water distribution designs.
    c. Supporting Design Calculations.
    d. Approved Shallow/Franchised Utility Design, including utility Right of Way plan.
    e. Copy of approval from Alberta Environment and Parks or other agencies.
    f. Construction specifications.
7. Once all drawings and plans are approved, submit electronic detailed drawings (including vectorized .dwg or equivalent format) to the Engineering Department.

2.11.2 Reference Standards

All references to specifications, standards, or methods of technical associations must refer to the latest adopted revision, including all amendments, in effect on the date of submission of bids, except where a date or issue is specifically noted.

2.11.3 Approval by the Engineering Department

Upon receiving detailed design, and all relevant reports from the Consultant, through the Planning and Development Department, Engineering shall inform the Consultant, within 21 days after receipt of the detailed design submission, whether or not the submission has been approved. Should the Engineering Department not approve of any part of the plans or proposals, comments will be provided to the Consultant for revision. Once the revisions have been made to the satisfaction of the Engineering Department, it will be approved.

2.11.4 Municipal Administrative Fees

1. The basic municipal review costs are covered by the permit application fee.
2. The Developer will be responsible for any extraordinary review costs deemed appropriate by the Municipality. These costs may include, but are not limited to:
    a. Specialized consulting expertise required by the Municipality to review development proposals, concept plans and drawings.
    b. Additional staffing required to review developments.
    c. Review of complex re-submissions and deviations from the Standards
    d. Where excessive errors and omissions are encountered
    e. Where insufficient information is provided
    f. Where improper procedures are followed
3. The cost of review may take several forms including:
    a. Lump sum fee charged to the Developer.
    b. Invoiced cost by specialized consultant plus mark-up for handling and administration
4. Each submittal by the Developer will be reviewed by the Municipality and the Developer will be informed of the anticipated review costs. The Developer shall reimburse the Municipality prior to review of re-submissions.

2.11.5 Development Agreement

The Developer will coordinate with the Planning and Development Department for requirements and the preparation and execution of the Development Agreement.

The construction of municipal improvements within a development area is subject to the terms and conditions of a Development Agreement including all financial, construction, maintenance, and security requirements of the Developer.

The necessary construction of off-site improvements or municipal infrastructure shall be borne by the Developer.

The Developer must have an approved development agreement in place before construction (excluding clearing, topsoil stripping and rough grading) of a development area may begin.

The Municipality shall determine financial security requirements, offsite levies, administration fees, and other fees in accordance with the terms and conditions of the Development Agreement.

2.11.5.1 Process

This section discusses the processes and requirements for the preparation and execution of a Development Agreement.

1. Draft
    a. Once subdivision has been conditionally approved, the developer may contact the Municipality to initiate a Development Agreement. The Developer shall indicate in writing the request for the commencement of the Development Agreement drafting.
    b. The Municipality will issue the final Development Agreement for signature once Detailed Engineering and Landscaping Drawings are approved, and all issues resolved.
2. Executed Development Agreement
    a. The Municipality will send copies of the final Development Agreement to be signed, sealed, and returned by the Developer. The Developer shall also complete the following when returning the signed and sealed development agreement:
        i. Provide financial securities acceptable to the Municipality in accordance with the Development Agreement.
        ii. Provide an original certificate of insurance and submit payment of inspection fees and offsite levies if any in accordance with the Development Agreement.
    b. Upon receipt of the above and upon removal or waiver of any conditions required by the Municipality to complete the Development Agreement, the Municipality will execute the Development Agreement and return one (1) copy to the Developer.

2.11.6 Letter of Credit Calculations

In conjunction of the Development Agreement process, the Consultant is required to submit estimated costs of all underground deep utilities and surface improvements including roads, sidewalks, pipelines, lift stations, water booster station/reservoirs, storm ponds etc. required for the development for the calculation of the Letter of Credit. The costs should also include the estimates for the total cost of consulting services through construction, including construction inspection, contract administration, quality assurance, and final record drawing production.

The Letter of Credit is calculated 50% of the estimated construction cost of the mentioned infrastructure, plus 100% of the Landscaping costs.

The Municipality’s GIS/TCA Asset Catalogue tool may be used to inventory the infrastructure as part of the cost estimate. Contact the Engineering Department for more information.

2.11.7 Right-of-Ways and Easements

Where easement or right-of-way or restrictive covenant documents are deemed necessary, they shall be prepared by a registered Land Surveyor at the Developer's expense before the issuance of Construction Completion Certificates.

The Municipal Land Administration Department has general guidelines for the preparation of Right-of-Way Agreements and Crossing Agreements. The Developer will coordinate with the Planning and Development Department for the requirements and the preparation and execution of the documents.

2.11.8 Bare Land Condominiums

The requirements for lot grading, deep services, roads intended for municipal transit routes, drainage easements, and landscape improvements within municipal reserves will comply with the requirements of these Engineering Servicing Standards.

2.11.9 Design Revisions after Approval

1. If for any reason it is necessary to make changes to the design drawings after they have been approved, the revised drawing(s) shall be submitted with the proposed changes shown in red. The subdivision should include a letter outlining the reason for the required changes.
2. The Planning and Development Department will inform the Developer within fourteen (14) days after receipt if the proposed changes meet with the approval of the Municipality.
3. One copy of the requested change will be signed and returned, accompanied by a letter authorizing the changes to be made on the original approved detailed design drawings. No changes are to be made to an original approved drawing without Municipal approval.

2.12 ENGINEERING AND MUNICIPAL PERMITS

The Municipal Engineering Department issues permits for construction works for development projects as well as capital projects. These permits are as follows:

- Development Permit
- Building Permit
- Clearing and Grading Permit
- Utility Installation and Street Occupation Permit
- Boulevard Crossing Permit

Other Permits administered by the Municipality related to public infrastructure include the Service Connection Permit, Water Meter Permit, and Route Haul Permit as required by the Land Use Bylaw.

In general, all works performed under these permits shall be required to conform to the Engineering Servicing Standards.

2.12.1 Development Permits

Development Permits are required for new projects, changes in the use of a property, or additions to existing structures. For example, a new building in a particular location or addition to an office or warehouse requires a Building Permit. Development Permits address issues of community planning, bylaws, land use, image, and compatibility. The Development Permit process is based on the Municipal Government Act and the Land Use Bylaw.

For more information and to apply refer to the Municipality website:

https://www.rmwb.ca/en/permits-and-development/development-permits.aspx

2.12.2 Building Permits

Building Permits assure building owners that their structure will perform as it should and keep its occupants safe. Most renovations in existing buildings and all new construction requires a Building Permit. In some situations, a Development Permit may be required before applying for a Building Permit.

For more information and to apply refer to the Municipality website:

https://www.rmwb.ca/en/permits-and-development/building-permits.aspx

2.12.3 Clearing and Grading Permits

Applicants are required to apply for and receive an approval from the Engineering department for Clearing, Grubbing and Grading under the following conditions:

- Cuts / Fills greater than 400 cubic meters.
- Slopes greater than 20% on subject property or adjacent properties.
- Sites below 248 m geodetic elevation.
- Sites near water bodies, streams, rivers, or wetlands.
- Clearing greater than 1,000 square meters.
- Work that will result in publicly owned and operated infrastructure.

Information to be included with the application for Clearing and Grading shall include, but not limited to, the following:

- Erosion and Sediment Control Plan.
- Cut and Fill Plan (existing and proposed contours) .
- Route Haul Permit (if required).
- All stockpile locations are to be shown on a site plan overview of the area.
- Stockpile sizes (width, length, height) and estimated quantity to be included in the application.

- Duration the stockpile will occupy the space.

Stockpiles will be allowed on proposed (undeveloped) school sites, Environmental Reserve sites and Municipal Reserve sites only by prior approval by the Municipality.

Legislative and due diligence requirements around tree clearing must be determined on a case-by-case basis and is influenced by the time of year the clearing is proposed, whether it is proposed on Crown land, and whether the trees provide habitat for sensitive owls or migratory birds. Surveys for due diligence purposes under the Migratory Birds Convention Act and the Wildlife Act (for Sensitive Owls) may be undertaken where necessary; consult with an environmental professional for project-specific details.

The general migratory birds nesting period in Fort McMurray is April 19 and August 3; this period is a general guideline of the likelihood of encountering migratory birds. More specific annual dates can be obtained from the Environment Canada, Canadian Wildlife Service. Sensitive owls may nest in the Fort McMurray area between February 15 to August 31.

The federal Migratory Birds Convention Act and the provincial Wildlife Act regulates disturbance to birds, their nests, and their eggs; neither of these Acts regulates tree clearing. Due diligence requirements under these Acts should be evaluated on a case-by-case basis to determine whether bird surveys are needed.

Both migratory bird and sensitive owl nest surveys require a research and collection licence/permit under the Wildlife Act. In order to confirm or deny the presence of owl species, call-playback surveys are typically required; however, call-playback surveys may be unnecessarily disruptive, and should only be carried out when there is a high likelihood of impacting sensitive owl nests.

For more information and to apply refer to the Municipality website:

https://www.rmwb.ca/en/permits-and-development/building-permits.aspx

2.12.4 Boulevard Crossing Permit

Construction or modification or removal of driveway accesses requires an approved Boulevard Crossing Permit from the Engineering department prior to commencement of the construction. Procedures and guidelines for the Installation of Boulevard Crossings can be found with the permit. All work performed under this permit shall conform to Section 4 Transportation, Roads and Sidewalks.

For more information and to apply refer to the Municipality website:

https://www.rmwb.ca/en/permits-and-development/building-permits.aspx

2.12.5 Utility Installation and Street Occupation Permit

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 any construction. The exception to this is an emergency dig up (i.e., water main break).

For any work to take place within a municipal right-of-way (i.e., roadway. Lane, etc.), the Developer and/or the Franchise Utilities Companies, the Contractors, and RMWB Project Managers must apply and obtain Utility Installation and Street Occupation Permit (per bylaw 85/50, 85/51 – 02/079) from Engineering Department at least 3 working days minimum for partial road closure, and 5 working days minimum for full road closure prior to the commencement of work.

Any modifications to be made to municipal infrastructure must be reviewed and approved by the Municipality before works proceeds. Typically, this is done through drawing reviews completed by the Engineering Department through the Development Agreement/Servicing Agreement process for a private land development project. For a Capital Works project this is typically done through drawing reviews completed the RMWB Project Managers and the Engineering Department. For any proposed modification to the Regional Municipality of Wood Buffalo's infrastructure that has not been previously approved by the Engineering Department a Utility Installation and Street Occupation Permit will not be issued until the proposed modifications are circulated and approved by the Engineering Department. In these situations, the Utility Installation and Street Permit Occupancy Permit to include drawings showing the proposed modifications to be circulated to the Engineering Department for approval. Allow 3 weeks for circulation and comments. Also, once the modifications are completed Record Drawings, in compliance with requirements outlined in Section 3, are required to be submitted to the Municipality.

All work performed under this permit will conform to the Engineering Servicing Standards.

All excavations under roadways and lanes 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% standard Proctor compaction has been achieved.

2.12.6 Utility Line Assignment

Authorization of franchised utility, monitoring wells, or any third-party infrastructure installations within public road rights-of-way by external agencies and private utilities must first enter into an agreement with the Regional Municipality of Wood Buffalo, Engineering department (engineering.permits@rmwb.ca).

The agreement usually takes the form of a Right-of-Way Consent & Access Agreement or a Franchise Agreement. A standard condition of the agreements is that all utility installations require Engineering approval in the form of a Utility Line Assignment (ULA) Permit.

Applications for ULA permits include utility alignment plans showing where new underground or aerial utility lines will be built, or where environmental testing will occur on the Municipal road rights-of-way.
The applicant that is proposing the installation, the Right-of-Way Management Group, other utility department and agencies, and other departments all play a role in reviewing, approving, construction, inspecting and/or recording information on these installations. Utility Line Assignment (ULA) standard request form is appended to the end of Section 2.

2.12.7 Service Connection Permit

A sewer and water connection permit is required from the Municipality (inspections@rmwb.ca or 780-743-7813) under the provincial Safety Codes Act when connecting to sewer and water infrastructure on private property, such as:

- Service connections
- Foundation drains / weeping tile connections

2.12.8 Water Meter Permit

A Water Meter Permit is required in order for a water meter to be installed on a service connection and is a mandatory requisite prior to using any water from the service.

For service and meter connection details, refer to Section 7 Water Distribution Systems. For more information, contact Underground Services Branch at 780.799.5823

2.12.9 Route Haul Permit

Any person desiring to haul materials or equipment on any roadway, excluding a truck route, shall make an application to the Streets Resource Branch. Application can be downloaded from the website and completed application can be submitted to the Streets Resource branch (streets.resource@rmwb.ca). All info required can be found within the application.

2.13 APPROVAL BY OTHER AGENCIES

Depending on the nature and scope of the proposed development or capital works project, approval may be required by other agencies, including provincial and federal regulators or other third parties. Once approval is received, a copy of the approval shall also be supplied to the Municipality. Approval by other agencies in no way removes the responsibility of the Developer or Consultant to comply with the Engineering Servicing Standards and obtaining the Municipality's approval of the detailed plans and specifications.

Some of the regulatory compliance considerations that may apply to the capital works or private land development project(s) are listed in the following table.

Table 2-1
General Regulatory Compliance Considerations for Development

Act Title and Description	Applicability
Water Act (Alberta)	All water bodies, including wetlands, are protected under the provincial *Water Act.* A development involving the alteration or destruction of a water body requires appropriate approvals under this Act; in some cases, additional requirements under the Alberta Wetland Policy may apply.
Public Lands Act (Alberta)	Crown land, including the bed and shore of all permanent water bodies are protected under the *Public Lands Act.*
Fisheries Act	Any activities with potential to cause harm to fish or fish habitat are regulated under this Act.
Historical Resources Act (Alberta)	Archaeological and paleontological resources are regulated under this Act.
Environmental Protection and Enhancement Act (EPEA) (Alberta)	Any development with potential for environmental contamination is regulated under this Act.
Species At Risk Act (SARA)	Activities with potential to impact a species at risk / species of concern and / or its habitat are regulated under this Act.
Migratory Birds Convention Act	Any activities with the potential to disturb migratory birds, their nests, or eggs (including potentially removal of vegetation) must comply with requirements under this Act
Wildlife Act (Alberta)	Wilful molestation, disruption, or destruction of wildlife, or a house, nest, or den of wildlife, are all prohibited by this Act. This Act makes special provisions for the protection of raptors and their nests/habitat.
Weed Control Act (Alberta)	This Act regulates the specific weed species that are listed in Schedule 1 (prohibited noxious weeds) and 2 (noxious weeds). The Act requires the destruction of Schedule 1 noxious weeds and the control of Schedule 2 noxious weeds. It prohibits the spread and proliferation of weeds.

2.13.1 Alberta Environment and Parks

The Engineering Consultant, on behalf of the Municipality, shall submit the detailed plans and specifications to Alberta Environment and Parks for approval with a copy to the Municipality. Once approval is received, a copy of the approval shall also be supplied to the Municipality.

2.13.2 Canada Post – Community Mailboxes

If applicable to the subdivision, the Developer will submit an overall subdivision layout plan (Outline Plan) to Canada Posts Delivery Planning Department for establishing the location, size, and details of community mailboxes. For further information and requirements, consult the relevant sections in Chapter 4 and the "Canada Post Postal Delivery Standards Manual, Planning for Postal Service" document available from Canada Post. Upon approval of location and details by Canada Post, community mailboxes are to be shown on all applicable drawings and brochures.

2.13.3 Third Party Crossing Agreements

1. A crossing, proximity, encroachment agreement and/or excavation permit may be required if a Developer or Regional Municipality of Wood Buffalo (capital works project) proposed work and/or future municipal infrastructure requires crossing of and/or construction activity adjacent to the following:
    a. Oil or gas pipelines
    b. High pressure gas mains
    c. Overhead or underground telecommunications lines
    d. Overhead or underground power lines
    e. Creeks and rivers
    f. Streets or highways
    g. Railways
    h. Other registered rights-if-way
2. The Developer shall submit documentary evidence to the Planning and Development Department that permission has been received from appropriate authorities for crossing of their facilities. If such crossings are intended, submit the evidence at the time of submission of detailed plans and specifications or soon thereafter, but in any event, prior to construction. All costs related to preparation of application, application fee and third-party inspection during crossing (if required) shall be borne by the applicant.

2.14 GEOTECHNICAL REPORT

1. Subject to the scope, scale and location of the proposed work, a Geotechnical Report will be required to confirm that that the land may be used safely for the use intended without an undue risk of hazards. Geotechnical Report requirements will be clarified in the pre-application meeting. The Report shall be prepared by a Professional Engineer or geoscientist registered in Alberta with qualifications and experience in Geotechnical Engineering.

2. The Geotechnical Report shall include information about:
    a. Physical properties of soil.
    b. Mechanical properties of soil including bearing strength, slope stability report.
    c. Design parameters (including water tables, sulfates, and frost zone).
    d. Identification of any hazards that may affect the safe development of the site including, but not limited to:

- Flooding
- Groundwater flows
- Mud flows
- Erosion
- Subsidence
- Land slip
- Earthquake
- Avalanche

3. The Geotechnical Report shall provide recommendations to reduce the risk of damage to the land, buildings and works on the land, and adjacent lands and developments regarding:
    a. Remediation of any unstable and potentially unsuitable soils or restricting the use of land as a result of geotechnical conditions.
    b. Identification of any parts of the development that require inspection by specialized personnel and outline a recommended inspection program during the development of the land.
    c. 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 development.
    d. Clearing and grading limits, compaction requirements, and any special construction requirements.
    e. Building foundations design, including weeping foundation drains, and weeping tile discharge.
    f. Road structure and pavement design based on 20-year design life.
    g. Trenching and bedding for utilities, and cathodic protection requirements.
    h. If applicable, groundwater testing to establish quantity and quality of groundwater for water supply and sewage disposal projects.
    i. Retaining wall and sheet pile wall designs.
    j. Further geotechnical investigations and reporting requirements before, during, or post construction.

3. 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 when deciding.

2.15 ENVIRONMENTAL ASSESSMENT REPORT

2.15.1 General

Environmental site assessments, remediation, and risk assessment reports for development of a site shall include but not be limited to the following:

1. A definition of the scope of the assessment and the assessment criteria to be used for the study site.
2. A summary of the qualifications of the person who completed the assessment and reporting.
3. A detailed discussion of the site assessment and/or previous assessments, including a review of the chemical or biophysical data with respect to the assessment criteria.
4. A clear and concise summary of the conclusions of the study and/or recommendations for further investigation/remediation.
5. A complete package of supporting documentation and appendices including, but not limited to, plans, photographs, aerial photographs, borehole logs test results, checklists, etc.
6. A statement of limitations for the report related to the reliability and availability of data.
7. Reports are to be stamped and signed by the professional responsible for authoring the report.

2.15.2 Phase I ESA Criteria

The following outlines municipality guidelines for completing a Phase I ESA:

1. The CSA Z768-01 mandatory records review list and justification for any deviation from this list.
2. A list of completed optional record reviews recommended in CSA Z768-01.
3. A record of physical site visit, including photographs of the site (preferable not when the land is covered with snow) and adjacent sites and a detailed description of the site visit. It should also include an assessment of the outside and inside of any structures.
4. Details of interviews with people knowledgeable of current and historical environmental site conditions.
5. A review of reasonably available historical data, including data related to solid, liquid, and hazardous waste, oil and gas activities and any other activities that may have an impact on the environment of the site.
6. A thorough review of the licensee’s corporate files for any oil or gas site or rights-of-way on the subject property or within 200 metres of the subject property. Any potential contaminant sources must be listed (e.g., flare pit, drilling sum, surface and/or subsurface storage tanks, spills, pipelines, process facilities, emissions, noise etc.,).
7. A list of water wells on or within 200 metres of the subject property. Information such as well depth, depth of aquifer, status lithology and owners’ name, etc. should also be included.

8. Aerial photos for well or facility sites should include one pre-disturbance, one post disturbance and one photo for every five to seven-year interval during operation, where available. The photos should be at a scale of 1:5000 minimally. 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 should include provincial regulatory agencies, municipalities, present and past site owners and adjacent landowners, tenants, and lease holders on the site, as well as anyone else with knowledge of the environmental conditions of the site.
10. Data searches should include adjacent properties, where reasonable.
11. If the Phase I ESA is more than one year old, or significant development has occurred on or around the subject property, it will need to be updated. An update would include a site visit, assessment of new development on and around the subject property, changes to environmental standards, a statement from the property owner regarding any knowledge of any contamination, etc.
12. If the ESA is more than three years old a new ESA is required.
13. The Developer is required to address the recommendations in the Phase I ESA.

2.15.3 Phase II ESA Criteria

1. A sampling plan with field and laboratory QA/QC, including field duplicates and blanks.
2. Discussion of the logic behind the placement of boreholes and monitoring wells.
3. Justification for any exceedances that are determined to not be of concern.
4. Justification for the choice of criteria to which the samples are compared.
5. Monitoring wells installed downgradient of all known or expected contamination sources, or justification for not installing monitoring wells at those locations.
6. Sufficient and appropriate information for remediation and/or risk management.

2.15.4 Remediation and Risk Management Plans

Remediation/Risk Management Plans are to be prepared in accordance with best practices and procedures and shall meet the requirements of AEP, AHS and the Tier 1 and Tier 2 guidelines, as applicable.

2.16 SLOPE STABILITY GEOTECHNICAL REPORT

2.16.1 General

A slope stability geotechnical report is required for all sites where, in the opinion of the Municipality, slope stability is a concern. For development that borders an escarpment or embankment the report should be provided as part of the Area Structure Plan / Outline Plan submissions.

Geotechnical report requirements to be applied, relative to the intended land use, shall include the following:

1. The assessment of the Factor of Safety (FS) for the existing slope or the existing slope or the proposed design slope profile, with respect to a safe set-back or buffer zone back from the crest or away from the toe of the slope.
2. If the FS for a slope for the proposed set-back is less than that recommended by the Geotechnical Engineer, the slope may be modified using remedial measures recommended by the Geotechnical Engineering consultant. Any remedial measures to increase the FS must consider the effect on adjacent man-made and natural features and be approved by the Engineer.
3. If the development is proposed to be constructed on a slope, the Geotechnical Engineer shall recommend a suitable FS for the on-slope development, based on a specific risk assessment of the proposed development.
4. It is the responsibility of the Developer and/or Builder to ensure that all development conditions identified in the slope stability geotechnical report are complied with.

2.16.2 Slope Stability Geotechnical Report Requirements

1. At a minimum, the scope of the report should provide set-back limits or development recommendations based on the recommended factor of safety. The minimum recommended set-back shall be shown on the final development plan.
2. The basis for the presented conclusions shall be clearly defined and the selected method of analysis shall be adequate, relative to the site-specific conditions, project type and size and public interests.
3. The geotechnical report requirements must consider the following issues, as well as other site-specific issues identified by the Geotechnical Engineer:
    a. Property lines and setbacks as per the land use bylaw.
    b. Establish a factor of safety with respect to the most probable adverse groundwater and loading conditions.
    c. Top of embankment or escarpment.
    d. Toe of slope (*note: Where the development at the toe of the slope is proposed, the report is to address the effect and extend of slope failure on the subject land and the adjacent properties and the protection of same*).

e. Erosion control and other mitigation measures (e.g. drainage works, grading, etc.) close to, along, and on the slopes crest, toe, and face.

f. Appropriate recommendations pertaining to re-vegetation, dewatering, and slope reconfiguration (e.g. cutting, filling, re-grading, french drain, retaining walls, etc.

g. Building location and foundation design.

h. Utility and road infrastructure.

i. The effect of surcharges due to the proposed structures, retaining walls and future site grading.

2.16.3 Verification

The Developer shall retain the Geotechnical Engineer to inspect the site and ensure conformance with report.

2.17 BIOPHYSICAL ASSESSMENTS

1. Subject to the scope, scale and location of the proposed work, the Municipality may require that a Biophysical Assessment be completed that identifies the environmental sensitivities of the site and recommendations to avoid, protect, and/or mitigate potential impacts to the environment. This may be requested during development of an Area Structure Plan, Outline, Subdivision, Design Brief and or for Development Permit applications.
2. The assessment must be completed by a qualified professional (e.g. P. Biol., P. Ag., R.P.F., or an equivalent standard acceptable to the Municipality).
3. The Biophysical Assessment shall include the following (but not limited to):
    a. The scope and magnitude of the project (project description).
    b. The baseline conditions (including existing or historical environmental features).
    c. 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 [i.e. sensitive owl habitat], vegetation), rare or endangered species, soil characteristics, and historical resources.
    d. A discussion about the methodology used to determine and evaluate environmental features.
    e. A discussion about the potential short and long-term impacts including cumulative effects of developing the land.
    f. The identification of appropriate and feasible mitigation measures to reduce the impacts to important environmental features.

g. 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.

h. Considerations of specific environmental restriction periods (i.e. nesting periods for non-migratory / migratory birds or sensitive owls, restricted activity periods for fish; tree clearing restriction periods for ungulates [Key Wildlife Biodiversity Zone and Key Caribou Range]) relating to the construction schedule.

i. Regulatory framework, with respect to the environmental aspects of the project that should be considered during all phases of the project.

4. The assessment must also establish requirements of an Environmental Construction Operation (ECO) Plan as per the Government of Alberta ECO Plan Framework (http://www.transportation.alberta.ca/Content/docType245/Production/EcoPlan.pdf) that:

   a. Will guide specific aspects of environmental protection for the work.

   b. Is prepared by and at the cost of the Contractor.

   c. Includes erosion and sediment control, soil and water management, emergency spill response.

   d. Sets out the remediation and reclamation plan for disturbed areas.

5. The Biophysical Assessment shall also consider conservation recommendations where appropriate for the property through environmental reserves, conservation easements, and setback areas (i.e. riparian areas). The Biophysical Assessment should clearly identify what lands are considered as Environmental Reserve and the quantitative or qualitative criteria used to establish this.

2.18 NOISE STUDY

The Regional Municipality of Wood Buffalo Policy establishes the maximum design noise level at 65 dBA Leq (24) for new development areas adjacent to arterial roadways, highway, railway, etc.

When a noise study is required by the Municipality, to support a project or development, the following criteria shall be used:

1. The maximum noise level of 65 dBA Leq (24) relates to the outdoor leisure area. The receiver is located 1.5 m above the ground and 3 m from the face of the building. If the location of the building is not known, the receiver should be located 4.5 m from the property line.

2. Noise levels are to be predicted for the 10-year traffic volume as forecast in the current RMWB Transportation Study. Predicted traffic volumes for highways (i.e. Hwy 63) should be obtained from Alberta Transportation.

3. The noise study is to contain a report of the findings and scaled drawing(s) of the site including the following:
    a. Building location(s)
    b. Receiver location(s)
    c. Road alignment
    d. Proposed noise barrier(s)
    e. Coordinate grid (for FHW method)
    f. Scaled cross-section at each receiver location showing roadway, receiver and ground elevation as required.
    g. Traffic volumes and percentage of heavy vehicles.
    h. Detailed calculations used to determine noise levels and barrier heights.
    i. Table showing receiver noise levels with and without a barrier.
4. The study will determine the applicable jurisdictional and environmental limits and recommended control measures to be implemented as part of the Development. Control measures may include subdivision layout, dwelling orientation, sound insulating walls and windows, and noise attenuation barriers.

2.19 STORMWATER MANAGEMENT (SWM) REPORT

The SWM report shall identify drainage areas and provide a mathematically supported design of the SWM system, including the location, capacity, and geometric footprint of SWM conveyance, storage and treatment facilities. The facility capacity sizing must meet or exceed the minimum design requirements in this document and all applicable Federal, Provincial and Municipal regulations.

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. 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.

Planning and design for major drainage systems must include the incorporation of surface drainage and overland flow routes, ponding areas, Storm Water Management Facilities (SWMF) and, where possible, escape routes to receiving watercourses.

New development must provide storm detention to suppress surcharging in the existing storm sewer system and to contain the major drainage within the development area.

The stormwater management plan shall be consistent with the standards outlined in Section 6 Stormwater Management and shall:

1. Identify the impact of the proposed development on the watershed.
2. Identify and quantify the amount of upstream drainage entering onto the proposed development lands, including all point(s) of entry.
3. Identify all existing flow channels, drainage pattern or routes and containment areas.
4. Address pre-development floss and post development flows.
5. Identify the point(s) of discharge from the lands, a well as the type and calculated capacity of the receiving drainage facility(s), 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.

The Consulting Engineer shall include a SWMF summary table for notable pond elevations and rainfall frequencies for each pond in the Outline Plan area. See table below for an example SWMF summary table.

Table 2.2 – Example SWMF 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	L.T.F. Elevation
1:100	881.6	2.7	28,500	510	Weir crest regulated
1:50	881.2	2.1	27,300	490	Orifice flow regulated
1:25	881.1	2.0	18,600	420	Orifice flow regulated
1:10	880.8	1.8	12,400	380	Orifice flow regulated
1:5	880.2	1.6	7,500	350	Orifice regulated
Pond Bottom	880.1	1.2	500	250	Nominal pond bottom
Inlet Crest	880.0	.0001	0	245	
Invert By-Pass Pipe	878.0	0	0	0	

2.20 GENERAL CONSTRUCTION GUIDELINES

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 meet the following general requirements.

Note that in the case of Capital Projects the General Conditions and Supplementary Conditions contained in the Construction Contract between the Municipality and the Contractor may provide further requirements than the items listed below; these items should be considered as the minimum responsibility of the Contractor.

2.20.1 Occupational Health and Safety

The Developer, Contractor, Consulting Engineer and Landscape Consultant shall comply with the provisions of the Occupational Health and Safety Act, and amendments thereto and regulations thereunder or any successive legislation and shall always ensure that all subcontractors at the worksite shall comply with the requirements of the said Act and regulations thereunder.

The Contractor shall be the general representative and agent to the Developer for the purposes of ensuring compliance with safety regulations for both itself and subcontractors. The Contractor shall bring to the attention of subcontractors the provisions of the Occupational Health and Safety Act and regulations thereunder.

The Municipality considers the Developer the Prime Contractor for the work site and is responsible for ensuring compliance with the Occupational Health and Safety Act by all employers and employees on the Work site.

The Contractor and the Consulting Engineer shall have either full certification in the Alberta Labour approval “Certificate of Recognition” (C.O.R.) Program appropriate to their industry or a Temporary Letter of Certification (T.L.C.) issued by the Alberta Construction Safety Association.

2.20.2 Commencement of Construction

Upon receipt of approved drawings and specifications, the Developer on the satisfactory execution of the Development Agreements and submission of Letter of Credit to the Planning and Development Department may proceed to install the municipal infrastructure improvements.

A copy of all approved drawings and specifications shall be maintained at the construction site during the installation of services.

The Developer shall give the Engineering and Parks Departments at least two (2) weeks’ notice prior to commencement of construction to allow for time to arrange for inspection staff from the appropriate Municipal Department.

2.20.3 Project Supervision

The Consultant shall be responsible for the layout, field surveys, inspection and approval of materials and the supervision of installation of all improvements which are the responsibility of the Developer. The Consultant or their authorized representative, or third-party consultants, shall be onsite at all times during the installation of services to certify that all improvements are in conformance with the approved plans and specifications.

The Developer shall organize regular site meetings involving the Municipality, Contractor, and sub-contractor; the frequency shall be determined prior to commencement of construction.

In addition to supervision carried out by the Consultant, the Municipality will periodically inspect the work and assist in coordinating the subdivision works with any related Municipal works. The Municipality will bring the use of any unacceptable materials or practices to the attention of the Consultant. If remedial action is not taken to the satisfaction of the Municipality, a Stop Work Order will be issued by the Development Officer and all work will cease. The unacceptable work will be corrected and/or replaced by the Developer.

2.20.4 Stop Work Order

1. The Municipality may issue a Stop Work Order to the developer/contractor due to non-conformance. Non-conformance includes:
    a. Unsafe practices
    b. Imminent danger
    c. Lack of traffic control
    d. Failure to submit required testing certification
    e. Construction not in accordance with approved drawings and specifications
    f. Non-compliance to Development Agreement/Contract
    g. Damage to existing facilities
    h. No Development Permit in place
    i. Environment Contamination Risks
2. Should a Stop Work Order be issued, the Developer shall immediately cease operation, rectify the non-conformance, and obtain the Municipality’s approval prior to proceeding.

2.20.5 Demolition Requirements

Any site demolition requires a permit from the Municipality. The demolition permit review process will account for service terminations (i.e. cut and cap of underground utilities), site safety plan, site access and traffic and pedestrian accommodation, impacts to adjacent sites, site remediation, and hazardous and waste material handling and disposal. Refer to the Municipal website for specific permit requirements.

All site demolition works must also adhere to the Part 8, "Safety Measures at Construction and Demolition Sites" of the Alberta Building Code.

Additional permitting may be required from Alberta Environment. Requirements for additional permits shall be the responsibility of the Developer.

2.20.6 Reporting

1. Submit regular progress reports to Engineering Department (and Parks Department where appropriate) in a format approved by the Municipality. In addition, invite the Municipality to regular site meetings and circulate meeting minutes.
2. Other information to be submitted as part of the Construction Completion Certificate (CCC) and Final Acceptance Certificate (FAC) processes includes:
    a. Test results
        i. Compaction (Subgrade, sub-base, base, asphalt)
        ii. Material Strength (as applicable)
        iii. Exfiltration/infiltration of sewer (as applicable)
        iv. Pressure Test Results
        v. Leakage Test Results
        vi. Chlorination and bacterial test results
    b. C.C.T.V. monitoring videos and reports of underground sanitary sewer and storm sewers

2.20.7 Competent Personnel

The Developer shall at all times employ skilled and competent personnel for all construction operations. The Municipality shall retain the right to require the removal of incompetent personnel.

2.20.8 Equipment

1. Construction equipment shall be maintained in proper operating conditions. The Municipality maintains the right to order the removal or repair of improperly maintained equipment.
2. Equipment shall be used in accordance with the manufacturer's recommendations and within the rated capacities specified.

2.20.9 Dust Control

The Developer shall be solely responsible for controlling dust nuisance resulting from their operations, both within the right-of-way and elsewhere, be it with calcium chloride, water or by other means available and acceptable to the Municipality.

2.20.10 Street and Sidewalk Cleaning

During construction and the warranty period and until the issuance of Final Acceptance Certificate, the Developer 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 tracking of mud from the development occurs.

2.20.11 Safety Provisions, Barricades and Fences

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, warning lights and guards shall be placed and maintained during the progress of the construction work and until it is safe for traffic or pedestrian use, all in conformance with the Transportation Association of Canada (TAC) and the Occupational Health and Safety (OH&S) act. Whenever required, flag person shall be provided to prevent accidents.

In redevelopment areas or locations where development permits are issued, provide:

1. Minimum of a 1.8 m perimeter fence (chain link or temporary but secure construction fencing), complete with warning signs.
2. Overhead protection over walkways if there is a risk of items falling on pedestrians.

All commercial and multifamily sites require perimeter chain link fencing and gated access control. The consultant will coordinate with the Municipality in planning the fence location, pedestrian safe areas, overhead protection as necessary, access points and parking areas.

2.20.12 Traffic and Utility Control

Refer to the Regional Municipality of Wood Buffalo's "Utility Installation and Traffic Control Manual" and TAC's Manual of a Uniform Traffic Control Devices for Canada, and the following general principles.

1. Prior to any work being done within the Municipal right-of-way, the applicant must obtain approvals from the Engineering Department at least five (5) working days prior to work commencing so notices and appropriate signage can be posted in advance.
2. Work shall be conducted to cause the least interruption to traffic.
3. The applicant shall provide and maintain safe and suitable temporary bridges at street and driveway crossings where traffic must cross open trenches.
4. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes or other utility controls shall be unobstructed and accessible during the construction period.

5. Adequate provision must be made for the flow of sewers, drains and water courses encountered during construction.
6. No valve, switch or other control on existing utility system shall be operated for any purpose by the applicant.
7. All property owners affected by such operations shall be identified in consultation with the Engineering Department and notified by the applicant before the interruption of service and advised of the probable time when service will be restored.
8. Prior to any road closure, the Applicant must submit a Traffic Accommodation Plan including Utility Installation and Street Occupation Permit for approval by Engineering Department.
9. The applicant shall be responsible for supplying, placing, and maintaining detour signing for the duration of construction.
10. Emergency access must be maintained at all times.
11. At their own expense, the applicant must provide, erect, and maintain all signs, barricades, flares, flag persons, and so on.
12. In order to permit movement of traffic across the streets where new pavements are being constructed, the applicant may be required by the Municipality to construct some intersections one-half at a time. In this way, traffic can 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.

2.20.13 Materials

1. The Developer shall only install materials that have been approved either in these standards, Standard Construction Specifications, or 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 the Municipal standards. Material testing shall be performed by an accredited testing agency and shall be at the cost of the Developer.
3. Failure to submit the material certification may be cause for halting the project and issuance of a Stop Work Order.

2.20.14 Survey Monument Control

The Developer may be responsible as follows:

1. To see that the survey control networks are extended (and recorded in accordance with the Alberta Surveys Act) into the development area. The density and location of survey control monuments shall be mutually agreed upon through consultation with the Engineering Department and Alberta Environment and Parks
2. To maintain, and if necessary, replace such monuments as they may be destroyed, damaged or removed by the operation of the Developer in carrying out the construction and installation of municipal improvement.

2.20.15 Maintenance of Existing Facilities

1. The Developer is responsible to ensure the existing services, such as sewer mains, watermains, roadways and landscaped areas are not disturbed or become inoperable as a result of actions by the Developer, their agents, or Contractors until Final Acceptance Certificate (FAC).
2. Existing services shall not be exposed to loadings beyond their design capacities. Existing services shall be maintained in operating condition and cleaned as necessary by the Developer where their actions are cause for additional maintenance. The existence and location of underground utilities indicated on the plans, which have been determined from the Municipality's records, are not guaranteed.

2.20.16 Onsite Representation

The Consulting Engineer or their authorized representative shall be onsite at all times when construction is in progress.

The Consulting Engineer 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 compliance with the approved drawings.

2.20.17 Staged Construction and Site Management Plan

The Municipality understands that Staged Construction is an acceptable business approach either between development phases and stages, or over the course of the seasonal cycles within a single phase or stage.

The Developer 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, or third-party tradespeople working on the site, or the Developer's own staff, contractors and agents, or closed-off completely)
2. Access for:
    a. Emergency vehicles
    b. Residents and/or local businesses (if applicable)
    c. Construction equipment (if applicable)
    d. Maintenance equipment
    e. Access control requirements, including signage, barricades and fencing
3. Maintenance requirements, including frequency or Level-of-Service to be maintained by the Developer.
4. Any interim measures required to be undertaken by the Developer to safeguard the public and the environment as a result of the interim conditions.

All partially completed works shall be properly restored prior to commencing with the next stage of construction.

The use of completed portions of a staged construction shall be subject to the conditions of the Partial Construction Completion Certificate.

2.21 THIRD PARTY (OIL AND GAS) CROSSINGS OF UTILITY RIGHTS-OF-WAY AND GOVERNMENT ROAD ALLOWANCES

The following requirements shall apply to third party (oil and gas) pipelines crossing Municipal Utilities or Government Road Allowances.

Refer to the standard drawings for additional details.

2.21.1 Typical Pipeline Crossing on Municipal Underground Utilities

1. Utility Line Assignment permit is required prior to construction.
2. Crossing shall be constructed in accordance with the latest CSA Z662 Oil and Gas Pipeline Standard and the Authorities Having Jurisdiction.
3. Pipeline shall be constructed with the following minimum clearances:
    a. Vertical 1.00 m
    b. Horizontal: 3.00 m
4. Pipeline shall be constructed straight extended 8.0 m from both end limits of road Right-of-Way. If utilities are not within a road Right-of-Way but within an easement, straight pipe shall be extended 4.0 m from both end limits of the utility Right-of-Way.
5. Pipeline marker tape to be placed over the pipeline
6. Backfilling shall maintain the original compaction around the Municipal utilities or as specified by an Engineer.
7. The Municipality shall be notified at least 48 hours prior to commencement of excavation for the purpose of inspection.
8. The Municipality shall be notified for inspection upon completion inspection.
9. Record drawings shall be required upon completion.

2.21.2 Typical Pipeline Crossing on Government Road Allowance

1. Utility installation and Street Occupation Permit is required prior to construction.
2. Crossing shall be constructed in accordance with the latest CSA Z662 Oil and Gas Pipeline Standard and the Authorities Having Jurisdiction.
3. Pipeline Marker tape to be placed over the pipeline.

4. Municipal Utilities, if any, shall be located on site.
5. All crossings shall be constructed in accordance with all requirements of transportation safety board of Canada, the ERCB, and any other Authority Having Jurisdiction
6. The Construction shall be straight with no vertical or horizontal bends within 8m minimum from the road allowance boundary,
7. Crossing deflection angle shall be in the range of 70 to 110 degrees.
8. The Municipality shall be notified at least 48 hours prior to commencement of excavation for the purpose of inspection.
9. The Municipality shall be notified for inspection upon completion inspection.
10. Record Drawings shall be required upon completion.
11. Backfill details are as per Table 2.3.

Table 2.3 – Backfill Details for Pipeline Crossings on Government Road Allowance

Road Allowance	Minimum Cover	Compaction	Recommended Construction Method
Undeveloped (with no future development planned)	1.20 m	Maintain Original	May use Open Cut
Undeveloped (with future development contemplated)	2.0 m	95%	May use Open Cut
Developed	1.50 m from lowest bottom of ditch	95% or greater, per direction from Engineering Dept.	Trenchless Methods

2.22 UNDERGROUND INFRASTRUCTURE IN THE VICINITY OF MUNICIPAL HIGHWAYS

The following standards apply to work for underground infrastructure (including watermains, sewer mains, 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 Regional Municipality of Wood Buffalo.

2.22.1 General

1. No infrastructure construction work (including installation and/or modification) shall be undertaken within 30 m of the Municipal Highway Rights-of-Way (ROW) without prior municipal approval.
2. Applications must be submitted to the Municipal Engineering Department and must include stamped plan / profile drawings of the proposed work, including legal land description, utility

identification, proposed location and alignment, installation method, depth of cover (see notes below), casing material and carrier pipe material.

3. The applicant shall allow up to 30 working days for application review and processing.
4. For proposed utilities that parallel the existing Municipal Highway, within the highway ROW, an agreement for a utility easement is required from the Land Administration Department in addition to the Engineering application.
5. The applicant shall contact the appropriate Municipal departments (Roads, Underground Services and Engineering) at least two working days prior to commencement of construction as well as prior to construction completion to allow for site inspection, if required.
6. The applicant shall be responsible for all the costs to repair any damages to the highway infrastructure resulting from the installation, maintenance, and operation of the underground utilities in the Municipal Highway right-of-way.
7. Following any work done by the applicant, their representatives or contractors, the applicant shall restore the Municipal Highway ROW, to the original or better condition.
8. The applicant shall be responsible for proper and adequate line marking as well as maintenance of the line markers within the highway right-of-way for the duration of the work.

2.22.2 Crossing Requirements

1. The open cut method for utility installation crossing a Municipal Highway shall not be permitted; trenchless methods shall be required. The applicant must identify the proposed method, undertake the appropriate geotechnical investigation, and accept all risk associated with the trenchless installation method.
2. Open cut method for utility installation may be used for utility installation parallel to a Municipal Highway, subject to Municipal approval.
3. The Minimum Depth of cover shall be as follows:
    a. 3.0m below the lowest ditch grade for sanitary sewer, including forcemains
    b. 2.5m below the lowest ditch grade for storm sewer
    c. 3.5m below the lowest ditch grade for watermain
    d. 3.5m below the lowest ditch grade for oil and high-pressure gas mains
4. The desirable angle of crossing is between 70 and 110 degrees; other angles may also be accepted in special circumstances.
5. The pipeline crossing shall be placed as a straight, continuous installation, with a minimum gradient of 1 in 120 (0.83%), and no sags.
6. No horizontal and/or vertical pipe bends are permitted within the crossing or within 30 meters of the ROW boundary.

7. A utility shall not be installed through a culvert or other drainage structure.

2.22.3 Cased Crossings

1. Where casing pipe is used, it shall be continuous and inserted by boring, augering, jacking, or other appropriate method. Casing shall be designed to be of equal or greater life span than the carrier pipe.
2. The inside diameter of the casing shall be a minimum of 100 mm greater than the outside diameter of carrier pipe. An exception to this is steel casing of polyethylene pipe, where the next size diameter of pipe may be used.
3. The casing shall extend across full width of the Highway ROW.
4. Vents shall not be placed within the limits of Highway ROW.
5. The casing shall be satisfactorily sealed to the carrier pipe at both ends.
6. No cables of any kind shall be placed within the casing of any pipeline.
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. Where cathodic protection is planned, the test leads shall be outside the outer boundaries of the Highway ROW.

2.22.4 Carrier Pipe Materials

Water mains and Sanitary / Storm Sewer Mains:

1. Jointed plastic pipe (i.e. PVC) may be used as a carrier pipe for water and sewer mains if installed within an outer continuous steel casing and adequately supported at the point where it leaves the casing in order to prevent pipe shear. All joints internal to the casing must be fully restrained, prior to insertion into the casing.
2. Fusible PVC or HDPE may be used as a carrier pipe for water and sewer mains if installed with an outer continuous steel casing and adequately supported at the point where it leaves the casing to prevent pipe shear.
3. Heavy-wall continuous steel or heavy-wall continuous polyethylene pipe can be used for uncased crossings of the Municipal Highways.

Oil and High-Pressure Gas Pipelines:

1. Cased and uncased crossings shall be constructed in adherence to the latest edition of CSA Z662 Oil and Gas Pipeline Standard and the Authorities Having Jurisdiction.
2. To be considered for uncased crossings, the oil / gas pipeline must be heavy-wall continuous pipe, meeting the appropriate CSA standards.

2.23 RECORD DRAWINGS AND OTHER COMPLETION DOCUMENTS

Within ninety (90) days of the completion of works, the Developer shall submit to the Municipality as constructed and other related information giving detailed measurements of the actual municipal services constructed. The As-Constructed Drawings shall be in the format of an update to the Detailed Engineering Design Drawings, with updated information as appropriate to capture any and all deviations from the approved design during construction. These changes may include the following:

1. Alignments and locations of underground infrastructure and surface works.
2. Final invert and rim elevations of manholes, catch basins and water valves.
3. Final locations of street furniture, including street signage, street lighting and traffic control devices, fire hydrants, vaults, franchise utility furniture.
4. Clear indication of completed works, and any remaining works to be completed in future phases or projects.

All drawings shall be completed in accordance with the Section 3 Engineering Drafting & Data Submission Standards.

For a list of submission requirements for Construction Completion Certificate (CCC), refer to the checklist at the end of this Section.

The submission of this data is for record purposes and is a condition of the issuance of Construction Completion Certificates by the Municipality. Record Drawing submission can be completed in one or two stages, as described below:

2.23.1 Interim Stage (Optional)

1. The Consulting Engineer shall certify that all work had been completed in accordance with the plans and specifications, the Engineering Servicing Standards and that all work and deficiencies have been completed. A single overall plan-view drawing of the extent of the completed works is to be provided.
2. On completion of all municipal underground infrastructure, including the sanitary and storm sewer systems, the water distribution system, the service connections for lot services, and all stormwater management facilities, the Developer shall submit to the Engineering Department record drawings of the completed underground works.
3. Together with the above, the Developer shall submit the monthly progress reports, lot service records, compaction test results and successful pressure, leakage and chlorination tests.
4. Upon satisfactory acceptance of this data, the Developer may request a construction completion inspection for sewer and water.
5. The interim Record Drawing submission may be used to support the application for a Construction Completion Certificate – Underground Only

2.23.2 Completed Stage

1. Within thirty (30) days of satisfactory completion of all works including all surface improvements, the Developer shall submit to the Engineering Department the following information:
    a. Certification by the Consulting Engineer that all work has been completed in general accordance with the plans and specifications.
    b. Set of Record Drawings as per Section 3 Engineering Drafting & Data Submission Standards.
    c. Reporting requirements for Tangible Capital Assets. This includes an itemized inventory of all contributed assets (i.e. every pipe, every valve, every manhole, etc.) the cost of each asset, and the mapped location of each asset. Refer to Section 3 Engineering Drafting & Data Submission Standards for further details.
    d. All previous certificates that were not submitted concerning materials inspection and testing, mix designs, deflection test, concrete strength tests, compaction tests, CCTV inspection reports, as required by this document and by the Municipality.
    e. Operation and maintenance manuals, spare parts, and lubricants (if applicable).
    f. The Developer may request a construction completion inspection and within thirty (30) days of such request, the Municipality will carry out an inspection for issuance of the Construction Completion Certificate. Should seasonal conditions not permit the inspection and execution 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.

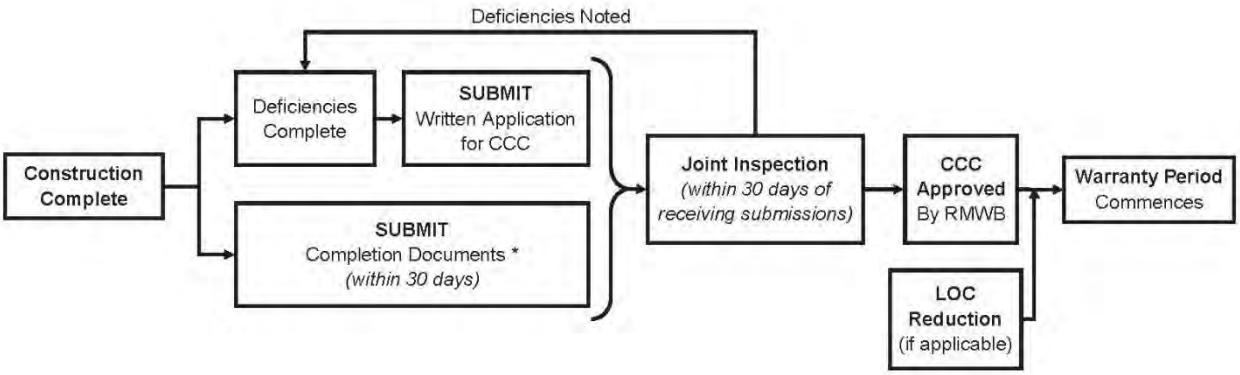
2.24 CONSTRUCTION COMPLETION CERTIFICATE (CCC)

Once the improvements have been constructed, the Developer must request, in writing to the Engineering Department, an inspection of the work. The Engineering Department will then schedule the site inspection based on availability of all parities. For both CCC and FAC inspections there should be one representative from the Engineering Consulting firm and from the Contractor in attendance. When inspecting underground infrastructure there needs to be a minimum of one representative from the Engineering Department and one from the Underground Services department. When inspecting roadway infrastructure, there needs to be a minimum of one representative from the Engineering Department and one from the Roads Department. If the project includes roadway boulevards or other park infrastructure there is to be a minimum of one representative from the Parks Department. Minutes of the inspection, enumerating all observed deficiencies shall be prepared by the Engineering Consultant to be reviewed and accepted by the Engineering Department and the other department in attendance at the inspection.

1. Once all outstanding deficiencies are corrected to the satisfaction of the Municipality, the Municipality shall execute the Construction Completion Certificate submitted by the Developer and Consulting Engineer, notifying:
    a. Acceptance of the portion of work by the Municipality.
    b. Commencement date of warranty.
2. A copy of the Construction Completion Certificate is included in this section for execution by the Developer and the Consulting Engineer. The procedure is illustrated in Figure 2.5.
3. If provided for in the Development Agreement, separate Construction Completion Inspections and commencement of warranty periods shall be issued for the following:
    a. Underground utilities only
    b. Underground utilities and surface works
    c. Landscaping
    d. Facilities
4. 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 take place between May 15 and November 15, subject to seasonal conditions. Refer to Section 10 Landscape and Park Development Standards for municipality take-over specific to landscape items.
5. Power energization shall be completed prior to the issuance of the full CCC. Safety Codes inspects and approves power and gas. Before CCC, Developer shall contact the franchise utilities (ATCO Gas and ATCO Electric), for site ID and then submits to development Services then the RMWB fills out the AMSC form and submits to Supply Chain Management. SCM will submit to AMSC. AMSC will select the retailer. The retailer will reply to franchise utilities. Franchise utilities will energize it and report back to SCM and developer. SCM will notify Development Services then the Development Services will inspect the site to ensure that the subdivision is energized prior to the issuance of the Full CCC.

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 2.5—Construction Completion Certificate Process



2.24.1 CCC Full - Underground and Surface

This CCC is issued when Underground and Surface work has been completed, inspected, and approved in accordance with the Project Specifications and Development Phasing.

1. Warranty commences.
2. Some minor deficiencies may exist (e.g. a small, isolated cracks in a sidewalk).
3. At the request of the Applicant, Letter of Credit (LOC) is reduced to not less than 10% of the value of the project plus 100% of the value of deficient work.
4. Development Permits can be issued.
5. Municipal operations such as snow clearing, garbage pickup, and transit services commence as appropriate, subject to the site being safe and uncluttered in the opinion of Public Works.
6. Record drawings must be submitted to the Municipality as outlined in Section 3 Engineering Drafting & Data Submission Standards.
7. An updated TCA & GIS must be submitted to the Municipality as outlined in Section 3 Engineering Drafting & Data Submission Standards.

2.24.2 CCC – Partial - Underground and Surface

This CCC is issued when 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.

1. Subject to approval from Engineering.
2. Warranty does not commence until remaining part has been completed and approved.
3. No reduction in Letter of Credit.
4. No municipal operations.
5. A Site Management Plan is required to address emergency, functionality, and operational issues.

2.24.3 CCC – Conditional - Underground and Surface

This CCC is issued when significant portions of the work are incomplete, deficient or have not been inspected due to seasonal conditions.

1. Same conditions as partial CCC noted above.
2. Entire phase is re-inspected when work is complete.

2.24.4 CCC – Underground Only

This CCC is issued on completion of Deep Services, including completion of all catch basins, as well as the stormwater management facilities necessary to accommodate the identified catchment area.

1. At the request of the Applicant, Letter of Credit for underground component is reduced, to not less than 10% of the value of the underground component plus 100% of the value of deficient and incomplete work.
2. Warranty commences, for the completed underground works only.
3. FAC will only be issued together with the FAC for the related surface works.
4. No municipal operations.
5. A Site Management Plan is required to address emergency, functionality, and operational issues.
6. In some case, Development Permits can be issued subject to Engineering's approval. (This is typically only applied to multi-family, commercial, industrial, institutional, or recreational buildings.)

2.24.5 CCC – Landscaping

This CCC is issued on completion of parks and landscaped surfaces on all MR and PUL lots and boulevard and median spaces within the development area, including hard and soft landscaping, pathways and walkways, playground structures, fences, and irrigation systems.

1. This CCC is contingent on an inspection being conducted by Parks for tree clearing, including inspection of trees along the clearing fringes and perimeter, and thinning of the underbrush in accordance with FireSmart.
2. At the request of the Applicant, the Letter of Credit for parks and landscaping component is reduced, to not less than 10% of the value of the parks and landscaping component plus 100% of the value of deficient and incomplete work.
3. Warranty period commences.
4. If the Developer installs sod in lieu of topsoil and seed across all turfed areas within the proposed development area, the Municipality will take over maintenance of sod within the development area during the warranty period. The establishment period of the sod will be the responsibility of the Developer. Acceptance of the sod can be done once there have been three cuts on all sodded areas. The Developer shall still be responsible for warranty items, but the Municipality will be responsible for keeping and providing maintenance records.
5. Some minor deficiencies may exist.
6. For additional information related to Landscaping CCC/FAC refer to Section 10 Landscape and Park Development Standards.

2.24.6 CCC – Facilities

This CCC is issued on the completion of facilities to be taken over by the Municipality, after the facility has been commissioned and may be safely occupied and operated for its intended use.

1. At the request of the Applicant, the Letter of Credit for facilities component is reduced to not less than 10% of the value of the facilities component, plus 100% of the value of deficient and incomplete work.
2. Warranty commences.
3. Some minor deficiencies may exist.

2.25 SUBDIVISION ENDORSEMENT

The Municipality will endorse the Subdivision Plan following the issuance of Construction Completion Certificate (CCC) for both the Underground and Surface construction works. In the absence of the issuance of CCC, the Municipality may endorse a Subdivision Plan if the Developer increases the Letter of Credit from 50% to 120% for any improvements outlined in the Development Agreement which have not yet been completed and accepted.

2.26 ISSUANCE OF BUILDING PERMITS

Unless otherwise agreed to by the Municipality, no building permits shall be issued until the subdivision plan complete with easements is registered, the Construction Completion Certificate has been issued for the underground utilities, and franchised utility work is complete.

The issuance of Building Permits in advance of the Surface Construction Completion Certificate is subject to the Site Management Plan to address emergency, functionality, and operational issues.

2.27 WARRANTY PERIOD

2.27.1 Developer Responsibilities

1. The Developer shall be responsible for any defect, fault, or deficiency in the completed work during a minimum twenty-four (24) month warranty period and shall remedy it at their own expense.
2. The Developer shall be responsible for any and all third-party damages up until the issuance of the Final Acceptance Certificate.
3. See Section 2.27.2 for Municipal responsibility for Snow Removal and Solid Waste collection. The Developer shall be responsible for providing these services until the Municipality takes over this service, or as otherwise agreed to between the Developer and Municipality.
4. The Developer shall remain responsible for all other maintenance and repair items including third-party damages, maintenance of street signs, flushing of sewer lines, and thawing and flushing of watermains.

2.27.2 Snow Removal and Solid Waste Collection

2.27.2.1 Collector and Arterial Roads

Following issuance of a Construction Completion Certificate for collector and arterial roads within the occupied development area, the Municipality will assume responsibility for snow removal and solid waste collection. This responsibility is subject to the roads and sidewalks being clear of construction materials and contractor activity in order that the municipal operations can be safely and efficiently provided. They must be safe and uncluttered in the opinion of the Roads and Solid Waste sections. Otherwise, the Municipality may, following five (5) days of notice to the Developer, contract out any site cleanup 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 Letter of Credit.

2.27.2.2 Local Roads

Following the issuance of a Construction Completion Certificate for local roads, the Developer will assume responsibility for snow removal and the collection of residential garbage on all local streets within the Development area 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.

Note: 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.

2.28 FINAL ACCEPTANCE CERTIFICATE (FAC)

Maximum of 90 days prior to the expiration of the warranty period, the Developer shall request in writing a final inspection, and within thirty (30) days of receipt of such request, the Municipality will carry out an inspection. Final Acceptance shall include underground services and surface work, and facilities, where applicable, and upon correction of all deficiencies, shall be issued under one combined Final Acceptance Certificate encompassing all improvements. Landscape improvements will be approved under a separate Final Acceptance Certificate. A copy of the certificate is included in this section for execution by the Developer and the Consulting Engineer. The warranty shall remain in effect until the Final Acceptance Certificate is accepted by the Municipality.

Should seasonal conditions not permit the inspection, execution of the Final Acceptance Certificate by the Municipality will be delayed until appropriate conditions for inspection exist.

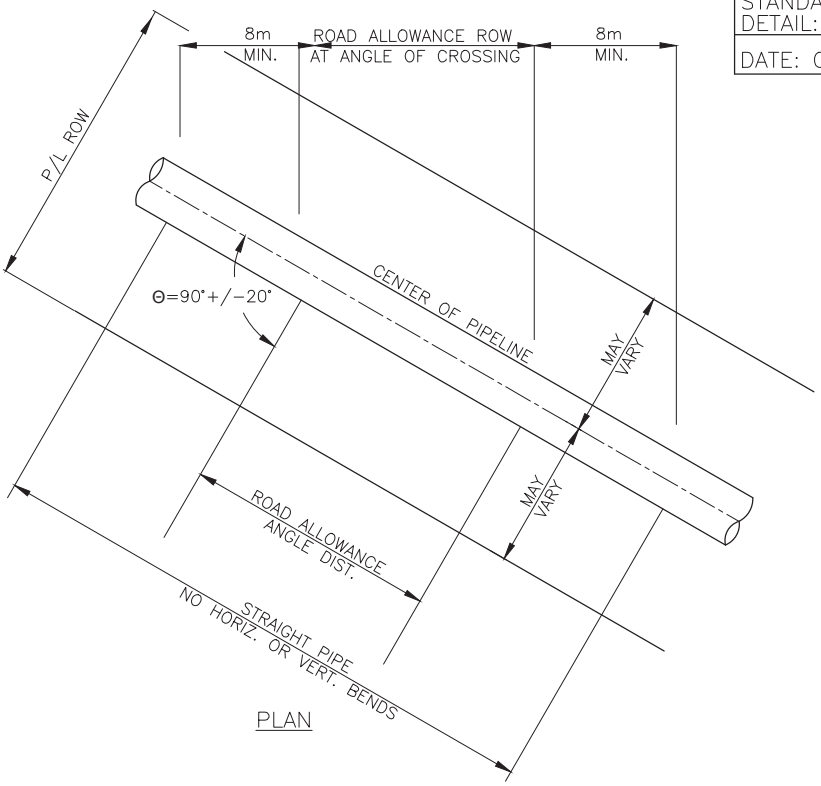
At the request of the Developer, full Letter of Credit will be returned after issuance of all Final Acceptance Certificates.

For a list of requirements for FAC, refer to the checklist at the end of this Section.

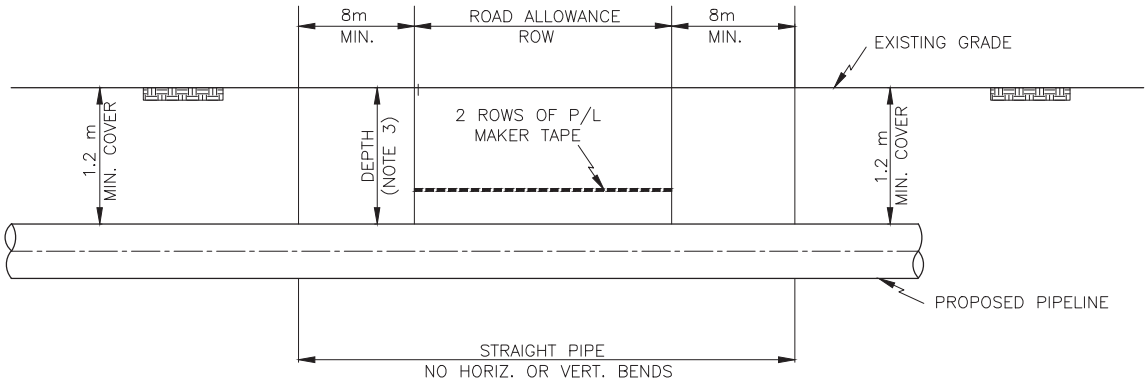
2.29 TYPICAL UTILITY AND ROW CROSSING STANDARDS DRAWINGS

Dwg. No.	Title
2-100	Recommended Typical Pipeline Crossing of Government Road Allowance
2-101	Recommended Typical Pipeline Crossing Under RMWB Service Utilities
2-102	Typical Pipeline Crossing Above RMWB Service Utility
2-103	Utility Crossing Sign Detail

STANDARD DETAIL:	2-100
DATE: OCT 2016	REV: 5



PLAN



SECTION

NOTES:

(1) UTILITY INSTALLATION / ROAD CLOSURE PERMIT IS REQUIRED PRIOR TO CONSTRUCTION. REFER TO UTILITY INSTALLATION AND TRAFFIC CONTROL MANUAL.

(2) CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST CSA Z662 OIL & GAS PIPELINE STANDARD AND THE AUTHORITIES HAVING JURISDICTION.

(3) BACKFILLING DETAILS ARE AS FOLLOWS:

BACKFILLING SPECFICATION

ROAD ALLOWANCE	MINIMUM COVER	COMPACTION	RECOMMENDED CONSTRUCTION
1. UNDEVELOPED (NO FUTURE DEV.)	1.20 m	MAINTAIN ORIGINAL	MAY USE OPEN CUT
2. UNDEVELOPED (FUTURE DEV.)	2.00 m	85 %	MAY USE OPEN CUT
3. DEVELOPED	1.00 m BELOW BOTTOM OF DITCH	95 % OR GREATER	BORING

(4) PIPELINE MARKER TAPE TO BE PLACED OVER PIPELINE, UNLESS BORED.

(5) RMWB UTILITIES, IF ANY SHALL BE LOCATED ON SITE.

(6) ALL CROSSINGS SHALL BE CONSTRUCTED IN ACCORDANCE WITH ALL REQUIREMENTS OF TRANSPORTATION SAFETY BOARD OF CANADA, THE ERCB AND ANY OTHER AUTHORITIES HAVING JURISDICTION.

(7) RMWB SHALL BE NOTIFIED AT LEAST 48 HOURS IN ADVANCE OF EXCAVATION FOR PURPOSE OF INSPECTION.

(8) THE CROSSING SHALL HAVE NO VERTICAL OR HORIZONTAL ENDS WITHIN 8 m FROM ROAD ALLOWANCE BOUNDARY. CROSSING DEFLECTION ANGLE SHALL BE IN THE RANGE 70–110 DEGREES.

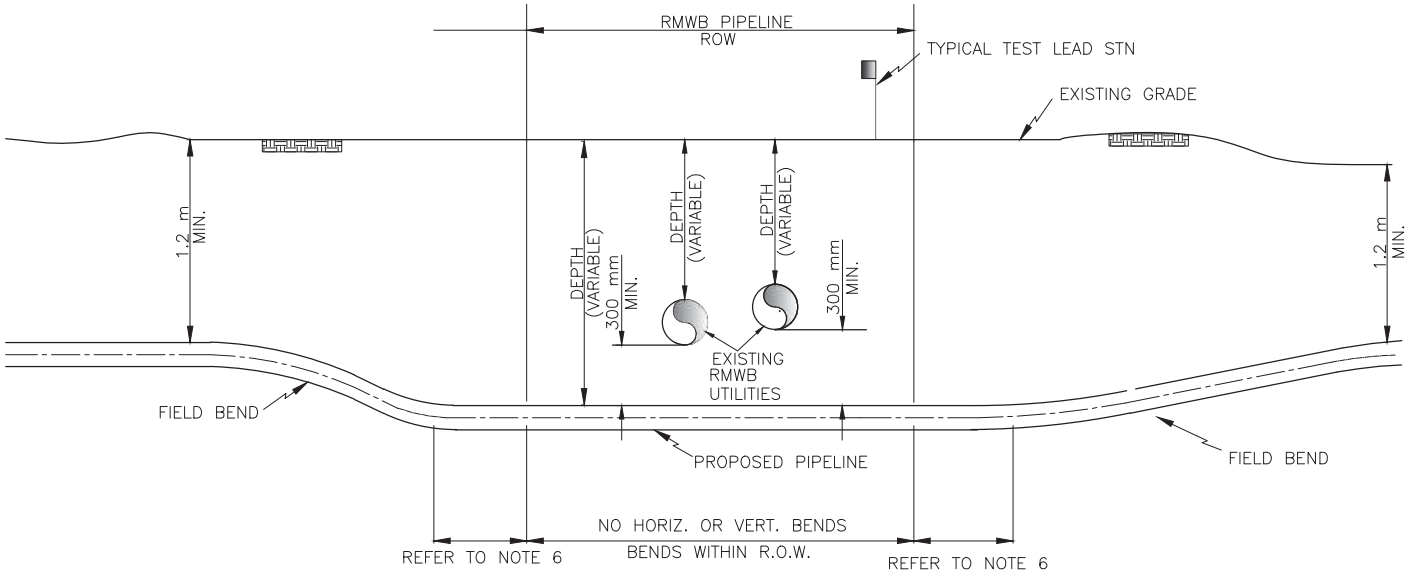
(9) AS–BUILT DRAWINGS SHALL BE SUBMITTED UPON COMPLETION.

(10) RMWB SHALL BE NOTIFIED FOR INSPECTION UPON COMPLETION INSPECTION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL PIPELINE CROSSING OF GOVERNMENT ROAD ALLOWANCE

STANDARD DETAIL:	2-101
DATE: OCT 2016	REV: 5



SECTION

NOTES:

(1) UTILITY INSTALLATION PERMIT IS REQUIRED PRIOR TO CONSTRUCTION. REFER TO UTILITY INSTALLATION AND TRAFFIC CONTROL MANUAL.

(2) CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST CSA Z662 OIL & GAS PIPELINE STANDARD AND THE AUTHORITIES HAVING JURISDICTION.

(3) RMWB SHALL BE NOTIFIED AT LEAST 48 HOURS IN ADVANCE OF EXCAVATION FOR PURPOSE OF INSPECTION.

(4) PIPELINE SHALL BE CONSTRUCTED BELOW THE EXISTING UTILITIES. WHERE THIS IS NOT APPLICABLE OR NOT PRACTICAL, CONSULT SHALL BE MADE WITH RMWB FOR MORE ACCEPTABLE ALIGNMENT AND GRADE.

(5) MINIMUM CLEARANCE FROM EXISTING UTILITIES IS AS FOLLOWS:
VERTICAL: 0.30 m
HORIZONTAL: 3.00 m

(6) PIPELINE SHALL BE CONSTRUCTED STRAIGHT EXTENDED 8.0M FROM BOTH END LIMITS OF ROAD RIGHT-OF-WAY. IF UTILITIES ARE NOT WITHIN A ROAD RIGHT-OF-WAY BUT WITHIN AN EASEMENT, STRAIGHT PIPE SHALL BE EXTENDED 4.0M FROM BOTH END LIMITS OF THE UTILITY RIGHT-OF-WAY.

(7) CROSSING DEFLECTION ANGLE SHALL BE IN THE RANGE OF 70 -110 DEGREES.

(8) PIPELINE MARKER TAPE TO BE PLACED OVER PIPELINE.

(9) BACKFILLING SHALL MAINTAIN THE ORIGINAL COMPACTION AROUND THE RMWB UTILITIES OR AS SPECIFIED BY AN ENGINEER.

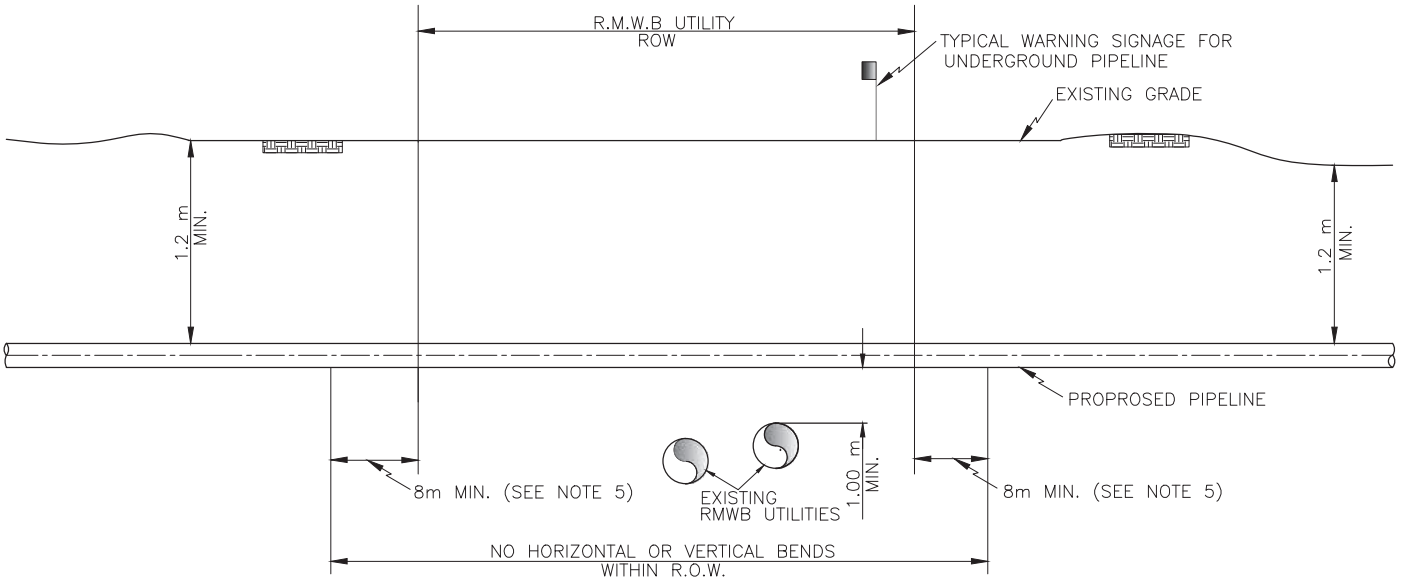
(10) RMWB SHALL BE NOTIFIED FOR A CONSTRUCTION COMPLETION INSPECTION.

(11) AS-BUILT DRAWINGS SHALL BE SUBMITTED UPON COMPLETION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL PIPELINE CROSSING UNDER RMWB SERVICE UTILITIES

STANDARD DETAIL:	2-102
DATE: OCT 2016	REV: 1



SECTION

NOTES:

(1) UTILITY INSTALLATION PERMIT IS REQUIRED PRIOR TO CONSTRUCTION. PLEASE REFER TO UTILITY INSTALLATION AND TRAFFIC CONTROL MANUAL.

(2) CROSSING SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LATEST CSA Z662 OIL & GAS PIPELINE STANDARD AND THE AUTHORITIES HAVING JURISDICTION.

(3) RMWB SHALL BE NOTIFIED AT LEAST 48 HOURS IN ADVANCE OF EXCAVATION FOR PURPOSE OF INSPECTION

(4) MINIMUM CROSSING CLEARANCE FROM EXISTING UTILITIES IS AS FOLLOWS:
VERTICAL: 1.00 m
HORIZONTAL: 3.00 m

(5) PIPELINE SHALL BE CONSTRUCTED STRAIGHT EXTENDED 8.0M FROM BOTH END LIMITS OF ROAD RIGHT-OF-WAY. IF UTILITIES ARE NOT WITHIN A ROAD RIGHT-OF-WAY BUT WITHIN AN EASEMENT, STRAIGHT PIPE SHALL BE EXTENDED 4.0M FROM BOTH END LIMITS OF THE UTILITY RIGHT-OF-WAY.

(6) CROSSING DEFLECTION ANGLE SHALL BE IN THE RANGE BETWEEN 70-110 DEGREES.

(7) PIPELINE MARKER TAPE TO BE PLACED OVER PIPELINE.

(8) BACKFILLING SHALL MAINTAIN THE ORIGINAL COMPACTION AROUND THE RMWB UTILITIES OR AS SPECIFIED BY AN ENGINEER.

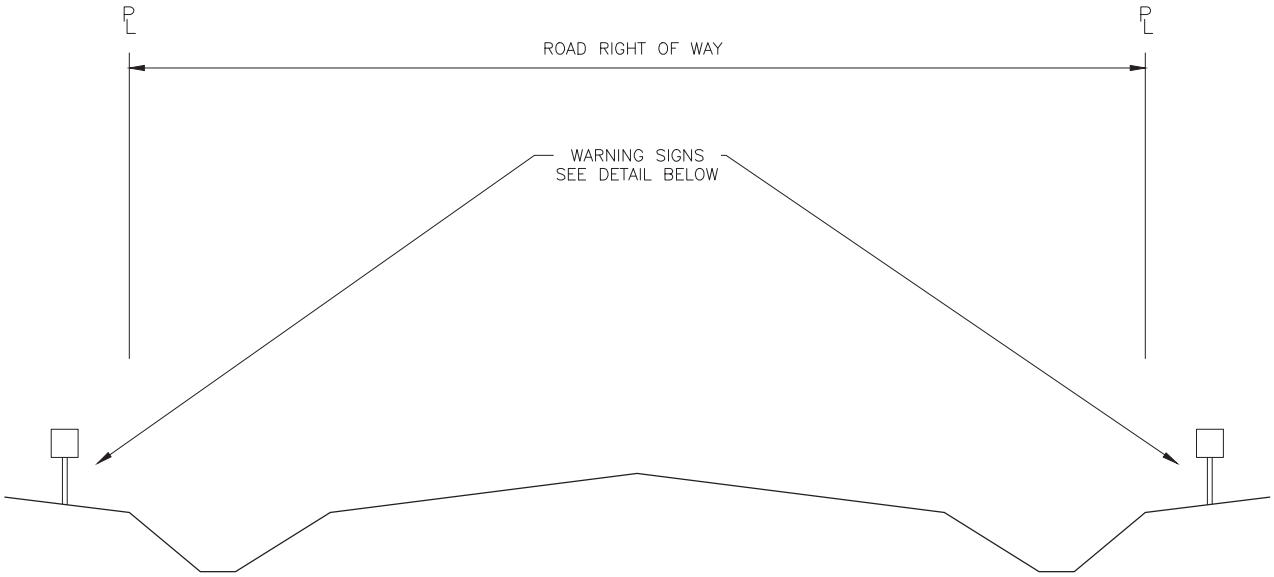
(9) AS-BUILT DRAWINGS SHALL BE SUBMITTED UPON COMPLETION.

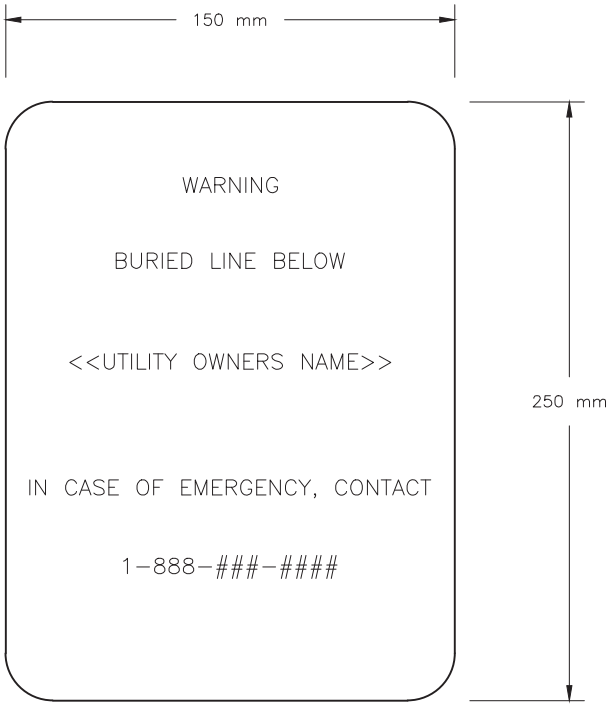
(10) RMWB SHALL BE NOTIFIED FOR A CONSTRUCTION COMPLETION INSPECTION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL PIPELINE CROSSING ABOVE RMWB SERVICE UTILITIES

STANDARD DETAIL:	2-103
DATE: OCT 2016	REV: 0





NOTES:

(1) WARNING SIGN TO BE MOUNTED ON METAL POST IN GROUND.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

UTILITY CROSSING SIGN DETAIL

2.30 REVIEW CHECKLISTS & STANDARD FORMS

2.30.1 General

The Municipality utilizes a checklist form to assist in the evaluation of a Developer's submittal; a copy of which follows.

The form shall not be considered complete. It remains the Developers' responsibility to ensure all aspects of the Engineering Servicing Standards and Development Procedures and other regulations are addressed accordingly.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

Engineering Standards Deviation Form

Deviation Number: _____

Development Project: _____
Capital Project – I/O Number: _____

To: Planning and Development and/or Engineering Manager
9909 Franklin Avenue
Fort McMurray, AB T9H 2K4

TO BE COMPLETED BY APPLICANT

Applicant Name: _____

Company Name: _____

Phone: _____

Email: _____

Mailing Address: _____

_____

_____

Signature: _____ Date: _____

Engineering Servicing Standards Article Number: _____ Page Number: _____

Deviation Request Description: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Revised: 2/6/2021 1

REGIONAL MUNICIPALITY OF WOOD BUFFALO

Engineering Standards Deviation Form

TO BE COMPLETED BY RMWB

Reviewed by:

❑ Development Services ❑ Underground Services ❑ Public Works
❑ Program Management ❑ Transit Services

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):

_____

_____

_____

_____

Manager or Director
of Engineering Signature: _____ Date: _____

Revision Request Process:

1. All deviation requests are to be submitted to the concerned manager's office. The manager will initiate review of the deviation request by concerned departments and inform the applicant of tentative period of approval. Two (2) weeks will be provided to the concerned departments for review.
2. Incomplete submissions (Drawings and Letter of Explanation) of deviation request with insufficient supporting documentation will be returned to the applicant without review. The RMWB shall not be responsible for conducting industry research or conducting other work to support and incomplete deviation request. The onus is on the applicant to provide a complete submission, which fully supports the deviation request.
3. The RMWB will provide ta response within four (4) weeks of receipt. Depending on the nature of the deviation request, the RMWB's response may require additional review time; in such situation, the RMWB will advise the applicant of the extended review period if necessary.
4. Concerned manager with the help of concerned staff will review the deviation requests and advise the director for approval or refusal.
5. If the deviation request is accepted, the applicant will be advised with instructions on how the change may be applied to an ongoing or pending project.
6. If the deviation request is denied, the applicant will be advised by the RMWB reasons for rejection. The applicant may elect to resubmit the deviation request, provided the RMWB's reasons for initial rejection are fully addressed in the subsequent submission.

For more information:
General Inquires: Engineering Department at 780-743-7850

Revised: 2/6/2021 2

REGIONAL MUNICIPALITY OF WOOD BUFFALO

Request for Utility Line Assignment (ULA)

A. REFERENCE FILE

Internal File #:		Revision #:		Date:	
Name of Project:					

B. CONTACT INFORMATON

Company Name:	Company Address:	Position/Role
Contact Name:	Contact Number:	E-mail:

C. SHALLOW UTILITIES

ATCO Electric, Fortis ☐	ATCO Gas ☐	Telus, Bell, Shaw ☐	Others (specify below): ☐ _____

D. PURPOSE OF INSTALLATION

Subdivision ☐	Development ☐	Commercial/ Residential ☐	RMWB PROJECTS:	Capital Project ☐ Facilities ☐ Parks ☐ Public Works ☐
New Installation ☐ Upgrade/Replacement ☐	Relocation ☐ Abandonment ☐	Others ☐ Specifty _____		

E. PROPOSED SCHEDULE OF INSTALLATION

Anticipated Start Date:	Anticipated Completion Date:

F. LOCATION

Urban ☐	Rural ☐	Various Locations ☐	
Township	W ____ Range____ Twp____ Sec____ Quarter Sec____	Plan No.	
Civic Address			
Site/Construction Dwg. Encls.	Yes ☐	No ☐	
Land/Crossing Agreement Necessary	Yes ☐ No ☐	Note: If Yes, contact the Land Administration Department at (780) 743-7006 to comply with Agreement requirements.	

G. INSTALLATION DETAILS (INCLUDE HERE IF NOT ON DRAWINGS)

Depth Zone (Underground)	Less than **0.70m** ☐	**0.70** - 1.50 m ☐	1.50 – 2.0 m ☐	Over 2.0m ☐	TBD ☐

Type of Structure _____ _____ Brief Description: _____ _____ _____ _____	Dimension: Length _____ Width _____ Height _____ Diameter _____ Area _____ Total Length _____ Total Area _____	Method of Installation Directional Bore ☐ Open Cut ☐ Directional Bore & Open Cut ☐ Joint Line/Trench ☐ Aerial ☐ Other Installation Type ☐	Construction Notes: _____ _____ _____ _____ _____ _____ _____

H. IMPACT TO MUNICIPAL INFRASTRUCTURE/ROW

Road ☐	Curb and Gutter ☐	Boulevard ☐	Others ☐
Walkway ☐	Lane/Alley ☐	PUL/URW ☐	Specify
Driveway ☐	Landscaping ☐	Underground Services ☐	_____
			_____

I. MUNICIPAL APPROVAL

APPROVED ☐ REFUSED ☐ ADDITIONAL REQUIREMENTS ☐

Reviewed by: _____ Approved by _____ Date _____

Recommendation, Special Conditions & Comments:

_____

_____

_____

Disclaimer: The municipal approval of the ULA does not constitute the approval of the Design and Construction Drawings. Accordingly, verification on site during installation for any conflict with existing infrastructure, other utilities and to private properties shall be the responsibility of the ULA applicant.

CERTIFICATE OF COMPLIANCE

To be completed and submitted by the Developer with every submission for discussion or approval.

Submitted For:			Date:				
Design Brief:							
Conceptual Planning Review (Conceptual Drawings):							
Final Approval (Detailed Design):							
Project Location and Brief Description:							
The development plans, drawings, specifications, reports and figures are in accordance with the Engineering Servicing Standards, Area Structure Plan and all other applicable standards and regulations. *If no, justification and added benefits for deviating from the standards shall be attached.*			Yes ☐ No ☐				
Developer:				**Engineering/Landscape Consultant:**			
Name:				Name:			
Address:				Address:			
Phone:		Fax:		Phone:		Fax:	
Signature:				Signature:			
Engineer's Seal				Permit to Practice			
Regional Municipality of Wood Buffalo							
Name:			**Review Status** Approved for Development ☐ Revise and Resubmit ☐ Acceptable, proceed to next phase ☐				
Signature:							
Date:							

CONSTRUCTION COMPLETION CERTIFICATE (CCC)
LIST OF DELIVERABLES

	Name of Development:			
	Item	Date	Approved By (initials)	Comments
□	Certificate of Compliance Submitted			
□	Set of Record Drawings as per Section 3 Engineering Drafting & Data Submission Standards			
□	Set of Record Drawings of Franchised Utilities and Street Furniture			
□	Reporting Requirements for Tangible Capital Assets			
□	Lot Service Records with Elevation at end of each Service			
□	Compaction test results for trench backfill and granular road base			
□	Asphalt concrete pavement (ACP) cores (including location map, density and thickness)			
□	Successful water pressure tests, leakage and chlorination / bacterial tests			
□	Concrete Materials Test Results			
□	Weekly and/or Monthly Progress Reports			
□	CCTV videos and reports of underground Sanitary Sewer and Storm sewers			
□	Operation and maintenance manuals, spare parts, and lubricants (as applicable)			
□	CCC Certificate signed and sealed by Developer's Consultant. The Consulting Engineer shall **certify** that all **work had been completed** in accordance with the plans and specifications, the Engineering Servicing Standards and that all work and **deficiencies have been completed**.			
□	Minutes of CCC Inspection			
□	Map (8 ½" x 11") showing boundary of the subdivision or phase.			

CONSTRUCTION COMPLETION CERTIFICATE

To be prepared and executed by the Developer and their Engineering/Landscape Consultant for submission to the Regional Municipality of Wood Buffalo.

Date:							
Brief Project Description:							
Developer:				**Engineering/Landscape Consultant:**			
Name:				Name:			
Address:				Address:			
Phone:		Fax:		Phone:		Fax:	

Final inspection was performed on dd / mm / yyyy all noted deficiencies have been rectified.

I, _____ of _____

Consultants Name *Engineering/Landscape 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 Engineering Servicing Guidelines.

Engineer's Seal and sign	Permit to Practice

Regional Municipality of Wood Buffalo

Based on the above certification, the Regional Municipality of Wood Buffalo accepts that the project is complete and that the warranty period as it effects the Municipality will commence on dd / mm / yyyy .

Name:		Name:	
Signature:		Signature:	
Date:		Date:	

Notes	_____ _____ _____ _____

Note: Applicant to attach a single sheet drawing showing the extent of infrastructure covered by this CCC

Construction Completion Checklist – Deep Utilities

List of essential and non-essential items

All essential items must be completed prior to requesting CCC inspection.
All non-essential items to be completed within 60 days of CCC inspection.

Check box for applicable facility:

Sanitary Sewer	☐	Water Mains & Hydrants	☐
Storm Sewer	☐	Lot Service Connections	☐

Subdivision/Project Name: _____ Phase/Stage: _____

Developer: _____ Project No.: _____

Consulting Engineer: _____ Inspection Date: _____

Essential Documentation

- ☐ Hydrostatic pressure test and flushing for force mains.
- ☐ Hydrostatic pressure test, chlorination, and flushing for water mains.
- ☐ Bacteriological test results.
- ☐ Fire hydrant flow test results.

Essential Field

- ☐ Gravity mains not holding water.
- ☐ All MHs and pipes unobstructed.
- ☐ MH's/CB's clean of debris.
- ☐ No infiltration.
- ☐ Benching complete.
- ☐ Pipe protrusions trimmed & grouted.
- ☐ Safety grates installed.
- ☐ Interior/Exterior drops installed.
- ☐ CB's have correct frame and grate
- ☐ MH's have correct RMWB branded cover.
- ☐ Bottom of frame to first step 600mm or less, grade rings between 100-300mm.
- ☐ Fire hydrant static pressure test.
- ☐ All main and hydrant valves are operable.
- ☐ All hydrants face the street.
- ☐ Final elevation of hydrants 75mm above finished grade.
- ☐ Fire hydrant caps painted as per flow test results.
- ☐ All pressure reducing valves and check valves installed and operable.
- ☐ All service CC's straight and operable, includes painted marker post.
- ☐ Other specify:

  _____
  _____
  _____

Non-Essential Documentation

- ☐ CCTV sanitary & storm mains.
- ☐ Sieve, proctor, compaction results.
- ☐ As-Constructed Record Drawings.
- ☐ TCA & GIS submission
- ☐ Weekly/Monthly Progress Reports (capital works projects)
- ☐ Operation and maintenance manuals (as applicable)

Non-Essential Field

- ☐ Other specify:

  _____
  _____
  _____

Legend:

OK - Indicates all Municipality requirements have been complied with or the utility has been inspected and was installed to Municipality specifications, or that the issues were resolved.
N/A – Not applicable
X - Indicates utility has been inspected and that all non-essential requirements must be resolved withing 60 days from the date of Substantial Completion/Construction Completion inspection.

Name & Sign:

_____

Municipality / Engineering Consultant / Contractor

Construction Completion Checklist – Surface Improvements

List of essential and non-essential items

All essential items must be completed prior to requesting CCC inspection.
All non-essential items to be completed within 60 days of CCC inspection.

Check box for applicable facility:

Concrete Curbs, Gutters & Sidewalks	☐	Gravel Roadways	☐
Asphalt Roadways	☐	Paved Lanes	☐

Subdivision/Project Name: _____ Phase/Stage: _____

Developer: _____ Project No.: _____

Consulting Engineer: _____ Inspection Date: _____

Essential Documentation

☐ None

Essential Field

☐ Sidewalk trip hazards replaced.
☐ Concrete cracks measuring greater than 5mm in width replaced.
☐ Four or more cracks in a single sidewalk panel replaced.
☐ Longitudinal cracks that extend three or more sidewalk panels replaced.
☐ Sidewalk panels with surface spalling greater than 25% of the panel area replaced.
☐ MH's/CB's clean of gravel/asphalt debris.
☐ All main and hydrant valves operable and accessible and have valve rods to proper height (nut 150-300mm from FG).
☐ Valve caps cleaned of debris
☐ Signage & pavement markings installed as per drawings and specifications.
☐ Other specify:

_____
_____
_____

Non-Essential Documentation

☐ Record As-Constructed Drawings
☐ TCA & GIS Submissions
☐ Granular base compaction reports
☐ 28 Day concrete test results
☐ Asphalt marshall and field cores (including location plan, density, thickness, and penalty calculations, if required)

Non-Essential Field

☐ Gutter, sidewalks, and asphalt cleaned.
☐ Backfill to top of curb/sidewalk.
☐ Grade rings grouted.
☐ Move/adjust signage & pavement markings based on field review.
☐ Settlements in concrete causing retention of water greater than 15mm in depth replaced.
☐ Asphalt segregation repaired as per AT spec.
☐ Asphalt ponding (max 6mm variation under a 3m straightedge or taut stringline) repaired.
☐ Other specify:

_____
_____
_____

Legend:

OK - Indicates all Municipality requirements have been complied with or the utility has been inspected and was installed to Municipality specifications, or that the issues were resolved.
N/A – Not applicable
X - Indicates utility has been inspected and that all non-essential requirements must be resolved withing 60 days from the date of Substantial Completion/Construction Completion inspection.

Name & Sign:

_____

Municipality / Engineering Consultant / Contractor

FINAL ACCEPTANCE CERTIFICATE (FAC)
LIST OF DELIVERABLES

	Name of Development:			
	Item	Date	Approved By (initials)	Comments
□	Set of Record Drawings as per the Engineering Drafting & GIS Standards, with any changes from the CCC submission shown			
□	Asphalt test results for Top Lift			
□	CCTV monitoring videos and reports of underground sanitary and storm sewers			
□	FAC Certificate signed and sealed by Developer's Consultant. The Consulting Engineer shall **certify** that all **work had been completed** in accordance with the plans and specifications, the Engineering Servicing Standards and that all work and **deficiencies have been completed**.			
□	Minutes of FAC Inspection			
□	Map (8 ½" x 11") showing boundary of the subdivision or phase.			

FINAL ACCEPTANCE CERTIFICATE

To be prepared and executed by the Developer and their Engineering/Landscape Consultant for submission to the Regional Municipality of Wood Buffalo.

Date:					
Brief Project Description:					
Developer:			**Engineering/Landscape Consultant:**		
Name:			Name:		
Address:			Address:		
Phone:		Fax:	Phone:		Fax:

Deficiency inspection was performed on dd / mm / yyyy all noted deficiencies have been rectified.

I _____ of _____

, _____ *Consultants Name* *Engineering/Landscape 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 Engineering Servicing Standards and that all deficiencies have been rectified to the Municipality's satisfaction.

Engineer's Seal and sign	Permit to Practice

Regional Municipality of Wood Buffalo

Based on the above certification, the Regional Municipality of Wood Buffalo accepts that the Warranty Period has expired effective dd / mm / yyyy and that the Municipality assumes responsibility for the development as it concerns the Municipality

Name:		Name:	
Signature:		Signature:	
Date:		Date:	

Notes	_____ _____ _____ _____

Note: Applicant to attach a single sheet drawing showing the extent of infrastructure covered by this FAC.

Final Acceptance Checklist – Deep Utilities
List of essential and non-essential items
All items must be completed prior to requesting FAC inspection.

Check box for applicable facility:

Sanitary Sewer	☐	Water Mains & Hydrants	☐
Storm Sewer	☐	Lot Service Connections	☐

Subdivision/Project Name: _____ Phase/Stage: _____

Developer: _____ Project No.: _____

Consulting Engineer: _____ Inspection Date: _____

Essential Documentation

☐ FAC CCTV sanitary & storm mains

Essential Field

☐ Gravity mains not holding water.
☐ All MH's and pipes unobstructed.
☐ MH's/CB's clean of debris
☐ No infiltration.
☐ Repair broken barrels/grade rings.
☐ All main and hydrant valves are operable.
☐ All pressure reducing valves and check valves are operable.
☐ All service CC's straight and operable, includes painted marker post (undeveloped lots only, removed from finished landscape).
☐ Fire hydrant static pressure test.
☐ Hydrant flange to grade (75mm above FG).
☐ Fire hydrant caps re-painted (if required)
☐ Other specify:

_____
_____
_____

Non-Essential Documentation

☐ Not Applicable

Non-Essential Field

☐ Not Applicable

Legend:
OK - Indicates all Municipality requirements have been complied with or the utility has been inspected and was installed to Municipality specifications, or that the deficiencies were resolved.
N/A – Not applicable
X - Indicates utility has been inspected and there are deficiencies that must be resolved and re-inspected.

Name & Sign:

_____
Municipality / Engineering Consultant / Contractor

Final Acceptance Checklist – Surface Improvements

List of essential and non-essential items

All items must be completed prior to requesting FAC inspection.

Check box for applicable facility:

Concrete Curbs, Gutters & Sidewalks	☐	Gravel Roadways	☐
Asphalt Roadways	☐	Paved Lanes	☐

Subdivision/Project Name: _____ Phase/Stage: _____

Developer: _____ Project No.: _____

Consulting Engineer: _____ Inspection Date: _____

Essential Documentation

☐ Top lift asphalt marshall and field cores (including location plan, density, and thickness)

Essential Field

☐ Sidewalk trip hazards replaced.
☐ Concrete cracks measuring greater than 2mm in width replaced.
☐ Three or more cracks in a single sidewalk panel replaced.
☐ Longitudinal cracks that extend two or more sidewalk panels replaced.
☐ Sidewalk panels with surface spalling greater than 10% of the panel area replaced.
☐ Settlements in concrete causing retention of water greater than 15mm in depth replaced.
☐ Gutter, sidewalks, and asphalt clean.
☐ MH's/CB's benching clean of gravel/asphalt debris.
☐ Grade rings grouted.
☐ All main and hydrant valves operable and accessible and have valve rods to proper height (nut 150-300mm from FG).
☐ Valve caps cleaned of debris.
☐ Damaged or missing signs & pavement markings replaced.
☐ Asphalt segregation repaired.
☐ Minor asphalt cracks (2-25mm) repaired (rout, clean, and seal).
☐ Major Asphalt cracks (greater than 25mm) full depth base repaired. (Rout, clean and seal for Mill & Overlay only)
☐ Asphalt ponding (max 6mm variation under a 3m straightedge or taut stringline) repaired.
☐ Other specify:

_____
_____
_____

Non-Essential Documentation

☐ Not Applicable

Non-Essential Field

☐ Obvious snowplow damage to concrete.

Legend:

OK - Indicates all Municipality requirements have been complied with or the item has been inspected and was installed to Municipality specifications, or that the deficiencies were resolved.
N/A – Not applicable
X - Indicates item has been inspected and there is a deficiency that must be resolved and reinspected prior to FAC.

Name & Sign:

_____

Municipality / Engineering Consultant / Contractor

REVIEW CHECKLIST FORM					
Developer:				File #:	
Company:					
Representative:					
Address:					
Phone:		Fax:		Email:	
General Project Description:					
Location:					
Urban Location:	□		Rural Location:	□	
Engineer's Seal					

Development Brief Submission

Date of Submission: / /

Item	Acceptable	Revise & Resubmit	Review By (initials)	Date	Review Comments
Overall Layout and Site Plans Submitted					
Conforms to Municipal Development Plan					
Conforms to Land Use By-Law					
Conforms to the Water Master Plan					
Conforms to the Sanitary Sewer Master Plan					
Conforms to the Storm Drainage Master Plan					
Conforms to the Transit Master Plan					
Conforms to Transportation Master Plans					
Conforms to Area Structure / Redevelopment Plan					
Other					

ENGINEERING DESIGN BRIEF AND CONCEPTUAL PLAN SUBMISSION

Date of Submission: / /

Item	Acceptable	Revise & Resubmit	Review By (initials)	Date	Review Comments
Conceptual Drawings Submitted					
Certificate of Compliance Submitted					
Professional Stamp & Permit to Practice					
Deviations from Standards (Application)					
Deviations from Standards (Approval)					
Supporting Design Calculations					
Geotechnical Report					
Traffic Impact Assessment					
Conceptual Transportation Plans					
Water Network Analysis					
Sanitary Sewer Analysis					
Stormwater Management Plan					
Environmental Impact Assessment					
Parks and FireSmart Review as required					
Easement and Crossing Agreement(s) as required					
Preliminary Clearing and Grading Plans					
Other					

DETAILED DESIGN SUBMISSION

Date of Submission: / /

Item	Acceptable	Revise & Resubmit	Review By (initials)	Date	Review Comments
Certificate of Compliance Submitted					
Professional Stamp & Permit to Practice					
Detailed Design Drawings Submitted					
• Plan / Profile Drawings					
• Stormwater Management Plans					
• Offsite Infrastructure					
Design Specifications Submitted					
Geotechnical Report Submitted					
Deviations from Standards (Application)					
Deviations from Standards (Approval)					
Detailed Clearing and Grading Plans					
Building Grade Plans					
Approved Franchised Utility Design					
Driveway Location and Street Furniture					
Approval from AESRD and Others					
Mechanical Plants (As required)					
Conforms to Parks Standards					
Project Schedule Included					
Agreements with Utility Franchises Complete					
Other					

3 Engineering Drafting & Data Submission Standards

3.1 INTRODUCTION

3.1.1 Purpose

These Drafting Standards were established to facilitate accurate drawings with a consistent electronic format for all engineering work compiled for the Regional Municipality of Wood Buffalo (henceforth RMWB).

1. All drawings are to be produced by computer, not manually, using the program “AutoCAD”.
2. This manual does not cover all possible conditions but is meant to be used as a guide in the development of engineering drawings.

3.1.2 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 see our website at: https://acaprod.rmwb.ca/citizenaccessprod/Default.aspx

3.2 CADD PRACTICE OVERVIEW

3.2.1 Drafting Standards

The Regional Municipality of Wood Buffalo Engineering Drafting and Data Submission Standards is to be used in the preparation of all design and construction record plans. These standards shall always be followed unless approved by the Engineering Department. Users are required to keep up to date with changes by checking for amendments posted on the website.

3.2.2 National CAD Standards (NCS)

The RWMB Drafting Standards refers to the United States National CAD Standards, latest edition. Copy of which can be found here: https://www.nationalcadstandard.org/ncs6/index.php

3.2.3 Branding Standards

There are Branding Standards in place to specify how the RMWB logo is to be used and scaled. Refer to these standards before using the logo.

https://www.rmwb.ca/en/mayor-council-and-administration/logos.aspx

3.3 DRAWING SET UP

3.3.1 Drawing Templates

The Municipality template drawings are available from the Engineering Department for the creation of design drawings. These drawings contain standard layer definitions and paper space layout definitions with standard title blocks, text styles and dimension styles.

Completed Drawings must adhere to the following composition standard:

1. Plans are to be drawn at 1:1 scale in Model Space, with text, symbols, hatch patterns and line widths adjusted by scale factor required.
2. Title Block sheets must always be inserted as a block in a Layout (Paper Space) at 0,0,0 with scale factor of 1 and rotation angle of 0. Title block info that will change from one drawing to the next should be inserted separately.
3. Model Space graphics must appear in the layout in correctly scaled VIEWPORTS.
4. Only one (1) title block per layout.
5. Title block is not to be exploded.
6. Only one (1) layout per .dwg file.

3.3.2 Base Plan Drawings (External References)

Base Plans from the Municipality include “as-built” utilities, legal, surface details and other data obtained from outside sources. These base plans are used for several drawings and continually updated; therefore, any information obtained from the Municipality to be used for “existing” information shall be externally referenced. When submitting drawings to the Municipality, all external references shall be bound to the drawing using the e-transmit command.

An Electronic Release Form is required for all data that is sent out of the Municipal office in digital format. The form **must** be signed before any digital base plans are distributed to the public. The request form can be obtained at: https://www.rmwb.ca/en/permits-and-development/engineering-servicing-standards.aspx

Any aerial photography used as background information shall be placed on a separate layer.

3.3.3 Coordinate Systems and Survey Standards

Digital data and drawings submitted to the RMWB will be in NAD83 UTM Zone 12N, grid coordinates. AutoCAD must contain projection/coordinate system descriptions as a note.

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.

3.3.4 Drawing Set Layout Standards

3.3.4.1 General Format

All engineering and landscape drawings that are submitted to the RMWB for approval should follow the basic format described herein.

ANSI D or 610mm x 915mm (22 x 34) plan size shall be used. Other sizes to be approved as required by the Municipality.

Digital formats for submissions are PDFs and .dwg files in the current approved version of AutoCAD (refer to the RMWB website) Any PDF submissions should have the stamp and signature of a Professional Engineer of Alberta.

Title blocks shall contain the information noted below:

- The Regional Municipality of Wood Buffalo Logo.
- Project Name or Name of Development.
- Description of Drawing.
- Legal Description.
- Name of the Consultant.
- Consultants Permit to Practice Stamp.
- Engineers Stamp.
- Identification of Draftsperson and Designer.
- List of Revisions.
- Legend.
- Scales.
- Dates.
- Drawing Numbers.
- Plan Specific Notes

Each page shall have a legend with symbols pertaining to that drawing. Also include a North Arrow within the legend in the upper right-hand corner of the page

Unless otherwise approved the scale of drawings shall be:

• overall plans		1:1000
• plan/profiles	horizontal	1:500
	vertical	1:50
• lot grading plan		1:500 or 1:750

(A Vertical Scale of 1:25 can be used in cases where the Vertical Exaggeration is needed for Clarity)

• cross sections	horizontal	1:100
	vertical	1:50
• overall system network analysis		1:5000
• landscape plans		1:200
• details		1:100

It is preferred that continuous chainage be used wherever possible. Generally, drawings shall be orientated such that north arrows point to the top or left-hand side of a page. Lettering read from the bottom or right-hand side of the sheet.

Elevations shall be relative to the geodetic datum. Benchmark numbers, location and elevations used shall be shown on design drawings.

Allow a minimum of 75 mm binding edge along the left side. Nothing shall be drawn in this area.

The plan portion of a drawing shall not extend into the profile section and vice versa.

Points of drawing technique that are significant to the preparation of drawings are as follows:

- Letters and figures shall be clearly legible, well spaced, properly formed and proportioned.
- Lines shall be uniform in weight and density.
- Proposed and existing features shall be readily distinguishable.
- Dimensioning is to be clearly legible and should be placed that it will not be misinterpreted. Dimensions should be given from an iron pin, lot line, chainage station, a centreline, and face of curb or other approved reference that can be readily established. All dimensions shall be in SI (System International) units.

3.3.5 Units

1. All drawings shall be metric. Units will be set to meters (Architectural drawings to millimeters) to azimuth system with 0° north pointed to 12 o'clock. Degrees will be in decimal degrees and measured clockwise. Drawing scales and dimensions shall be shown on all drawings.
2. All elevations shown on drawings shall be metric geodetic datum. The source and location of the datum used shall be clearly noted on each drawing they appear on.
3. Lettering should be uppercase inclined for proposed work and uppercase vertical for existing infrastructure. Lettering shall be unobstructed by linework and other drawing information. Conflicts between linework, symbols, dimensioning or text shall be removed.
4. Numerical values shown on the drawings shall be shown to three decimal places for proposed work and two decimal places for existing work.
5. All objects colour and line type properties should be set to by-layer.

3.3.6 Notes

1. Construction notes shall be boxed and located around the perimeter of the drawing, tagged to the drawing feature, in sufficient detail to facilitate construction.
2. The following notes shall be shown on either the index plan or the first drawing of the set:
    - *"All work and materials are as described in the Regional Municipality of Wood Buffalo 'Engineering Servicing Standards and Development Procedures' and the 'Standard Construction Specifications' or as otherwise approved by the Manager of Development Services in the Engineering Department."*
    - *"Connection to, or alteration of, existing Municipal-owned utilities, requires authorization by the Manager of Development Services in the Engineering Department."*
3. Standard details such as manholes, catch basins, hydrants, etc., that are shown and described in the Municipal Standard Drawings need not be shown in detail on the drawings; the Standard Drawing No. shall be quoted on the plan for reference.

3.3.7 Drawing Sheet Numbering

3.3.7.1 Set Content and Order

The organization of a set of drawings is influenced by many factors, including project size, complexity, regulatory and client requirements, and the type and number of contracts.

The RMWB follows the Uniform Drawing System (UDS) from the National CAD Standard for drawing set organization. The UDS establishes standardized guidelines for organizing drawing sets to accommodate these influences. The basic method for organizing drawing sets is based on use by the traditional architectural/engineering disciplines. UDS establishes consistency using standard sheet types that are common to all disciplines.

Sheet types are classified as General, Plans, Elevations, Sections, Large-Scale Views, Details, Schedules, and Diagrams, User Defined and 3D Representations. These classifications create consistency and facilitate use of a drawing set.

A numerical sheet type designator is assigned to each sheet type classification.

The organization of a drawing set should support the requirements and facilitate the production efforts of the design and construction team. The organization system must be flexible and adaptive to the influences of project size and complexity, including delivery requirements.

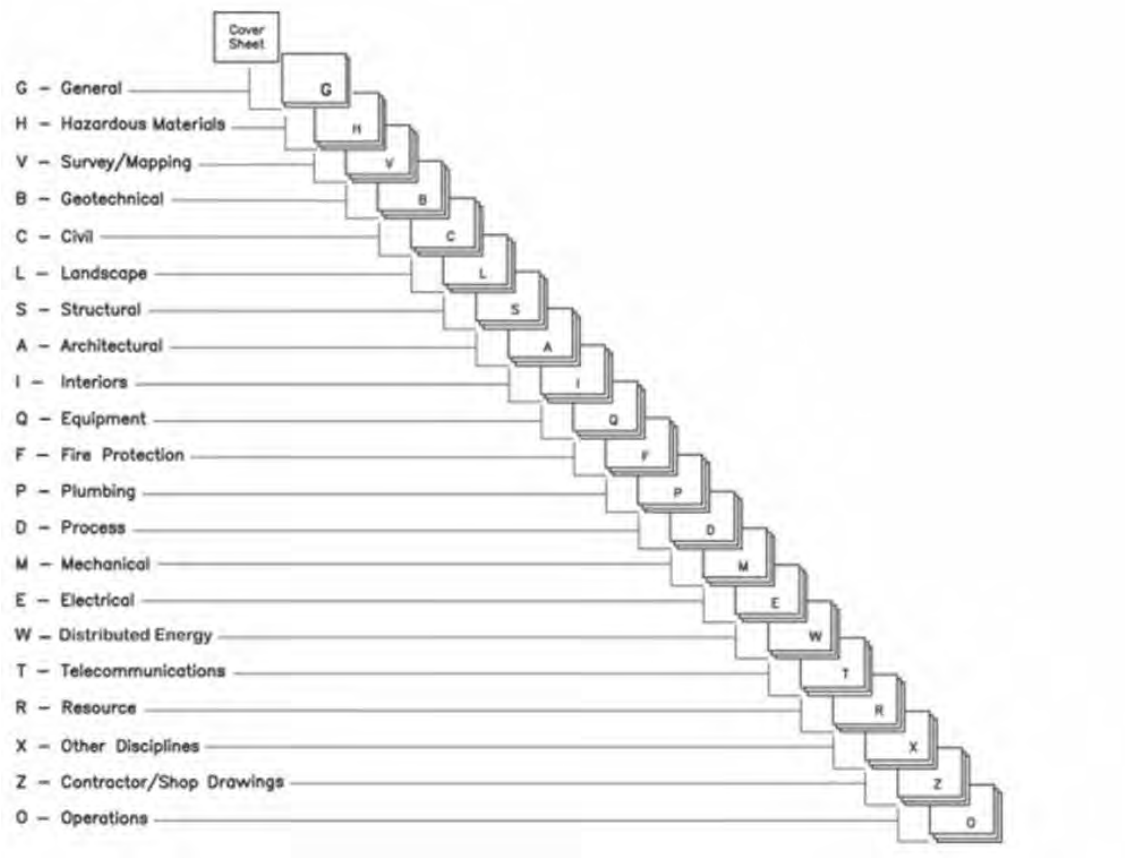
- Create subsets of the total plan set by segregating the information by disciplines.
- Place the subsets in a logical order to fit the sequence of construction.
- Place each type of drawing in a subset in order from general to specific information.

A drawing set for a project, or a facility, must also provide for the inclusion of each of the various types of construction drawings, as follows:

- Procurement Drawings: Drawings issued for bidding or negotiating before signing of an agreement.
- Contract Drawings: Drawings that describe the work of the project.
- Resource Drawings: Drawings that show existing conditions, or new construction related to the work, but are not included in the contract.
- Addenda and Modification Drawings: Collectively known as Supplemental Drawings.

Although the initial purpose of construction drawings is to build or modify a facility, portions of a drawing set can be reused for facility management or for future projects. Logical set organization and sheet identification procedures facilitate retrieval and use of this information.

Following the cover sheet, sheets should be organized into subsets in the order illustrated below. Please note that not all subsets will apply to every project, or more specific additional categories may be required depending on the size, scope, and complexity of the project.



3.3.7.2 Sheet Identification

The sheet identification format is based on the National CAD Standards Level 1. It is consistent, yet flexible enough for a wide range of project scopes. The UDS sheet identification format depicted here includes the following components:

- the discipline designator, consisting of one alphabetical character and a hyphen or two alphabetical characters.
- the sheet type designator, consisting of one numerical character.
- the sheet sequence number, consisting of two numerical characters.

The one- or two-character discipline designator identifies the sheet as a member of a subset. A sheet type designator that identifies the type of information on the sheet is followed by the sheet sequence number.

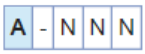
3.3.7.3 Discipline Designator

The first component of the sheet identification format, the discipline designator, is based on the traditional system of alphabetical discipline designators, using a single alphabetical character with a hyphen (Level 1) or two alphabetical characters (Level 2).

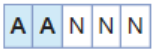
The discipline designator denotes the category of subject matter contained in the file or on the layer designated. A dash always follows the Level 1 discipline designator; a dash is not used when the Level 2 discipline designator is used.

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

Discipline Designator Name Format



Level 1 Discipline Designator



Level 2 Discipline Designator



Discipline Character



Modifier Character

***A** = alphabetical character*
***N** = numerical character*

Designator		Description of Suggested Names	Content
Level 1	Level 2		
T	**-**	**Telecommunications**	
-	**TA**	Audio Visual	Cable, music, and closed-circuit television (CCTV) sytems
-	**TC**	Clock and Program	Time generators and bell program systems
-	**TI**	Intercom	Intercom and public address systems
-	**TM**	Monitoring	Monitoring and alarm systems
-	**TN**	Data Networks	Network cabling and equipment
-	**TT**	Telephone	Telephone systems, wiring, and equipment
-	**TY**	Security	Access control and alarm systems
-	**TJ**	User Defined	
-	**TK**	User Defined	

3.3.7.4 Sheet Type Designator

The sheet type designator is a single numerical character that identifies the sheet type. All sheet types may apply to all discipline designators. It is not necessary to use all the sheet types for a project or within a discipline.

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 profile drawings on sanitary sewer or road plan sheets
- Place same scale sections on the same sheet as large-scale plans of stairs or escalators
- Place schedules on a plan sheet when the information is closely associated.
- Combine different types of drawings on the same sheet on small projects.

SHEET TYPE DESIGNATORS	
0	**General** (symbols legend, notes, etc.)
1	**Plans** (horizontal views and combination Plan & Profile)
2	**Elevations and Profiles** (vertical views)
3	**Sections** (sectional views, wall sections)
4	**Large-Scale Views** (Scaled up reproductions of plans, elevations, Δ or sections that are not details)
5	**Details**
6	**Schedules and Diagrams**
7	**User Defined** (for types that do not fall in other categories, including typical detail sheets)
8	**User Defined** (for types that do not fall in other categories)
9	**3D Representations** (isometrics, perspectives, photographs)

Sheet Type Name Format

A	A	**N**	N	N

Sheet Type Designator

***A** = alphabetical character*
***N** = numerical character*

3.3.7.5 Sheet Sequence Number

The sheet sequence number is a two-digit number that identifies each sheet in a series of the same discipline and sheet type.

Sequence numbering starts with 01; sheet number 00 is not permitted. The first sheet of each series is numbered 01, followed by 02 through 99. Sequence numbers need not be sequential, to permit future insertion of sheets during design. While many projects may not require more than a single digit, standardization of a two-digit sequence number allows for efficient electronic file sorting and facility management databases. On plan sheets, it may be desirable to replicate the floor name within each discipline. This makes sheets A-102, M-102, and E-102 the second-floor plan for each of the various disciplines.

Additional drawings inserted in a set of drawings after a sheet identification organization has already been established can be identified with a suffix. This suffix may be comprised of three user-defined designators.

Sheet Sequence Name Format

A	A	N	**N**	**N**

Sheet Sequence Number

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

User-Defined Designators

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

A-102-R1 for a partially revised floor plan.

A	-	1	0	2	-	**X**	**1**

A-102-X1 for a totally revised floor plan.

A	-	1	0	2	-	**A**	**1**

A-102-A1 for Phase 1 of a sequenced construction floor plan.

***A** = alphabetical character*
***N** = numerical character*
***U** = user-defined character*

3.3.8 General Drawing Requirements

The Design drawings shall show all existing and proposed information. It shall be the Engineering Consultant's responsibility to coordinate with the utility companies to establish the location of their existing and proposed services.

Drawings which are needed will vary from project to project. If a project area is too large to fit on one drawing it may be divided into two. Every drawing set shall include a cover sheet. Legends can be provided on one sheet after the over page or be shown as needed on any drawings which utilize symbols. If shown on each sheet throughout the set, only the symbols which appear on a particular drawing should be shown in the legend.

There are three templates to be used. The Cover Sheet Template, Template A for plan view, and Template B for profiles. Templates should be populated with information and named as shown below. All construction projects are to have sediment and control plans prepared by the Contractor.

For all capital works projects the drawings shall include the project number or contract number (QU-xxxx / RFP-2021-xx) assigned by the RMWB and follow sheet numbering conventions as set out in Section 3.4.4.

The drawings shall be neat and legible with adequate clearance margins between the drawing information and the title block border. Limits of construction and match lines shall be clearly marked on the drawing.

All sheet borders shall be in millimetres (mm) and plotted at 1:1.

All drawings submitted to the RMWB should conform to the following:

3.3.8.1 Cover Sheet(s)

a. The Regional Municipality of Wood Buffalo Logo
b. Name of development or project name for capital works projects
c. Stage/Phase of Development
d. Nature of the drawings
e. Names of Developer and Consulting Engineer / Landscape Architect (logos optional)
f. Date
g. QU Number or RFP Number (if applicable)
h. Consultant Project Number
i. Key Plan a simple Overall Location of the project within the Municipality (This may be contained on the Location plan, depending on the size of the project and Individual Preference)

2. List of Drawings Plan (G-00x)
    a. Sheet List Table
3. Legend Plan (G-00x)
    a. General Notes, Legend and Abbreviations
4. Index Plan (G-00x)
    a. The index plan shall be a copy of the legal plan indicating that portion of a street relating to a particular plan/profile sheet
    b. A location plan showing the development as it relates to the surrounding lands and its orientation shall be provided.
    c. Street names to be shown
    d. Phase/Stage boundary

3.3.8.2 Plan View Drawings (Template A)

1. Tentative Legal Plan with Easement (C-1xx)
    a. Property line work
    b. Lot and block numbers
    c. Lot dimensions
    d. Right-of-Way widths dimensioned
    e. Easement line work
    f. Easement dimension (and/or note of typical width)
    g. Roadway names
2. Clearing, Stripping and Grading (CSG) Drawing(s) (C-1xx)
    a. Identify the owners of all lands adjacent to or within the clearing, stripping and/or grading area
    b. Identify intended CSG 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
    c. Provide cross-sections, along adjacent lands, minimally at 200 m intervals and specifically where proposed ground and existing ground exceeds 300 mm difference in elevation change
    d. Provide cross-sections for temporary drainage swales showing basic dimension, longitudinal grades, and side slopes
    e. Show Phase boundaries; indicate the area expected to be developed during the current year and the type of soil stabilization proposed for areas to be developed in following years
    f. Any unusual site conditions (wells, structures, etc.) or contamination areas
    g. Existing utility rights of way (easements)
    h. Existing survey control stations and markers
    i. Existing ground contours
    j. Proposed ground contours
    k. Test hole locations and original ground elevations at test hole locations
    l. Identify natural features that are to be preserved and/or removed
    m. Detail of topsoil stockpiles; include height, width, length, and volume

n. Location of all existing utilities (e.g. water, sanitary sewers, storm sewers, gas, electrical, pipelines, etc.)

o. The means by which all storm water in and from the subject lands will be controlled and disposed of, including:

   i. How will the drainage from its natural route(s) be controlled?

   ii. What erosion and sediment control measures are to be installed?

3. Roads, Lanes and Walkway Drawing (C-1xx)

   a. Street and/or Lane Name (e.g. Lane “A”)

   b. Carriageway widths (FOC to FOC)

   c. Sidewalk and/or appropriate curb and gutter type and width

   d. Boulevard widths

   e. Roadway V.P.I. elevations

   f. Roadway centre line length and grade between V.P.I.’s

   g. Direction of flow along roadways

   h. Vertical curve information (length and mid-ordinate difference in elevation)

   i. Centreline curve radii. Table format is acceptable

   j. Lane and Public Utility Lot V.P.I. elevations

   k. Land and Public Utility Lot distance and centre line grade between V.P.I.’s

   l. Direction of flow along lanes and utility lots

   m. Drainage swales (concrete, grass, etc.) including grades

   n. Catch-basin manholes and catch-basins

   o. Erosion and sedimentation control measures

   p. Reinforced lane and/or driveway crossings

   q. Curb ramps

   r. Temporary access roads and/or turnarounds including grades and drainage flow direction information

   s. Location of any storm water facility’s including normal water level and high-water level elevations

   t. Walkways, including bollard locations

   u. Safety barriers and railings

   v. Cross-sections for all roadway designations

w. Community mailboxes

x. Enhanced amenities (e.g. subdivision entry feature, sound wall, etc.)

y. Transit stops

4. Traffic Control Devices and Signage Drawing (C-1xx)

    a. Show existing and proposed sidewalks including curb ramps, roadway medians. For this drawing, this information is to be shown in a lighter tone than the proposed markings

    b. Show existing trail and pathways on-site (not part of project) and/or 30 m beyond the Phase boundary at the proposed connection point(s). For this drawing, this information is to be shown in a lighter tone than the proposed markings

    c. Pavement markings including parking stalls, bike lanes, arrows, etc., as applicable to the project

    d. Bus routing and bus stop signs

    e. Traffic control signs

    f. Street name identification signs

    g. Decorative street name markers

    h. Detention pond warnings signs

5. Overall Utilities Drawing (C-1xx)

    a. Water main and trunks including hydrant and valves. No text or identifiers required. Alignments to be dimensioned

    b. Sanitary main and trunks including manholes. No text or identifiers required. Alignments to be dimensioned

    c. Storm main and trunks including manholes, catch-basin manholes, catch-basins, treatment units, outfalls, inlets, etc. No text or identifiers required. Alignments to be dimensioned

    d. Shallow utilities including duct crossings. No text or identifiers required

    e. Easements. No text or identifiers required

    f. Sidewalks, trails, curb lines, curb ramps, medians, community mailboxes, transit stops, and enhanced feature (structure). No text or identifiers required

    g. Stationing for road, land and/or utility lot centre lines

6. Water Distribution Drawing (C-1xx)
    a. Invert elevation at all V.P.I.'s
    b. Distance, pipe size, pipe material, and grade between V.P.I.'s
    c. Main alignments
    d. Hydrants and hydrant identification numbers
    e. Valves and valve identification numbers
    f. Fittings
    g. Insulated sections of mains, if applicable
    h. Stationing for road, land and/or utility lot centre lines
7. Water Distribution Disinfection and Flushing Drawing (C-1xx)
    a. Show lot and block numbers for all lots
    b. Show hydrants and hydrant identification numbers
    c. Show valves and valve identification numbers
    d. Show receiving sewer manholes and manhole identification numbers
    e. Show proposed sequence of flushing, including valve opening and closing sequence
8. Sanitary Sewer Drawing (C-1xx)
    a. Invert elevations at all manholes
    b. Rim to lowest invert depths
    c. Distance, pipe size, pipe material and grade between manholes
    d. Insulated sections of mains, as applicable
    e. Main alignments
    f. Direction of pipe flow
    g. Manholes and manhole identification numbers
    h. Identify drop manholes (interior/exterior)
    i. Identify manholes requiring safety platforms, as applicable
    j. Sanitary calculation worksheet
    k. Stationing for road, land and/or utility lot centre lines

9. Storm Sewer Drawing ‘A’ – Major/Minor System (C-1xx)

This drawing is to show the catchment area and sub-catchment areas that affect the immediate development phase. The drawing is to minimally include the information noted below:

a. Major drainage routes
b. Location of trapped lows including accurate extents of water ponding area and ponding depth
c. Minor drainage catchment areas
d. Minor drainage main alignments
e. Direction of minor drainage pipe flow
f. An area, volume, and discharge table for a storm water management facility, if applicable
g. Natural overland drainage routes

10. Storm Sewer Drawing ‘B’ – Minor System (C-1xx)

a. Invert elevations at all manholes
b. Rim to lowest invert depths (MH depth)
c. Distance, pipe size, pipe material (general note acceptable) and grade between manholes
d. Insulated sections of mains, as applicable
e. Main alignments
f. Direction of pipe flow
g. Manholes, catch-basin manholes, and manhole identification numbers
h. Identify manholes requiring safety platforms, as applicable
i. Catch-basin type and identification numbers
j. Catch-basin leads
k. Storm Water Management Facility (SWMF), including contours and utility infrastructure (e.g. pipes, outlets, treatment units, etc.) and if any enhancement features are proposed (e.g. water fountain, dock for a wet pond or sports field for a dry pond), etc.
l. SWMF normal and high-water level, overflow route, free board elevation, etc.
m. Access road to SWMF
n. Erosion and sedimentation control measures
o. Storm water calculation spreadsheets

a. Stationing for road, land and/or utility lot centre lines

11. Shallow Utilities Drawing / Electrical Plan (C-1xx)
    a. Electrical Plan Drawing (Shallow Utility base plan)
        i. Property lines, block numbers, lot numbers, and street names
        ii. Duct lines
        iii. Power, telephone, cable television and gas alignments
        iv. URD pull boxes, pedestals, transformers, street lighting., etc.
        v. Power supply and lighting for trails and enhanced landscaping features etc., where the Developer has indicated such
        vi. Proposed utility right of ways (easements) to accommodate all shallow utilities, as applicable
12. Lot Grading Drawing (C-1xx)

Drawn at scale of 1:500 or 1:750 to better illustrate of all the following information:

a. Legal description (lot and block number) for each parcel of land
b. Civic (municipal) address
c. Elevations at front lot corners
d. Elevations at rear lot corners
e. Intermediate side yard elevations along property lines
f. Service locations and invert elevations
g. Insulated services, as applicable
h. Recommended lowest top of footing elevation
i. Indicate lot drainage type for residential lot (e.g. A1, B, C, D, W)
j. Show proposed lot drainage for multi-family, commercial or industrial sites with elevations, distances, and grades
k. Show proposed drainage for green spaces (i.e. municipal reserves, berms, public utility lot, park areas, etc.) specifically elevations that determine drainage patterns and courses (e.g. swale along a linear park, raised area in park for sports field, etc.) See Landscaping Drawing, below, for further information
l. Location of power, telephone, and television services
m. Location of hydrants, streetlights, transformers, switch gear cubicles, URD's telephone pedestals and cable television pedestals
n. Location of community mailboxes

o. Location of any no parking zones

p. Show lots with proposed restrictive covenants

13. Landscape Drawing (L-1xx)

a. Existing and proposed contours at 0.5m intervals within the site and extending 3 meters beyond, as well as all other grading detail.

b. Site boundaries.

c. Temporary site access, laydown areas, parking.

d. Stockpile locations.

e. All existing and proposed utility information.

f. Existing vegetation and/or other natural features to remain.

g. Existing trees to be relocated.

h. Proposed plant material illustrated at 2/3 the mature spread or diameter, as noted in the Alberta Horticulture Guide, current edition.

i. Plant schedules, including overall quantities. (may be added in details section also)

j. Areas to be sodded and seeded with seed mix specified.

k. Type and depth of mulch for shrub beds and tree wells.

l. Location of proposed site furnishings and related construction.

m. Areas of concrete, asphalt or special paving.

n. Irrigation systems where applicable.

o. Fencing locations and construction details. (may be added in details section also)

p. Locations of bollards along PUL walks or trails.

q. Streetlights and park lighting where applicable.

r. Trail locations, signage, and proposed drainage.

s. Adjacent land use information.

t. Total measurements (square meters) of shrubs beds, flowerbeds, islands, buffers, PUL's, MR's and parks).

u. Total measurements (square meters) of sodded and seeded areas.

3.3.8.3 Plan Profile Drawing Requirements (Template B) (C-2xx)

1. General

   Generally, all underground services and surface improvement profiles are shown on the same drawings. The plan portion of the drawing will be positioned at the top and the profile portion at the bottom. If the plans have too much information on them to be easily legible plans may be separated into road and servicing sets.

   As much information is to be shown on the profile plans as possible. If the plans are deemed illegible or over-crowded the Engineering Department may ask for the plans to be separated. For simple plans the road, sewer, and shallow utility information may go on the same drawing. For more complicated drawings road drawings may be shown on one drawing while sewer and utilities are shown on another. Also, in some instances it may be more appropriate to break out the surface improvements and underground utilities into two separate top plan views above the profile view.

   Information shown on plan profiles shall include, but not be limited to, the following information.

2. Top Plan View – Surface Improvements

   The following information related to surface improvements should be illustrated in the top plan view:

   a. Street and/or lane name (e.g. Lane “A”)
   b. Carriageway widths (face of curb to face of curb)
   c. Sidewalk and/or curb and gutter type and width
   d. Boulevard widths
   e. Roadway V.P.I. and H.P.I. elevations

3. Top Plan View – Underground Utilities

   a. Property lines
   b. Main sizes, lengths, and identification
   c. Hydrant locations and identification numbers
   d. Hydrant flange elevation
   e. Valve locations and identification numbers
   f. Fitting sizes and locations
   g. Manhole and catch basin locations and identification numbers
   h. Catch basin lead sizes, lengths, and alignment
   i. Direction of flow (storm and sanitary mains)

j. Insulation, as applicable

4. Profile View

The profile view should be shown on the bottom half of the drawing and illustrate the following road and utility information:

a. Stationing for road, land and/or utility lot centre lines
b. Vertical point of intersection (V.P.I.) elevations for surface improvements
c. Length and grade between V.P.I.'s for surface improvements
d. Vertical curve information, if applicable
e. V.P.I. elevations for water fittings and vertical bends
f. Valve and hydrant 'Tee' locations
g. Vertical alignments of manholes
h. Manhole rim and invert elevations
i. Utility main lengths, sizes, materials, and gradients
j. Insulation, drop manhole, safety platform, as applicable
k. Oil and gas pipelines, power and/or communication concrete duct banks, etc.

3.3.8.4 Detailed Sheets (C-5xx)

a. Details and sections required to complete the plan set

3.3.8.5 Other Discipline Projects

Follows the sheet naming and organization refer to Item 3.4.4.

a. Details/General Notes Plan
    i. Details and sections required to construct the plan set.
b. Building Structural Plans (S-xxx)
    i. Drawings related to building structural plans
c. Building Mechanical Plans (M-xxx)
    i. Drawings related to building mechanical plans
d. Building Electrical Plans (E-xxx)
    i. Drawings related to building electrical plans
e. Calculations Plan (C-xxx)
    i. Storm, Sanitary, Water or any other calculations which were completed to prove the validity of design.
f. Additional Plans
    i. Additional plans not mentioned above

2. Special Requirements for Design Drawings
    a. The design drawings shall be supplemented with the following details:
        i. details of special protection for pipe sections which are exposed to high velocities or which require corrosion protection or insulation
        ii. drawings required for obtaining permits for the crossings of oil, gas, power transmission lines or railroads and highways
        iii. details of placement on fill, tunneling, or pipe jacking, if such special methods are envisaged
        iv. thrust block details

3.3.9 File Naming

A Model File is a digital drawing of a building, site, or work area, created in CAD. Elements graphically representing the building or site should always be drawn full size. For example, a building wall that is 50 metres long should be drawn 50 metres long. A model file contains full size drawing of the building, site or part of the building or site. These models may be 2D or 3D, but they all must be accurate, complete, and in conformance with emerging industry standards regarding layer/level usage and symbology.

a. The first two characters of the name are the discipline designators, consisting of one alphabetical character and a placeholder (hyphen) for Level 1 discipline designators, or two alphabetical characters for Level 2 discipline designators. The Level 2 discipline designator is optional. Refer to 3.4.4.3.
b. The third and fourth characters are alphabetic characters that define the type of model.
c. The fifth through eighth characters are alphanumeric user-defined modifiers for the model types.
d. The three remaining characters after the required decimal point are defined by the CAD software and represent file name extensions such as. dgn, .dwg, .dwf and .dxf.

Model File Name - Example: Project No. QU # 1234

qu1234c_sp1001.dwg

QU#1234 = RMWB project number used as file name prefix

c = civil discipline designator

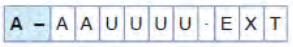
sp = site plan model file type

1001 = user-defined modifier

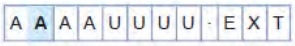
Dwg – file extension for AutoCAD drawing

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 and Profile
SV	Survey
FN	Foundation Plan
FR	Framing Plan

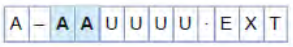
Model File Name Format



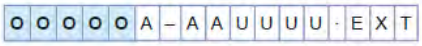
Level 1 Discipline Designator and Placeholder (Hyphen)



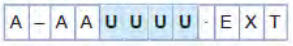
Level 2 Discipline Designator



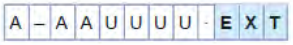
Type of Model



Optional Prefix



User-Defined Model Type Modifiers



File Name Extension

***A** = alphabetical character*
***N** = numerical character*
***U** = user-defined character*
***O** = optional character (user-defined)*
***EXT** = file name extension*

3.3.9.1 Sheet Files

A Sheet File is a digital file that coincides with the physical sheets that make up a set of plans.

The "electronic sheet file" may be comprised of a border template (a file that contains graphic and text elements common to all sheets of a specific size), text, symbols and views of files, representing everything that appears on the final sheet.

Sheet Files are sometimes erroneously referred to as "plot" files. Plot files are the files that result from CAD software, using a specific plotter or printer device driver. Plot files exist in the plotter's native language (such as HPGL or Postscript) and are generally usable only by the specific plotting device.

Sheet files are created by and can be edited by CAD and BIM software.

Because the main purpose of the sheet file is to prepare information to produce a specific sheet, the format of the file name should be consistent with the format for the sheet identification. The sheet file name should categorize the contents of each digital sheet file to the same degree as the sheet identification categorizes the physical printed drawing sheet.

a. The first five characters represent the project number.
b. The sixth character is the Level 1 discipline designator.
c. The seventh character is the optional Level 2 discipline designator.
d. The eight character is the hyphen. It serves as a placeholder that makes the name more readable and easier to manage.
e. The ninth character is the sheet type designator. (See Sheet Type Designators in the Sheet Identification Section)
f. The 10th & 11th characters define the sequence.
g. The 12th character is the hyphen. (optional) It serves as a placeholder that makes the name more readable and easier to manage.
h. The 13th, 14th, and 15th characters are user defined. (optional)



Sheet File Name - Example: Project No. QU#1234

Qu1234c_101.dwg

QU#1234 = RMWB project number used as file name prefix

c = Civil discipline designator

1 = sheet type designator (Plans)

01 = first sheet sequence number of the "Plan" series of drawings

.dwg = file extension for an AutoCAD drawing

Sheet File Name - Multiple sheets (Layout Tabs) in one drawing file (.dwg).

For example: A drawing file includes Civil sheets C-101, C-102 & C-103 for Project No. QU#1234

qu1234c_101_103.dwg

QU#1234 = RMWB project number used as file name prefix

c = Civil discipline designator

1 = sheet type designator (Plans)

01_03 = sheet sequence numbers of the "Plan" series of drawings

.dwg = file extension for an AutoCAD drawing

3.3.10 Issued

An issue is defined as an issue to the Municipality/Contractor for specific purposes such as approvals, tendering, record, etc. These issues are recorded appropriately on the drawing within the issue block.

Issues are coded in alphabetical order starting with issue “A”. The issue letter, date and reason for issue shall be filled in electronically along with the appropriate revision status.

The drawing issue letter will change for each issue even if there is no change on the drawing.

Subsequent to a drawing being issued for TENDER, or certified for CONSTRUCTION, the CAD operator must, when making an external issue, close off the revision column with a line (if there is no top line) and update the revision number in the revision column and the revision box in the lower right-hand corner of the base sheet. These blocks typically contain attributes.

Drawings being issued for CONSTRUCTION must only be stamped and signed with the appropriate permit stamp (where required) and engineer seal, prior to issue. The Municipality requires the TENDER issue to be stamped, and an alternate stamp may be placed on the drawing. (i.e. FOR TENDER ONLY - NOT FOR CONSTRUCTION)

Drawings being issued for any subsequent issue after being stamped, sealed and signed must display the appropriate electronic issue stamp, permit stamp (where required) and representative seal c/w the Date, By, Revision and Issue being filled in electronically. (i.e. For Construction, For Record, etc.)

All final drawings being issued, via electronic or hard copy media must display the drawing disclaimer.

3.3.11 Revisions

Whenever necessary, for any reason to make any changes to the design drawings after they have been approved, a pdf copy of each of the original drawings affected shall be submitted with the proposed encompassed within a revision cloud with a triangle referencing the title block revision area for a brief description, accompanied by a letter outlining the reasons for the required changes.

The Planning Department will inform the Developer within 7 days after receipt if the proposed changes meet with the approval of the Municipality. One copy of the requested change will be signed and returned, accompanied by a letter authorizing the changes to be made on the original approved detailed design drawings. No changes are to be made to any original approved drawings without following this procedure.

3.3.11.1 Documenting Revisions

Prior to a drawing being issued for tender or certified for construction, the drawing revision number will be “0” zero.

Changes or additions to technical information on a drawing after being approved construction will be noted in the revision column complete with a brief description and revision box at the lower right-hand corner the base sheet.

Subsequent issue of a drawing after it has been issued for tender or certified for construction where changes have been recorded in the revision column will be issued as revision 1.

The revision will be dated, signed. The revision box alongside the drawing number will also be changed to 1. Upon every subsequent issue where changes have been recorded, the revision number will be increased (both in the revision column and the revision box next to the drawing number) and the revision will be dated, signed.

As a drawing set transitions from being Issued for Tender to Issued for Construction, the revision number should be reset to “0” and the descriptions in the revision portion of the title block are cleared for any that might pertain to the next issue of drawings.

3.3.11.2 Revision Markings

All technical changes or additions to issue for tender or certified for construction drawings, shall be clearly marked by placing a triangular flag containing the current revision number adjacent to the spot where the change was made.

In addition to the flag marking, it may be required to cloud the entire area where the addition or change took place.

3.4 CAD CONVENTIONS

3.4.1 Layer Naming Conventions

Layers are used to sort the data types being depicted by the linework (Not to sort line weights, line types, colours or other schemes). The RMWB layering standards must be used to create layers to accommodate groupings of related data. Layer naming conventions for existing and proposed conditions shall be adhered to. If new layers are required, the consultant shall create the layer name using the standard layer naming convention.

The National CAD Standard has incorporated the CAD Layer Guidelines, as published by the American Institute of Architects (AIA).

3.4.2 Layer Name Format

The layer name format is organized as a hierarchy. This arrangement allows users to select from several options for naming layers according to the level of detailed information desired. Layer names consist of distinct data fields separated from one another by dashes.

There are four defined layer name data fields: Discipline Designator, Major Group, two Minor Groups and Status. The Discipline Designator and Major Group fields are mandatory. The Minor Group and Status files are optional. Each data field is separated from adjacent fields by a dash ("-") for clarity.

The complete NCS layer name format, showing the Discipline Designator, the Major Group, two Minor Groups, and the Status fields.

A	I	-	W	A	L	L	-	F	U	L	L	-	D	I	M	S	-	N

3.4.2.1 Discipline Designator, Level 1

The Discipline Designator denotes the category of subject matter contained on the specified layer. The Discipline Designator is a two-character field. The first character is the discipline character, and the second character is an optional modifier.

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

A typical layer name showing the required data fields only.

Note that only the mandatory discipline character is shown, creating a Level 1 Discipline Designator.

A	-	W	A	L	L

3.4.2.2 Discipline Designator, Level 2

The optional second character is used to further define the discipline character. As an example, the Level 2 Discipline Designators for Architectural are shown:

Designator	Description
A	Architectural
AD	Architectural Demolition
AE	Architectural Elements
AF	Architectural Finishes
AG	Architectural Graphics
AI	Architectural Interiors
AS	Architectural Site
AJ	User Defined
AK	User Defined

A typical layer name showing the required data fields only.

Note that the mandatory Level 1 discipline character is supplemented by the optional discipline modifier to create a Level 2 Discipline Designator.

A	D	-	W	A	L	L

3.4.2.3 Major Group

The major group is a four-character field that identifies a major building system. The prescribed Major Group field codes (four-character abbreviations) shown on the Layer List are logically grouped with specific discipline designators. However, any Major Group may be combined with any prescribed Discipline Designator, provided that the definition of the Major Group remains unchanged. Therefore, any reasonable combination of the prescribed Discipline Designators and Major Groups is permitted.

Note: The NCS recognizes that there will be instances where user-defined Major Group field codes will be required.

User-defined Major Group field codes are permitted. In these cases, however, they must contain four alphabetic and/or numeric characters and/or "~".

3.4.2.4 Minor Group

This is an optional, four-character field to further define the Major Groups. For example, A-WALL-FULL denotes Architectural, Wall, Full-height.

A second Minor Group may be used for still further delineation of the data contained on a layer. For example, A-WALL-FULL-TEXT indicates Architectural, Wall, Full-height, Text.

Note: User-defined Minor Group field codes are permitted. They must contain four alphabetic and/or numeric characters and/or "~".

A typical layer name showing one optional Minor Group fi eld:

A-WALL-FULL

A typical layer name showing two optional Minor Group fields:

A-WALL-FULL-TEXT

3.4.2.5 Status (Phase)

The status field is an optional single character field that distinguishes the data contained on the layer according to the status of the work or the construction phase.

The prescribed field codes for this field are as follows:

Codes	Description
A	Abandoned
D	Existing to demolish
E	Existing to remain
F	Future work
M	Items to be moved
N	New work
T	Temporary work
X	Not in contract
1	Phase number 1
2	Phase number 2
3	Phase number 3
4	Phase number 4
5	Phase number 5
6	Phase number 6
7	Phase number 7
8	Phase number 8
9	Phase number 9

A typical layer name showing the location of the optional Status field:



See Appendix B for a list of the standard layering CAD conventions.

3.4.3 Plotting Conventions

The RMWB uses colour dependent plot styles (ctb's) with line weights assigned to the colours. This will define how the linework looks when plotted. All layer colours shall conform to the RMWB drafting standards.

3.4.4 Linetype Conventions

All line types shall conform to the RMWB drafting standard, custom line types. Drawings must not contain line types or complex line types other than those defined in **RMWB-ENGINEERING2021.ctb** supplied by RMWB.

The line types are all converted to metric and formatted to display properly at a 1:1000 scale, with ltscale set to 1, psltscale set to 1. Setting your scales to 1 will cause the line types to automatically scale to your viewport scale, ensuring that they will appear at the appropriate size.

3.4.5 Block Conventions

AutoCAD blocks are used to group entities. These graphic blocks shall **not** be exploded. Blocks representing simple objects or simple symbols shall not contain nested blocks (blocks made of blocks). Most symbols should be created with linetype and colour "Bylayer". This allows complete control over the appearance of the symbol. By default, the symbol 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.

Newly created blocks should have the following properties:

- Insertion point at 0,0,0
- All objects drawn on layer 0
- All blocks must have a node in the center point of the block

Any blocks required but not shown may be created if they prescribe to the above conditions and appear in a legend.

See Appendix C for Block Libraries.

3.4.6 Hatching

Common hatching patterns are shown in Appendix C. Hatching shall be shown on cross sections to differentiate between materials. Overall plan drawings may contain some hatching if needed for clarity.

3.4.7 Details

Include the applicable standard RMWB Engineering Servicing Standards and Development Procedures details with your drawing submission detail sheets. The RMWB details can be referenced in the construction notes.

If it is necessary to make a change or deviate from a standard detail, the revised detail must be included on the detail sheet with revisions shown in bold to alleviate confusion.

Any additional details not included in the Engineering Servicing Standards and Development Procedures must be included on the detail sheets.

All roadways must include the typical roadway cross-sections regardless of whether they follow the RMWB Engineering Servicing Standards and Development Procedures standards or not.

3.4.8 Annotation

3.4.8.1 Text Styles

Two standard text styles are to be used, ROMANSINCL and ROMANS. ROMANSINCL is to be used for all proposed and future design information. ROMANS is to be used for all existing, abandoned, and demolished information. For both text styles, the following recommended text heights are as follows:

Scaled Height (mm) of Text	
Actual Height	Description
2.0	Main Sizes, Curve Data, Dimensions, Grade Text / Spot Elevations, and other design information
3.0	Lot Numbers
4.0	Road Name, Phase Labels, Plan Profile Labels
5.0	Block # Text

3.4.8.2 Dimensions

All dimensioning must be created on entities in model space with associative dimensions.

Two dimension styles called ‘RMWB_romans’ and ‘RMWB_romansincl’

Dimensions incorporate numerical values into a drawing as a means of sizing various components and locating parts of a structure or site for a project.

Dimensions must be accurate and adequate to clearly provide information required during project construction.

Inadequate dimensions require clarifications during construction and possible loss of time.

General Dimensioning Rules:

1. Dimensions should be located outside the floor plan or view being dimensioned.
2. Dimensions located outside the view should be located at the top and/or right side of the plans whenever possible.
3. Dimensions shown on the interior of a plan or other view should be arranged in continuous strings for clarity and consistency.
4. Dimension lines, extension lines, and text leaders DO NOT CROSS.
5. Arrange the longest dimensions the furthest away from your drawing to prevent crossing shorter dimensions.
6. Use an equal spacing between a series of parallel dimensions.
7. Avoid using object lines as dimension extension lines when possible.

3.4.8.3 Symbols

Symbols		
Text	Symbol	Usage
%%C	ø	Diameter
%%D	°	Degrees
%%P	±	Plus/minus

3.4.9 Abbreviations

Abbreviations			
A	ampere	CAL	caliper
AB	anchor bolt	CB	catch basin
ABS	acrylonite butadiene styrene (plastics)	CCRED	concentric reducer
AC	alternating current	Cd	Cadmium
Aban	Abandoned	CDN	Canadian
ACP	Asphaltic Cement	C	cord length
AC	asbestos cement (pipe)	CC	curb cock
AFC	automatic frequency control	CDT	conduit
AF	audio frequency	CF	curb face
Al	aluminum	C&G	curb and gutter
AM	amplitude modulation	CHC	continuous high chair
ASCM	Alberta Survey Control Measurement	CI	cast iron
AUX	Auxiliary	CIP	cast in place
Ave	avenue	CJ	construction joint
AVG	average	℄	centreline
AWG	American wire gauge	CL	clearance
		cm	centimeter
B&B	Balled and Burlap	CMP	corrugated metal pipe conc.
BBL	barrel	CR	curb return
BC	begin horizontal curve	Cr	chrome
BLDG	building	CRES	crescent
BLVD	boulevard	CS	corporation stop
BM	benchmark	CSG	casing
BOC	back of curb	CSK	countersink
BOW	back of walk	CTR	centre
BPD	barrels per day	Cu	copper
BRKR	breaker	cu	cubic
BSMT	basement	CULV	culvert
BVC	begin vertical curve	CV	control valve
BWV	backwater valve	CW	cold water
⍰	defection angle	FBM	board foot (foot, board measure)
DBL	double	F/C	flanged by compression
DC	direct current	FDN	foundation
DI	ductile iron	Fe	iron
DIA	diameter	FF	flat-face
DIM	dimension	FIB	found iron bar (survey)
DL	deadload	FLTR	filter
DR	dimension ratio	FM	frequency modulation
DWG	drawing	FM/UL	Factory Mutual/Underwriters Laboratory
DWV	drain waste vent (plastics)	FOC	face of curb
		FS	forged steel
e	external (curve data)	FSD	flat side down
EC	end of curve	FSL	full surface level
ECCRED	eccentric reducer	FSU	flat side up

Abbreviations			
ECB	erosion control blanket		
e.g.	example	GA	gauge
EHV	extra high voltage	GALV	galvanized
EJCTR	ejector	GRD	electrical ground
ELB	elbow		
ELEV	elevation	HDW	hardware
EMT	electrical metallic	HF	high frequency
	tubing	HGR	hanger
EOP	Edge of pavement	HORIZ	horizontal
EP	epoxy (plastics)	hp	horsepower
EPDM	ethylene propylene dienemonomer (plastics)	HP	high pressure
ER	Environmental Reserve	HSS	high strength steel
EQ	equal	HT	height
ESP	external static pressure	HV	high voltage
EVC	end vertical curve	HW	hot water
		HYD	hydrant
IB	iron bar	Hz	hertz
ID	inside diameter		
INV	invert	PL	property line
IP	iron pipe	PVC	polyvinyl chloride
LC	length of curve	PVI	point of vertical intersection
LVC	length of vertical curve	PT	pressure treated
LIN	linear		
LL	liveload	R	radius
LOG	lip of gutter	Rd	road
LP	low pressure	RED	reducer or reducing
LR	long radius	REINF	reinforce(d)
		REQ	required
MAX	maximum	REV	revision
MH	manhole	RF	raised-face
MIN	minimum	RGE	range
Mono	monolithic	RIM	rim elevation
MR	municipal reserve	RO	rough opening
MTG	mounting	Rolled	curb (mountable)
		rpm	revolutions per minute
N	newton		
N/A	not applicable	RR	railroad
NIC	not-in-contract	RW	raw water
		R/W	right-of-way
No.	number	RWL	rainwater leader
NPT	National pipe thread		
NTS	not-to-scale	SAN	sanitary (sewer)
		SCH	schedule
o/c	on-centre	SDR	standard dimension ratio
OD	outside diameter	SPD	Standard Proctor Density
OC	on centre	SPEC	specification
		SPF	spruce, pine, fir
PE	polyethylene	sq	square

Abbreviations			
pH	hydrogen-ion concentration	SR	short radius
		STA	station
PI	point-of-intersection	St	street
PRV	pressure reducing valve	STM	storm
Pt	platinum	STD	standard
PUL	Public utility corridor	SW	switch
		S/W	sidewalk
TAN	tangent	S4S	smooth four sides
TDH	total differential head		
TH	test hole	V	volt
TLLD	total load	VCT	vitrified clay tile
TOC	top of curb	VC	vertical curve
TVS	tapping valve and sleeve	VERT	vertical
TWP	township	VHF	very high frequency
TYP	typical		
		W	watt
		WCB	water curb box
		WOG	water, oil and gas
		WM	watermain
		U/G	underground
		UHF	ultra high frequency
		UR/W	utility right-of-way
		US	American
		UV	ultraviolet

3.4.10 SI Units and Symbols

The following list of physical quantities, SI (System International) units and SI symbols are to be used in reports prepared for the RMWB:

SI Units and Symbols		
Physical Quantities	Units	Symbols
Length	Kilometre	km
	Metre	m
	centimetre	cm
	millimetre	mm
	micrometre	um
Area	square kilometre	km^2
	hectare	Ha
	square metre	m^2
	square centimetre	cm^2
	square millimetre	mm^2
Volume	cubic metre	m^3
	hectare metre	ham
	cubic centimetre	cm^3
	cubic millimetre	mm^3
	litre	l
Mass	tonne	t
	kilogram	kg
	gram	g
	milligram	mg
Density (mass density)	tonne per cubic metre	t/m^3
	kilogram per cubic metre	kg/m^3
	gram per cubic centimetre	g/cm^3
Unit Weight (weight density)	kilonewton per cubic metre	kN/m^3
Force	meganewton	MN
	kilonewton	kN
	Newton	N
Flow	megalitres per day	ML/d
	metre per second	m/s
	litre per second	L/s
Pressure	megapascal	MPa
	kilopascal	kPa
Energy	kilojoule	kJ
	joule	J
Power	kilowatt	kW
	kilowatt-hour	kW.h
	ampere-hour	A.h

SI Units and Symbols		
Physical Quantities	Units	Symbols
	ampere	A
	volt	V
	kilovolt	kV
	kilovolt ampere	kVA
Temperature	degree Celsius	°C
Coefficient of volume compressibility or swelling	1/megapascal	MPa^{-1}
	1/kilopascal	kPa^{-1}
Coefficient of Consolidation or swelling	square metre per second	m^2/s
	square metre per year	m^2/yr
	square centimetre per second	cm^2/s
Noise	decibel	dB
Time	year	yr
	day	d
	hour	h
	second	s
Illumination	lux	lx
Hydraulic conductivity (formerly coefficient of permeability)	metre per second	m/s
	centimetre per second	cm/s
Concentration	milligram per litre (ppm)	mg/L
	milligram per millilitre (ppb)	mg/mL

3.5 TCA & GIS

3.5.1 Tangible Capital Asset (TCA) Report

To gather and maintain useful information pertaining to municipal assets, the Municipality is requesting an excel spreadsheet template to be filled out and submitted. A TCA report is required for private developments as part of the development agreement process. An updated TCA is required for the Construction Completion Certificate (CCC) application and again for the Final Acceptance Certificate (FAC) application. If the completed spreadsheet is not submitted, to the satisfaction of the Engineering Department, the CCC or FAC will not be issued until acceptable. For capital works projects, the TCA report is required at FAC only.

Up to date copy of the excel asset catalogue and catalogue guide may be obtained from the Municipality's web address:

https://www.rmwb.ca/en/permits-and-development/engineering-servicing-standards.aspx

3.5.2 Geographic Information System (GIS)

The RMWB is now requiring record drawing submissions to include a digital GIS File Format of all work completed by the proponent. GIS layers should include a spatial representation of all work completed as well as appropriate attribute information completed within the GIS layer. A detailed data dictionary describing the required attribute information is attached.

3.5.3 GIS Layers

This submission should include the following GIS Layers:

1. Deep Utilities
    a. Water System
        - Water Lines (all linear features)
        - Water Nodes (all valves, fittings, etc…)
        - Water Polygons (structures, ponds, etc…)
    b. Sanitary Sewer System
        - Sanitary Lines (all linear features)
        - Sanitary Nodes (all fittings, manholes, etc…)
        - Sanitary Polygons (structures, ponds, etc…)
    c. Storm Water System
        - Storm Lines (all linear features)
        - Storm Nodes (all fittings, manholes, etc…)
        - Storm Polygons (structures, ponds, etc…)
2. Shallow Utilities
    d. Utility Duct System
        - Duct Lines (all linear features)
        - Duct Nodes (all structures, fitting, etc…)

3.5.4 GIS Data Template

A GIS template is available for download from the Municipality website. GIS File Geodatabase (.gdb file) titled “DSV30_SCHEMAONLY.gdb” which includes 11 empty feature classes that you will load your data into. These empty feature classes are to be used as a template so that your data will conform to RMWB data standards. The File Geodatabase format is used to maintain field data types, attribute domains and the structure of the data. Shapefiles will not enforce the data rules as required and are not encouraged.

Altering the base template schema could result in your data delivery being rejected until corrections are made. This includes changing field names or entering attribute values beyond those defined in the attached data dictionary.

https://www.rmwb.ca/en/permits-and-development/engineering-servicing-standards.aspx#

3.5.5 Sample GIS Data

A sample data set is available for download from the Municipality website in a file geodatabase titled “DSV30_SAMPLE.gdb”.

https://www.rmwb.ca/en/permits-and-development/engineering-servicing-standards.aspx

This includes a sample of all the GIS data layers that will be populated with your data. Note that this sample data is not comprehensive and does not necessarily include all possible feature types or configurations. It is intended as reference only.

3.5.6 Description of Specifications

1. All data should be projected in NAD 83 UTM ZONE 12N Grid. The template and sample are provided in this projected coordinate system.
2. All data submission must be Esri geodatabase (.gdb)
3. Data should be drawn on top of a base legal layer (called survey parcels) which will be clipped to the project area and provided at your request. This is to ensure confidence that the submission spatially aligns with the projected survey parcels.
4. The GIS data should be an accurate representation of the as-constructed information.
5. GIS data should match the likeness of the lines and points as depicted in the DWG and PDF deliveries.
6. Point features associated with a line should be snapped to and drawn on top of a line feature.
7. Line features should be split at all nodes.
8. Line features should be snapped to other line features (avoid overhangs or undershoots).
9. Only those features which have been added/removed or modified in the contract should be provided in the delivery. Existing features that have not been added/removed or modified are not required.

10. In the following pages a data dictionary describes the attribute specifications required for each layer.
    i. Note that the domains tab lists the attribute values for each field in each layer.
    ii. Note that all other tabs describe each layer and the appropriate domain for each field.
11. The provided data template is configured with GIS “domains”. These enable a “dropdown list” for use while editing that contain only the correct attribute values for each field. Attention to detail is a must to ensure that the correct attribute is assigned to each feature.
12. Using “Other” or leaving attributes as NULL should be used as a last resort and avoided if possible.
13. The delivery to the RMWB should be a .gdb file containing the delivery feature classes. This .gdb should be compressed into a . zip file.

3.6 DATA SUBMISSIONS

Outlined are the various submissions in which the preparation of detailed Engineering Drawings and Specifications and Landscape Plans and Specifications may be needed.

3.6.1 File Presentation

a. A drawing must be purged of all definitions not used such as layer names, text styles, layer filters, blocks, etc.
b. No objects should reside on layer “0” or DEFPOINTS except for objects contained in a block definition.
c. A drawing must not contain any errors that are detectable using the Audit command.
d. The drawing must be saved such as to be printed without any page setup. The main layout must be active, and all the viewports adjusted and locked to correct scale.
e. Base plan and proposed works and attribute labels shall be drawn in model space at 1:1 scale. Layouts shall be set up with a single title block per layout and include construction notes and pertinent details in paper space.

3.6.2 Conceptual Submissions

a. Plans of the roadway network, site servicing layouts and landscape improvements.
b. Detailed calculations supporting how the development will be serviced including all proposed right-of-ways, easements, and utility lots.

3.6.3 Detailed Engineering Drawings

Upon acceptance of the conceptual engineering and landscape plans the Developer shall submit electronically for approval to the Planning Department for circulations to the appropriate departments, pdf copy of the design drawings and any other supporting studies and calculations.

Engineering drawings, diagrams and reports must be sealed by a Professional Engineer registered in the Province of Alberta. Landscape plans are to be submitted with the Engineering Drawings and be signed by the Landscape Consultant, who is a member in good standing of the Alberta Association of Landscape Architects.

3.6.4 Record (As-Constructed) Submissions

The Engineering Consultant shall submit through E-Permitting record drawings and other related information giving detailed measurements of the actual municipal services constructed. The submission of this data for record purposes is a condition of the issuance of Construction Completion Certificates by the Municipality. Record Drawings may be required in two stages, as indicated in Section 2 Procedures for Development.

3.6.5 General Requirements:

1. Drawings shall include all information as specified elsewhere for the construction drawings but shall be corrected upon completion of construction to note all works removed during construction. As an alternative, this information shall be retained in the digital file on layer (C-SERV-D) but not displayed on the final print. Note abandoned services (C-SERV-A) and reflect As-Constructed conditions for permanent records.
2. All dimensions shown shall reflect the As-Constructed conditions of the construction. As-Constructed drawings shall be to scale in accordance with the As-Constructed dimensions shown. The Revision Table shall be completed indicating the drawings are Record Drawings.
3. All As-Constructed features shall be surveyed, and survey points imported into the digital drawing on the appropriate layers. The As-Constructed drawing shall reflect the true elevation and location of all constructed features, in both the plan and profile views. Record (as-constructed) elevations will be to 2 decimals.
4. Tangible Capital Asset table to be filled out and included with the digital submission.
5. The As-Constructed drawings shall be submitted as follows:
    a. Municipal Standard **AutoCAD format** (including all external references)
    b. A **pdf** version, sealed by a Professional Engineer registered in the Province of Alberta
    c. A csv file of any survey information
    d. Tangible Capital Assets Report
    e. GIS Files

    Submit digital submissions through e-permitting, by FTP, email or USB.

6. Line work for all constructed works shown on the drawings shall retain the thicker line density for ease of determining the extent of works covered by the drawings. Any future construction elements for the project are to be clearly identified and labelled as future on the Record Drawings.
7. All As-Constructed drawings shall also include the following information:
    a. The location and elevation of all existing utilities and services encountered in the construction operation,
    b. The location and invert elevation at property line of all individual service connections, and the tee chainage, at the main for all constructed and existing works,
8. All service connections shall be shown with dimensions to property lines. Private services will also be shown on the drawings with labels indicated “private”.
9. See Appendix E for Submission Compliance Checklist

3.6.6 Additional Information

Record drawings will be of the same format as the original construction drawings with all changes noted and the following information added:

- Design data is erased on original and replaced with as-constructed data.
- All hydrants, valves, curb stops, manholes and catch basins are to be dimensioned in two directions or labelled with a Northing and Easting coordinate.

3.7 APPENDIX A – AREA CODES

AREA_CODE	AREA_CODE_LARGE	NEIGHBOURHOOD_SUBDISTRICT_NAME	SUBDIVISION_CODE
1312	1	ABASAND RESERVOIR	ABCR
6202	62	ABRAHAM'S LANDING	ABRA
1006	10	ALBERTA DRIVE	LTAD
8430		ANZAC	ANZC
1306	1	ARSENAULT / ADRAIN	ABAR
1309	1	ASPEN GARDENS	ABAS
5199	5	ATHABASCA OPEN SPACE	OSAT
5111	5	ATHABASCA TERRACE	THAT
1308	1	AVERY BAY	ABAB
7207	7	BALL/BACON	TLBB
2402	2	BEACON HILL CENTRAL	BHCE
2404	2	BEACON HILL CROSSING	BHCR
2403	2	BEACON HILL NORTH	BHNO
2401	2	BEACON HILL SOUTH	BHSO
7211	7	BEAR RIDGE	TLBR
7208	7	BEATON	TLBE
1009	10	BIRCHGROVE	LTBR
7206	7	BRETT/STORM POND	TLBS
7204	7	BREUKEL	TLBK
7205	7	BURNS/BROSSEAU	BLBN
7201	7	BURTON ESTATES	TLBU
7210	7	CARTIER HEIGHTS	TLCA
7209	7	CARTIER MOBILE HOME PARK	TLCM
5121	5	CASTLE RIDGE	THCR
5105	5	CEDARWOODS	TLCD
1002	10	CLEARWATER	LTCL
7216	7	CONFEDERATION HEIGHTS NORTH	TLCN
7212	7	CONFEDERATION HEIGHTS SOUTH	TLCS
8480		CONKLIN	CONK
5198	5	CONN CREEK NORTH	THCN
5112	5	CORNERBROOK	THCB
6217	62	DICKINSFIELD EAST	DKFE
6218	62	DICKINSFIELD NORTH	DKFN
6219	62	DICKINSFIELD SOUTH	DKFS
3340	3	DRAPER	DRPR

5109	5	DUNCAN	THDU
7224	7	EAGLE RIDGE	TLER
7227	7	EAGLE RIDGE NORTH	TLEN
7228	7	EAGLE RIDGE SOUTH	TLES
7202	7	EGLERT	THEG
5110	5	ELMORE	THEL
8260		FORT CHIPEWYAN	CHIP
8240		FORT FITZGERALD	FITZ
8280		FORT MCKAY	MKAY
8530	85	FORT MCMURRAY AIRPORT	YYMA
5120	5	GARNET	THGR
6196	61	GOLF COURSE	THGC
6611	66	GRANDVIEW	GGGD
1301	1	GRAYLING TERRACE	ABGT
6609	66	GREENWICH LANE	GGGN
6601	66	GREGOIRE COMMERCIAL NORTH	GGCN
6602	66	GREGOIRE COMMERCIAL SOUTH	GGCS
8420		GREGOIRE LAKE ESTATES	GLES
6610	66	GRENFELL/GREY	GGGR
1005	10	HAINEAULT	LTHN
1304	1	HANGINGSTONE PLACE	ABHN
1004	10	HARDIN	LTHR
7213	7	HARPE HEIGHTS	TLHH
7301	73	HERITAGE POINT	PCHR
1305	1	HILL VIEW PARK	ABHP
5108	5	HILLCREST	THHC
1310	1	HILLTOP ESTATES	ABHE
8300		HINTERLAND	HLCR
8400		HINTERLAND	HLSO
8200		HINTERLAND	HLNO
7498	74	HWY 63 NE	THEH
7435	74	HWY 63 NW	NW63
9502	9	J.HOWARD PEW PARK	JHPP
8460		JANVIER	JANV
6704	67	KEYANO INDUSTRIAL CAMPUS	GGKI
1010	10	KING/KEYANO	LTKS
8524	85	L.ROBERT INDUSTRIAL PARK	LRIP
7214	7	LAKEWOOD	TLLW

6501	65	LANDFILL	LDFL
1012	10	MACDONALD ISLAND	LTMD
6705	67	MACKENZIE INDUSTRIAL PARK EAST	GGSE
6708	67	MACKENZIE INDUSTRIAL PARK NORTH	GGNE
6706	67	MACKENZIE INDUSTRIAL PARK SOUTH	GGSW
6707	67	MACKENZIE INDUSTRIAL PARK WEST	GGNW
8440		MARIANA LAKE	MRLK
6126	61	MARTIN RIDGE ESTATES	THMR
9503	9	MCCORMICK	WWMC
1001	10	MCMURRAY	LTMM
7215	7	MORGAN HEIGHTS	TLMH
1003	10	MORRISON	LTMR
7399	73	OPEN SPACE	OSPC
7499	74	OPEN SPACE	OSHE
7299	7	OPEN SPACE	OSTL
8399	83	OPEN SPACE	OSSP
8599	85	OPEN SPACE	OSYM
6900	69	OPEN SPACE	OSSA
6799	67	OPEN SPACE	OSMC
6899	68	OPEN SPACE	OSPC
6699	66	OPEN SPACE	OSGR
9599	9	OPEN SPACE	OSWW
6599	65	OPEN SPACE	OSLF
2499	2	OPEN SPACE	OSBH
1013	10	OPEN SPACE	LTMD
1399	1	OPEN SPACE	OSAB
6199	61	OPEN SPACE	TLCN
7221	7	PACIFIC PLACE	TLPC
7223	7	PAQUETTE HEIGHTS	TLPH
7220	7	PARSONS CREEK	TLPR
1302	1	PATIO HOMES EAST	ABPE
1303	1	PATIO HOMES WEST	ABPW
7304	73	PHASE 1 SCHOOL SITE	PC1S
7302	73	PHASE 1B	PC1B
7303	73	PHASE 1C	PC1C
7305	73	PHASE 2A	PC2A
7306	73	PHASE 2B	PC2B

7222	7	PINE PLACE	TLPN
1008	10	PRAIRIE	LTPR
8401	84	PRAIRIE BUSINESS PARK	PRBP
6812	68	PRAIRIE CREEK	GGPC
7219	7	PROSPECT POINTE	TLPP
9501	9	PTARMIGAN MOBILE PK.	WWPT
6502	65	QUARRY RIDGE	QRYR
9598	9	RAILWAY	WWRW
1011	10	RAILWAY SOUTH	LTRS
1307	1	RAVINE PARK	ABRP
8351	<Null>	RICKARDS LANDING	<Null>
1007	10	RIEDEL	LTRD
1311	1	RIVER VIEW HEIGHTS	ABRV
5102	5	ROSS HAVEN	THRH
2405	2	SAKITAWAW TRAIL SOUTH	GGST
6901	69	SALINE CREEK	SALC
6902	69	SALINE CREEK GOLF COURSE	SALG
8320	83	SAPRAE CREEK ESTATES	SAPR
5104	5	SILIN FOREST	THSF
5106	5	SILVER SPRINGS	THSS
7203	7	ST.ANNE/TIMERLEA SCHOOLS	TLST
7230	7	STONE CREEK CENTRAL	TLSC
7233	7	STONE CREEK LANDING	TLSL
7231	7	STONE CREEK NORTH	TLSN
7229	7	STONE CREEK SOUTH	TLSS
7234	7	SYNCRUDE ATHLETIC PARK	OSTL
7432	74	TAIGANOVA ECO INDUSTRIAL PARK	TIAG
7226	7	THE GARDENS OF PAQUETTE HEIGHTS	TLGP
7225	7	THE LANDINGS OF PAQUETTE HEIGHTS	TLLP
5107	5	THICKWOOD COMMUNITY FACILITIES	THTC
5196	5	THICKWOOD SOUTH SLOPE	THGC
7218	7	TIMBER HEIGHTS	TLTH
7217	7	TIMBERLEA COMMERCIAL	TLTC
5101	5	TIMBERLINE	THTL
5113	5	TUNDRA NORTH	THTN
5114	5	TUNDRA SOUTH	THTS
9505	9	UPPER CLIFF	WWUC

8323	83	VISTA RIDGE	VIST
9504	9	WATERWAYS CENTRAL	WWCN
5116	5	WESTVIEW	THWV
5115	5	WESTVIEW HEIGHTS	THWH
6125	61	WOOD BUFFALO CENTRAL	THWC
6124	61	WOOD BUFFALO EAST	THWE
6122	61	WOOD BUFFALO ESTATES	THWB
6127	61	WOOD BUFFALO SOUTH	THWS
6123	61	WOOD BUFFALO WEST	THWW
5103	5	WOODLAND	THWL
7434	74	WWTP	WWTP

3.8 APPENDIX B – STANDARD LAYERING CAD CONVENTIONS

Civil Discipline Layer List Example

See Section 4.1.1.1 for Level 1 Discipline Designators. This example is for the Civil Discipline

See Section 4.1.1.4 for additional Status (Phase) Designators.

This example shows only New Work (-N), Future Work (-F), Existing to Remain (-E) and Demolished (-D)

The layers and colours in this table correspond to the RMWB-Engineering-2021.ctb . See RMWB Drafting Standards.

Name	Colour	Linetype	Description
0	white	Continuous	
C-ANNO-D	58	Continuous	Demolished Civil General Annotation
C-ANNO-DIM-D	58	DASHDOT	Demolished Civil Dimension Annotation
C-ANNO-DIM-E	253	Continuous	Existing Civil Dimension Annotation
C-ANNO-DIM-F	217	Continuous	Future Civil Dimension Annotation
C-ANNO-DIM-N	211	Continuous	New Civil Dimension Annotation
C-ANNO-E	253	Continuous	Existing Civil General Annotation
C-ANNO-F	217	Continuous	Future Civil General Annotation
C-ANNO-LEGD-D	58	Continuous	Demolished Civil Legend Annotation
C-ANNO-LEGD-E	253	Continuous	Existing Civil Legend Annotation
C-ANNO-LEGD-F	217	Continuous	Future Civil Legend Annotation
C-ANNO-LEGD-N	211	Continuous	New Civil Legend Annotation
C-ANNO-N	green	Continuous	New Civil General Annotation
C-ANNO-NOTE-D	58	Continuous	Demolished Civil General Notes
C-ANNO-NOTE-E	253	Continuous	Existing Civil General Notes
C-ANNO-NOTE-F	217	Continuous	Future Civil General Notes
C-ANNO-NOTE-N	211	Continuous	New Civil General Notes
C-BLDG-D	58	C-TOPO-BLDG	Demolished Building
C-BLDG-E	91	C-TOPO-BLDG	Existing Building
C-BLDG-F	217	C-TOPO-BLDG-F	Future Building
C-BLDG-N	green	C-TOPO-BLDG	New Building
C-BLRD-D	253	Continuous	Demolished Bollard
C-BLRD-E	253	Continuous	Existing Bollard
C-BLRD-F	217	Continuous	Future Bollard
C-BLRD-N	white	Continuous	New Bollard
C-BORE-MWEL-D	253	DASHDOT	Demolished Borehole: Monitoring Well
C-BORE-MWEL-E	253	Continuous	Existing Borehole: Monitoring Well
C-BORE-MWEL-F	217	Continuous	Future Borehole: Monitoring Well

C-BORE-MWEL-N	red	Continuous	New Borehole: Monitoring Well
C-BORE-NOTE-D	253	DASHDOT	Demolished Borehole Note
C-BORE-NOTE-E	253	Continuous	Existing Borehole Note
C-BORE-NOTE-F	217	Continuous	Future Borehole Note
C-BORE-NOTE-N	red	Continuous	New Borehole Note
C-BUS-PATT-D	58	Continuous	Demolished Transit Stop Treatment Hatch
C-BUS-PATT-E	252	Continuous	Existing Transit Stop Treatment Hatch
C-BUS-PATT-F	252	Continuous	Future Transit Stop Treatment Hatch
C-BUS-PATT-N	252	Continuous	New Transit Stop Treatment Hatch
C-CATV-EQPM-D	58	Continuous	Demolished CATV Equipment
C-CATV-EQPM-E	253	Continuous	Existing CATV Equipment
C-CATV-EQPM-F	8	Continuous	Future CATV Equipment
C-CATV-EQPM-N	192	Continuous	New CATV Equipment
C-CATV-OVHD-D	58	OVERHEAD_CABLE_DEMO	Demolished CATV Overhead line
C-CATV-OVHD-E	253	OVERHEAD_CABLE	Existing CATV Overhead line
C-CATV-OVHD-F	217	OVERHEAD_CABLE_FUTURE	Future CATV Overhead line
C-CATV-OVHD-N	32	OVERHEAD_CABLE	New CATV Overhead line
C-CATV-UNDR-D	58	CABLE_DEMO	Demolished CATV Underground line
C-CATV-UNDR-E	253	CABLE	Existing CATV Underground line
C-CATV-UNDR-F	217	CABLE_FUTURE	Future CATV Underground line
C-CATV-UNDR-N	32	CABLE	New CATV Underground line
C-COMM-EQPM-D	58	Continuous	Demolished Telecommunications Equipment
C-COMM-EQPM-E	253	Continuous	Existing Telecommunications Equipment
C-COMM-EQPM-F	252	Continuous	Future Telecommunications Equipment
C-COMM-EQPM-N	32	Continuous	New Telecommunications Equipment
C-COMM-OVHD-D	58	OVERHEAD_COMMUNICATION_DEMO	Demolished Telecommunications Overhead Line
C-COMM-OVHD-E	253	OVERHEAD_COMMUNICATION	Existing Telecommunications Overhead Line
C-COMM-OVHD-F	217	OVERHEAD_COMMUNICATION_FUTURE	Future Telecommunications Overhead Line
C-COMM-OVHD-N	191	OVERHEAD_COMMUNICATION	New Telecommunications Overhead Line
C-COMM-UNDR	191	TELEPHONE	Telecommunications Underground line
C-COMM-UNDR-D	58	BURIED_COMMUNICATION_DEMO	Demolished Telecommunications Underground line

C-COMM-UNDR-E	253	TELEPHONE	Existing Telecommunications Underground line
C-COMM-UNDR-F	217	BURIED_COMMUNICATION_FUTURE	Future Telecommunications Underground line
C-DRIV-D	58	DASHDOT	Demolished Driveway
C-DRIV-E	253	Continuous	Existing Driveway
C-DRIV-F	217	Continuous	Future Driveway
C-DRIV-N	21	Continuous	New Driveway
C-DTCH-BOTD-D	58	CUT	Demolished Ditch Bottom
C-DTCH-BOTD-E	253	CUT	Existing Ditch Bottom
C-DTCH-BOTD-F	217	CUT	Future Ditch Bottom
C-DTCH-BOTD-N	241	CUT	New Ditch Bottom
C-DTCH-CNTR-D	58	DRAIN_DITCH	Demolished Ditch Center
C-DTCH-CNTR-E	253	DRAIN_DITCH	Existing Ditch Center
C-DTCH-CNTR-F	217	DRAIN_DITCH_FUTURE	Future Ditch Center
C-DTCH-CNTR-N	red	DRAIN_DITCH	New Ditch Center
C-DTCH-TOPD-D	58	FILL	Demolished Ditch Top
C-DTCH-TOPD-E	253	FILL	Existing Ditch Top
C-DTCH-TOPD-F	217	FILL	Future Ditch Top
C-DTCH-TOPD-N	241	FILL	New Ditch Top
C-ENVR-WETL-D	58	DASHDOT	Demolished Environmental Wetland
C-ENVR-WETL-E	253	Continuous	Existing Environmental Wetland
C-ENVR-WETL-F	217	Continuous	Future Environmental Wetland
C-ENVR-WETL-N	61	Continuous	New Environmental Wetland
C-ENVR-WETL-SETB-D	58	DASHDOT	Demolished Environmental Wetland Setback
C-ENVR-WETL-SETB-E	253	DASHED	Existing Environmental Wetland Setback
C-ENVR-WETL-SETB-F	217	DASHED	Future Environmental Wetland Setback
C-ENVR-WETL-SETB-N	53	DASHED	New Environmental Wetland Setback
C-EROS-SETL-BASIN-D	58	DASHDOT	Demolished Erosion Settlement Basin
C-EROS-SETL-BASN-E	253	Continuous	Existing Erosion Settlement Basin
C-EROS-SETL-BASN-F	217	Continuous	Future Erosion Settlement Basin
C-EROS-SETL-BASN-N	yellow	Continuous	New Erosion Settlement Basin
C-EROS-SILT-D	58	ZIGZAG	Demolished Erosion Silt Fence
C-EROS-SILT-E	253	ZIGZAG	Existing Erosion Silt Fence
C-EROS-SILT-F	217	ZIGZAG	Future Erosion Silt Fence

C-EROS-SILT-N	red	ZIGZAG	New Erosion Silt Fence
C-ESMT-D	58	HIDDEN	Demolished Easement
C-ESMT-E	252	HIDDEN	Existing Easement
C-ESMT-F	217	HIDDEN	Future Easement
C-ESMT-N	43	HIDDEN	New Easement
C-FENC-BARB-D	58	BARBED_WIRE_FENCE_DEMO	Demolished Fence - Barbed Wire
C-FENC-BARB-E	253	BARBED_WIRE_FENCE	Existing Fence - Barbed Wire
C-FENC-BARB-F	217	BARBED_WIRE_FENCE_FUTURE	Future Fence - Barbed Wire
C-FENC-BARB-N	193	BARBED_WIRE_FENCE	New Fence - Barbed Wire
C-FENC-GRAL-WBEM-D	58	DASHDOT	Demolished Guardrail W-Beam
C-FENC-GRAL-WBEM-E	253	Continuous	Existing Guardrail W-Beam
C-FENC-GRAL-WBEM-F	217	DASHED	Future Guardrail W-Beam
C-FENC-GRAL-WBEM-N	11	Continuous	New Guardrail W-Beam
C-FENC-IRON-D	58	IRON_FENCE_DEMO	Demolished Fence - Iron
C-FENC-IRON-E	253	IRON_FENCE	Existing Fence - Iron
C-FENC-IRON-F	217	IRON_FENCE	Future Fence - Iron
C-FENC-IRON-N	193	IRON_FENCE	New Fence - Iron
C-FENC-POST-D	58	POST_CABLE_FENCE_DEMO	Demolished Fence - Post&Cable
C-FENC-POST-E	253	POST_CABLE_FENCE	Existing Fence - Post&Cable
C-FENC-POST-F	217	POST_CABLE_FENCE_FUTURE	Future Fence - Post&Cable
C-FENC-POST-N	193	POST_CABLE_FENCE	New Fence - Post&Cable
C-FENC-STEL-D	58	CHAINLINK_FENCE_DEMO	Demolished Fence - Chainlink
C-FENC-STEL-E	253	CHAINLINK_FENCE	Existing Fence - Chainlink
C-FENC-STEL-F	217	CHAINLINK_FENCE	Future Fence - Chainlink
C-FENC-STEL-N	193	CHAINLINK_FENCE	New Fence - Chainlink
C-FENC-VINL-D	58	VINYL_FENCE_DEMO	Demolished Fence - Vinyl
C-FENC-VINL-E	253	VINYL_FENCE	Existing Fence - Vinyl
C-FENC-VINL-F	217	VINYL_FENCE	Future Fence - Vinyl
C-FENC-VINL-N	193	VINYL_FENCE	New Fence - Vinyl
C-FOPC-UNDR-D	58	BURIED_FIBER_OPTIC_DEMO	Demolished Buried Fibreoptic
C-FOPC-UNDR-E	253	FIBEROPTIC	Existing Buried Fibreoptic
C-FOPC-UNDR-F	217	BURIED_FIBER_OPTIC_FUTURE	Future Buried Fibreoptic
C-FOPC-UNDR-N	32	FIBEROPTIC	New Buried Fibreoptic
C-LEGL-LOTL-D	58	PROPERTY_LINE_DEMO	Demolished Legal lot/block linework
C-LEGL-LOTL-E	253	Continuous	Existing Legal lot/block linework
C-LEGL-LOTL-F	217	Continuous	Future Legal lot/block linework

C-LEGL-LOTL-N	yellow	Continuous	New Legal lot/block linework
C-MPIP-OIL-D	58	OIL_PIPELINE_DEMO	Demolished Oil pipeline
C-MPIP-OIL-E	253	OIL_PIPELINE	Existing Oil pipeline
C-MPIP-OIL-F	217	OIL_PIPELINE_FUTURE	Future Oil pipeline
C-MPIP-OIL-N	62	OIL_PIPELINE	New Oil pipeline
C-MPIP-SGAS-D	58	GAS_PIPELINE_DEMO	Demolished Gas pipeline
C-MPIP-SGAS-E	253	GAS_PIPELINE	Existing Gas pipeline
C-MPIP-SGAS-F	217	GAS_PIPELINE_FUTURE	Future Gas pipeline
C-MPIP-SGAS-N	52	GAS PIPELINE	New Gas pipeline
C-NGAS-PIPE-D	58	DASHDOT	Demolished Natural gas pipeline
C-NGAS-PIPE-E	253	HIDDEN	Existing Natural gas pipeline
C-NGAS-PIPE-F	217	HIDDEN	Future Natural gas pipeline
C-NGAS-PIPE-N	52	HIDDEN	New Natural gas pipeline
C-NGAS-UNDR-D	58	GAS_LINE_DEMO	Demolished Natural gas underground
C-NGAS-UNDR-E	253	GAS	Existing Natural gas underground
C-NGAS-UNDR-F	217	GAS_LINE_FUTURE	Future Natural gas underground
C-NGAS-UNDR-N	52	GAS	New Natural gas underground
C-PIPE-CASE-D	58	DASHDOT	Demolished Pipe Casing
C-PIPE-CASE-E	253	Continuous	Existing Pipe Casing
C-PIPE-CASE-F	217	DASHED	Future Pipe Casing
C-PIPE-CASE-N	yellow	Continuous	New Pipe Casing
C-POND-DRAN-D	58	Continuous	Demolished Ponding Drainage
C-POND-DRAN-E	253	Continuous	Existing Ponding Drainage
C-POND-DRAN-F	217	Continuous	Future Ponding Drainage
C-POND-DRAN-N	93	Continuous	New Ponding Drainage
C-POWR-EQPM-D	58	Continuous	Demolished Power Equipment
C-POWR-EQPM-E	253	Continuous	Existing Power Equipment
C-POWR-EQPM-F	252	Continuous	Future Power Equipment
C-POWR-EQPM-N	190	Continuous	New Power Equipment
C-POWR-LITE-D	58	Continuous	Demolished Power Lightpole
C-POWR-LITE-E	253	Continuous	Existing Power Lightpole
C-POWR-LITE-F	217	Continuous	Future Power Lightpole
C-POWR-LITE-N	190	Continuous	New Power Lightpole
C-POWR-OVHD-D	58	OVERHEAD_POWER_DEMO	Demolished Overhead Powerline
C-POWR-OVHD-E	253	OVERHEAD_POWER	Existing Overhead Powerline
C-POWR-OVHD-F	217	OVERHEAD_POWER_FUTURE	Future Overhead Powerline

C-POWR-OVHD-N	242	OVERHEAD_POWER	New Overhead Powerline
C-POWR-POLE-D	58	Continuous	Demolished Powerpole
C-POWR-POLE-E	253	Continuous	Existing Powerpole
C-POWR-POLE-F	217	Continuous	Future Powerpole
C-POWR-POLE-N	yellow	Continuous	New Powerpole
C-POWR-STRC-D	58	DASHDOT	Demolished Power Structure
C-POWR-STRC-E	253	DASHED	Existing Power Structure
C-POWR-STRC-F	8	DASHED	Future Power Structure
C-POWR-STRC-N	40	DASHED	New Power Structure
C-POWR-UNDR-D	58	BURIED_POWER_DEMO	Demolished Underground power
C-POWR-UNDR-E	253	POWER	Existing Underground power
C-POWR-UNDR-F	217	BURIED_POWER_FUTURE	Future Underground power
C-POWR-UNDR-N	242	POWER	New Underground power
C-PROP-ROW-REQD-N	red	Continuous	Proposed Right of Way Required
C-PROP-ROW-SURP-N	62	Continuous	Proposed Right of Way Surplus
C-RAIL-EQPM-D	58	Continuous	Demolished Rail Equipment
C-RAIL-EQPM-E	253	Continuous	Existing Rail Equipment
C-RAIL-EQPM-F	217	DASHED	Future Rail Equipment
C-RAIL-EQPM-N	132	Continuous	New Rail Equipment
C-RAIL-TRAK-D	58	Continuous	Demolished Rail Track
C-RAIL-TRAK-E	253	Continuous	Existing Rail Track
C-RAIL-TRAK-F	217	DASHED	Future Rail Track
C-RAIL-TRAK-N	71	Continuous	New Rail Track
C-ROAD-ASPH-D	58	DOT	Demolished Road Asphalt
C-ROAD-ASPH-E	green	DOT	Existing Road Asphalt
C-ROAD-ASPH-F	217	DASHED	Future Road Asphalt
C-ROAD-ASPH-N	133	Continuous	New Road Asphalt
C-ROAD-ASPH-PATT-D	58	Continuous	Demolished Asphalt Hatch
C-ROAD-ASPH-PATT-E	254	Continuous	Existing Asphalt Hatch
C-ROAD-ASPH-PATT-F	254	Continuous	Future Asphalt Hatch
C-ROAD-ASPH-PATT-N	254	Continuous	New Asphalt Hatch
C-ROAD-BARR-D	58	Continuous	Demolished Barrier
C-ROAD-BARR-E	253	Continuous	Existing Barrier
C-ROAD-BARR-F	217	DASHED	Future Barrier
C-ROAD-BARR-N	yellow	Continuous	New Barrier
C-ROAD-CONC	10	Continuous	Concrete

C-ROAD-CONC-D	58	DASHDOT	Demolished Concrete
C-ROAD-CONC-E	253	HIDDEN2	Existing Concrete
C-ROAD-CONC-F	217	Continuous	Future Concrete
C-ROAD-CURB-BACK-D	58	Continuous	Demolished Back of Curb
C-ROAD-CURB-BACK-E	253	Continuous	Existing Back of Curb
C-ROAD-CURB-BACK-F	217	HIDDEN2	Future Back of Curb
C-ROAD-CURB-BACK-N	22	Continuous	New Back of Curb
C-ROAD-CURB-D	58	Continuous	Demolished Lip of Gutter
C-ROAD-CURB-E	253	Continuous	Existing Lip of Gutter
C-ROAD-CURB-F	217	HIDDEN2	Future Lip of Gutter
C-ROAD-CURB-FACE-D	58	Continuous	Demolished Face of Curb
C-ROAD-CURB-FACE-E	253	Continuous	Existing Face of Curb
C-ROAD-CURB-FACE-F	217	HIDDEN2	Future Face of Curb
C-ROAD-CURB-FACE-N	yellow	Continuous	New Face of Curb
C-ROAD-CURB-N	red	Continuous	New Lip of Gutter
C-ROAD-GRVL-PATT-D	58	Continuous	Demolished Gravel Hatch
C-ROAD-GRVL-PATT-E	9	Continuous	Existing Gravel Hatch
C-ROAD-GRVL-PATT-F	217	Continuous	Future Gravel Hatch
C-ROAD-GRVL-PATT-N	yellow	Continuous	New Gravel Hatch
C-ROAD-NOTE-D	58	DASHDOT	Demolished Road Design Text
C-ROAD-NOTE-E	253	Continuous	Existing Road Design Text
C-ROAD-NOTE-F	217	DASHED	Future Road Design Text
C-ROAD-NOTE-LOG-D	58	Continuous	Demolished Lip of Gutter Text
C-ROAD-NOTE-LOG-E	253	Continuous	Existing Lip of Gutter Text
C-ROAD-NOTE-LOG-F	217	Continuous	Future Lip of Gutter Text
C-ROAD-NOTE-LOG-N	red	Continuous	New Lip of Gutter Text
C-ROAD-NOTE-N	11	Continuous	New Road Design Text
C-ROAD-PATT-D	58	Continuous	Demolished Various Road Hatches
C-ROAD-PATT-E	253	Continuous	Existing Various Road Hatches
C-ROAD-PATT-F	217	Continuous	Future Various Road Hatches
C-ROAD-PATT-N	40	Continuous	New Various Road Hatches
C-ROAD-SIGN-D	58	Continuous	Demolished Signage
C-ROAD-SIGN-E	253	Continuous	Existing Signage
C-ROAD-SIGN-F	217	Continuous	Future Signage
C-ROAD-SIGN-N	41	Continuous	New Signage
C-ROAD-SWLK-D	58	DASHDOT	Demolished Sidewalk

C-ROAD-SWLK-E	253	Continuous	Existing Sidewalk
C-ROAD-SWLK-F	217	HIDDEN2	Future Sidewalk
C-ROAD-SWLK-N	11	Continuous	New Sidewalk
C-ROAD-WHIT-D	58	DASHDOT	Demolished White paint markings
C-ROAD-WHIT-E	253	Continuous	Existing White paint markings
C-ROAD-WHIT-F	217	DASHED	Future White paint markings
C-ROAD-WHIT-N	white	Continuous	New White paint markings
C-ROAD-YELO-D	58	DASHDOT	Demolished Yellow paint markings
C-ROAD-YELO-E	253	Continuous	Existing Yellow paint markings
C-ROAD-YELO-F	217	DASHED	Future Yellow paint markings
C-ROAD-YELO-N	yellow	Continuous	New Yellow paint markings
C-SERV-D	58	Continuous	Demolished Lot Service
C-SERV-E	253	Continuous	Existing Lot Service
C-SERV-F	217	Continuous	Future Lot Service
C-SERV-N	11	Continuous	New Lot Service
C-SITE-FURN-D	58	Continuous	Demolished Site Furniture
C-SITE-FURN-E	253	Continuous	Existing Site Furniture
C-SITE-FURN-F	217	HIDDEN	Future Site Furniture
C-SITE-FURN-N	red	Continuous	New Site Furniture
C-SITE-TREE-D	58	Continuous	Demolished Site Trees
C-SITE-TREE-E	253	Continuous	Existing Site Trees
C-SSWR-CPLR-D	58	DASHDOT	Demolished Sanitary coupler
C-SSWR-CPLR-E	9	Continuous	Existing Sanitary coupler
C-SSWR-CPLR-F	217	Continuous	Future Sanitary coupler
C-SSWR-CPLR-N	33	Continuous	New Sanitary coupler
C-SSWR-FRCM-D	58	SANITARY_FORCEMAIN_DEMO	Demolished Sanitary Forcemain
C-SSWR-FRCM-E	253	SANITARY_FORCEMAIN	Existing Sanitary Forcemain
C-SSWR-FRCM-F	217	SANITARY_FORCEMAIN_FUTURE	Future Sanitary Forcemain
C-SSWR-FRCM-N	23	SANITARY_FORCEMAIN	New Sanitary Forcemain
C-SSWR-MHOL-D	58	DASHDOT	Demolished Sanitary Manhole
C-SSWR-MHOL-E	253	Continuous	Existing Sanitary Manhole
C-SSWR-MHOL-F	217	DASHED	Future Sanitary Manhole
C-SSWR-MHOL-N	20	Continuous	New Sanitary Manhole
C-SSWR-PIPE-D	58	Continuous	Demolished Sanitary Pipe
C-SSWR-PIPE-E	253	Continuous	Existing Sanitary Pipe
C-SSWR-PIPE-F	217	Continuous	Future Sanitary Pipe

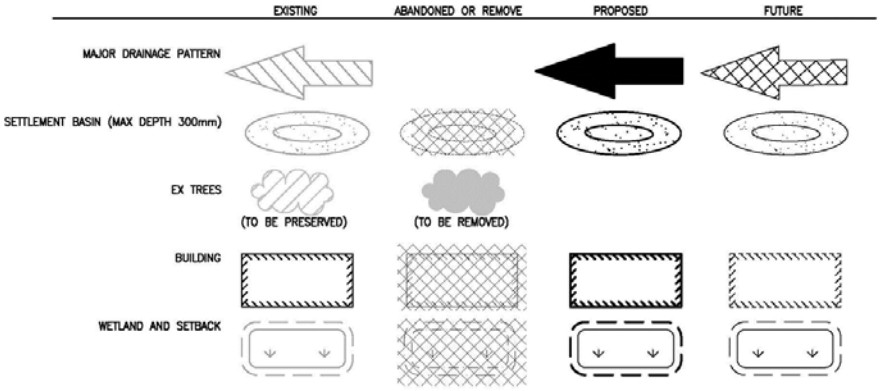
C-SSWR-PIPE-N	23	Continuous	New Sanitary Pipe
C-SSWR-PLUG-D	58	DASHDOT	Demolished Sanitary Plug
C-SSWR-PLUG-E	253	Continuous	Existing Sanitary Plug
C-SSWR-PLUG-F	217	Continuous	Future Sanitary Plug
C-SSWR-PLUG-N	23	Continuous	New Sanitary Plug
C-SSWR-UNDR-D	58	SANITARY_SEWER_DEMO	Demolished Sanitary Main
C-SSWR-UNDR-E	253	SANSEWERLINE	Existing Sanitary Main
C-SSWR-UNDR-F	217	SANITARY_SEWER_FUTURE	Future Sanitary Main
C-SSWR-UNDR-N	23	SANSEWERLINE	New Sanitary Main
C-STRM-CBMH-D	58	DASHDOT	Demolished Storm Catchbasin Manhole
C-STRM-CBMH-E	253	Continuous	Existing Storm Catchbasin Manhole
C-STRM-CBMH-F	217	DASHED	Future Storm Catchbasin Manhole
C-STRM-CBMH-N	90	Continuous	New Storm Catchbasin Manhole
C-STRM-CBSN-D	58	DASHDOT	Demolished Storm Catchbasin
C-STRM-CBSN-E	253	Continuous	Existing Storm Catchbasin
C-STRM-CBSN-F	217	DASHED	Future Storm Catchbasin
C-STRM-CBSN-N	93	Continuous	New Storm Catchbasin
C-STRM-CULV-D	58	DASHDOT	Demolished Storm Culvert
C-STRM-CULV-E	253	Continuous	Existing Storm Culvert
C-STRM-CULV-F	217	DASHED	Future Storm Culvert
C-STRM-CULV-N	90	Continuous	New Storm Culvert
C-STRM-PLUG-D	58	Continuous	Demolished Storm Plug
C-STRM-PLUG-E	253	Continuous	Existing Storm Plug
C-STRM-PLUG-F	217	Continuous	Future Storm Plug
C-STRM-PLUG-N	90	Continuous	New Storm Plug
C-STRM-POND-DRAN-D	58	Continuous	Demolished Storm Pond Drainage
C-STRM-POND-DRAN-E	253	Continuous	Existing Storm Pond Drainage
C-STRM-POND-DRAN-F	217	Continuous	Future Storm Pond Drainage
C-STRM-POND-DRAN-N	93	Continuous	New Storm Pond Drainage
C-STRM-UNDR-D	58	STORM_SEWER_DEMO	Demolished Storm main
C-STRM-UNDR-E	253	STORMSEWERLINE	Existing Storm main
C-STRM-UNDR-F	217	STORM_SEWER_FUTURE	Future Storm main
C-STRM-UNDR-N	93	STORMSEWERLINE	New Storm main
C-TOPO-MAJR	yellow	Continuous	Major topographic contours
C-TOPO-MAJR-E	253	DASHED	Existing Major topographic contours
C-TOPO-MAJR-F	217	DASHED	Future Major topographic contours

C-TOPO-TREE-E	253	Continuous	Existing Surveyed Treeline
C-TRAN-STOP-D	253	Continuous	Demolished Transit Stop
C-TRAN-STOP-E	253	Continuous	Existing Transit Stop
C-TRAN-STOP-F	8	Continuous	Future Transit Stop
C-TRAN-STOP-N	white	Continuous	New Transit Stop
C-WALL-RTWL-D	58	DASHDOT	Demolished Retaining Wall
C-WALL-RTWL-E	253	DASHDOT	Existing Retaining Wall
C-WALL-RTWL-F	252	DASHDOT	Future Retaining Wall
C-WALL-RTWL-N	22	DASHDOT	New Retaining Wall
C-WATR-CAV-D	58	DASHDOT	Demolished Water Combined Air Valve
C-WATR-CAV-E	253	Continuous	Existing Water Combined Air Valve
C-WATR-CAV-F	217	Continuous	Future Water Combined Air Valve
C-WATR-CAV-N	133	Continuous	New Water Combined Air Valve
C-WATR-FHYD-D	58	DASHDOT	Demolished Fire Hydrant
C-WATR-FHYD-E	253	Continuous	Existing Fire Hydrant
C-WATR-FHYD-F	217	DASHED	Future Fire Hydrant
C-WATR-FHYD-N	130	Continuous	New Fire Hydrant
C-WATR-STRC-D	58	DASHDOT	Demolished Water Fittings
C-WATR-STRC-E	253	Continuous	Existing Water Fittings
C-WATR-STRC-F	217	Continuous	Future Water Fittings
C-WATR-STRC-N	130	Continuous	New Water Fittings
C-WATR-UNDR-D	58	WATER_MAIN_DEMO	Demolished Water Main
C-WATR-UNDR-E	253	WATERLINE	Existing Water Main
C-WATR-UNDR-F	217	WATER_MAIN_FUTURE	Future Water Main
C-WATR-UNDR-N	133	WATERLINE	New Water Main
C-WATR-VALV-D	58	DASHDOT	Demolished Water Valve
C-WATR-VALV-E	253	Continuous	Existing Water Valve
C-WATR-VALV-F	217	Continuous	Future Water Valve
C-WATR-VALV-N	130	Continuous	New Water Valve
C-WATR-WELL-D	58	DASHDOT	Demolished Water Well
C-WATR-WELL-E	253	Continuous	Existing Water Well
C-WATR-WELL-F	217	Continuous	Future Water Well
C-WATR-WELL-N	152	Continuous	New Water Well
C-WELL-GAS-D	58	Continuous	Demolished Gas Well
C-WELL-GAS-E	253	Continuous	Existing Gas Well
C-WELL-GAS-F	252	Continuous	Future Gas Well

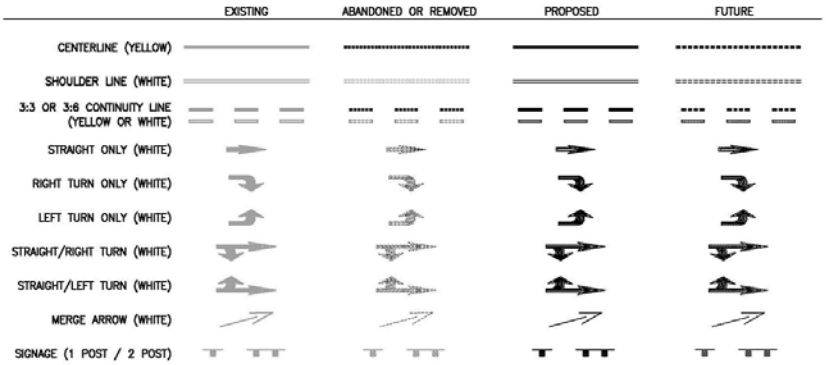
C-WELL-GAS-N	211	Continuous	New Gas Well
C-WELL-OIL-D	58	DASHDOT	Demolished Oil Well
C-WELL-OIL-E	253	Continuous	Existing Oil Well
C-WELL-OIL-F	217	Continuous	Future Oil Well
C-WELL-OIL-N	211	Continuous	New Oil Well
Defpoints	white	Continuous	NO PLOT LAYER
G-ANNO-D	58	Continuous	Demolished General Annotation
G-ANNO-E	253	Continuous	Existing General Annotation
G-ANNO-F	217	Continuous	Future General Annotation
G-ANNO-N	211	Continuous	New General Annotation
V-SURV-ASCM-E	253	Continuous	Survey discipline layer - Existing ASCM
V-SURV-BNCH-MARK-E	253	Continuous	Survey discipline layer - Existing Benchmark
V-SURV-POST-E	253	Continuous	Survey discipline layer - Existing Iron Post
V-SURV-POST-N	191	Continuous	Survey discipline layer - New Iron Post

3.9 APPENDIX C – BLOCK AND HATHING LIBRARIES

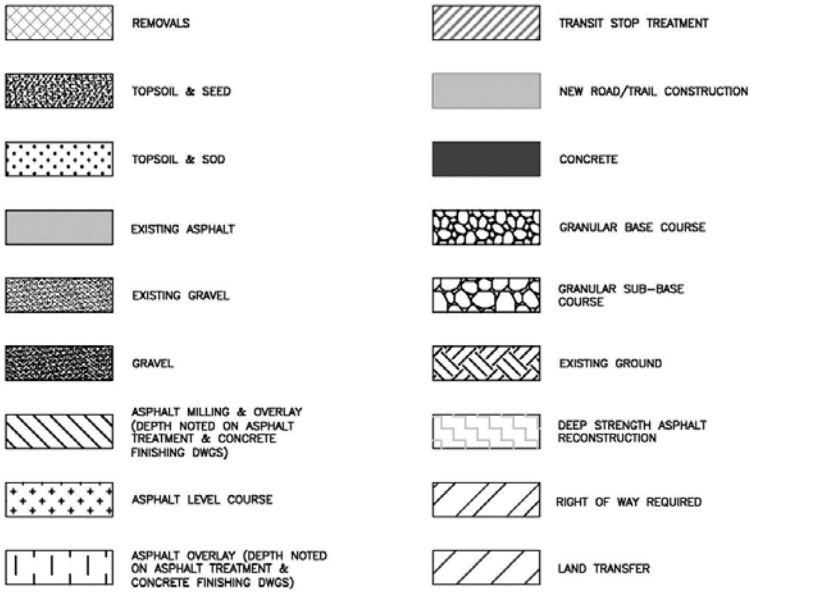
SURFACE WORKS CONTINUED

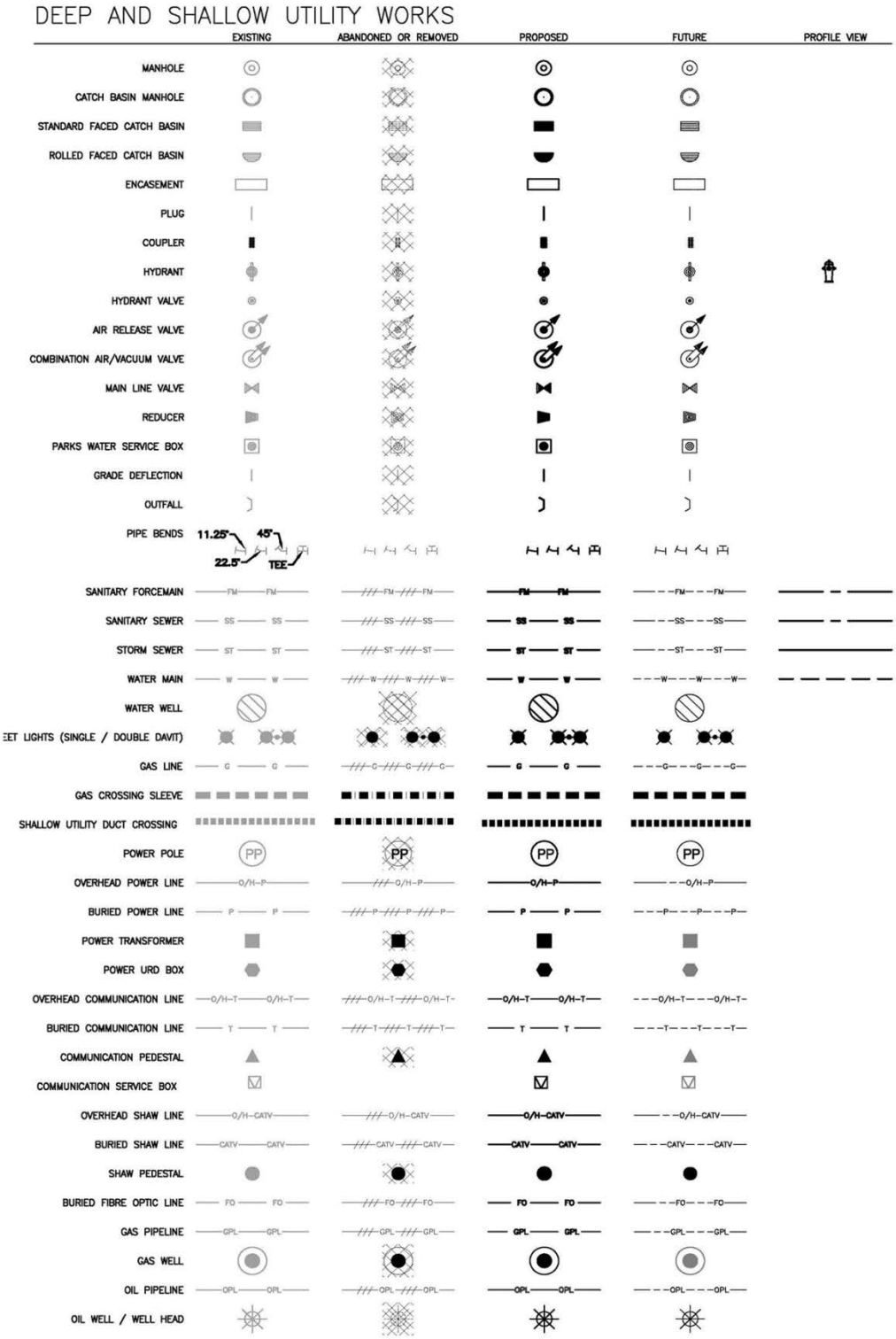


SIGNAGE & PAVEMENT MARKINGS



HATCH PATTERNS




DEEP AND SHALLOW UTILITY WORKS
EXISTING
ABANDONED OR REMOVED
PROPOSED
FUTURE
PROFILE VIEW
MANHOLE
CATCH BASIN MANHOLE
STANDARD FACED CATCH BASIN
ROLLED FACED CATCH BASIN
ENCASEMENT
PLUG
COUPLER
HYDRANT
HYDRANT VALVE
AIR RELEASE VALVE
COMBINATION AIR/VACUUM VALVE
MAIN LINE VALVE
REDUCER
PARKS WATER SERVICE BOX
GRADE DEFLECTION
OUTFALL
PIPE BENDS
11.25°
45°
22.5°
TEE
SANITARY FORCEMAIN
SANITARY SEWER
STORM SEWER
WATER MAIN
WATER WELL
EET LIGHTS (SINGLE / DOUBLE DAVIT)
GAS LINE
GAS CROSSING SLEEVE
SHALLOW UTILITY DUCT CROSSING
POWER POLE
OVERHEAD POWER LINE
BURIED POWER LINE
POWER TRANSFORMER
POWER URD BOX
OVERHEAD COMMUNICATION LINE
BURIED COMMUNICATION LINE
COMMUNICATION PEDESTAL
COMMUNICATION SERVICE BOX
OVERHEAD SHAW LINE
BURIED SHAW LINE
SHAW PEDESTAL
BURIED FIBRE OPTIC LINE
GAS PIPELINE
GAS WELL
OIL PIPELINE
OIL WELL / WELL HEAD

3.10 APPENDIX D – GIS DATA DICTIONARY

*Data Dictionary is subject to change. Current version can be found on the Municipalities website.

https://www.rmwb.ca/en/permits-and-development/engineering-servicing-standards.aspx

Global Domains

Facility status

DomainName	***dsSTAT***
Description	Facility status
FieldType	String
DomainType	CodedValue

Code	Description
Abandoned	Abandoned
Active	Active
Disposed	Disposed
IFC	Issued For Construction
NIS	Not In Service
Proposed	Proposed
Unknown	Unknown

Rehab types

DomainName	***Rehab***
Description	Rehab treatment types
FieldType	String
DomainType	CodedValue

Code	Description
CIPP	Cured-in-Place
Other	Other
Sliplining	Sliplining

Deep Utility Domains

Material types

DomainName	***duMATL***
Description	Deep utilities material types
FieldType	String
DomainType	CodedValue

Code	Description
AC	Asbestos Cement
CI	Cast Iron
CMP	Corrugated Metal Pipe
CONC	Concrete
Copper	Copper
CSP	Corrugated Steel Pipe
DI	Ductile Iron
FPVC	Fusible PVC
HDPE	High-Density Polyethylene
Other	Other
PC	Polymer Concrete
PE	Polyethylene
PP	Polypropylene
PVC	Polyvinyl Chloride
RC	Reinforced Concrete
RCL	Reinforced Concrete With Liner
STL	Steel
SWSP	Smooth Wall Steel Pipe
VCP	Vitrified Clay Pipe

Water Distribution Systems Domains

Node types		Line types		Polygon types	
DomainName	***ds_wN***	DomainName	***ds_wLN***	DomainName	***ds_wPY***
Description	Water node types	Description	Water line types	Description	Water polygon types
FieldType	String	FieldType	String	FieldType	String
DomainType	CodedValue	DomainType	CodedValue	DomainType	CodedValue

Code	Description
Adapter	Fitting - Adapter
Bend	Fitting - Bend
Cap	Fitting - Cap
Coupling	Fitting - Coupling
Cross	Fitting - Cross
Elbow	Fitting - Elbow
Flange	Fitting - Flange
FP	Fitting - Flush Point
Nipple	Fitting - Nipple
Plug	Fitting - Plug
Reducer	Fitting - Reducer
ST	Fitting - Saddle Tee
Tee	Fitting - Tee
Wye	Fitting - Wye
Hydrant	Hydrant - Fire Hydrant
Other	Other
Chamber	Structure - Chamber
PS	Structure - Pump Station
VC	Structure - Valve Chamber
Valve	Valve
ARV	Valve - Air Release
BOV	Valve - Blow Off
BV	Valve - Butterfly
CV	Valve - Check
CLV	Valve - Cleanout
GV	Valve - Gate
HV	Valve - Hydrant
PRV	Valve - PRV
SV	Valve - Service
VV	Valve - Vacuum
VB	Valve - with Bypass

Code	Description
HL	Hydrant Lead
Intake	Intake
Main	Main
Other	Other
SC	Service Connection
TF	Trickle Fill
TRANS	Transmission
Trunk	Water Trunk

Code	Description
Other	Other
Pumphouse	Pumphouse
Reservoir	Reservoir
RPVC	PRV Chamber
RWS	Raw Water Storage
Tank	Tank
WTP	Water Treatment Plant

Sanitary Sewer Systems Domains

Node types		Line types		Polygon types	
DomainName	***ds_ssN***	DomainName	***ds_ssLN***	DomainName	***ds_ssPY***
Description	Sanitary sewer node types	Description	Sanitary sewer line types	Description	Sanitary sewer structure types
FieldType	String	FieldType	String	FieldType	String
DomainType	CodedValue	DomainType	CodedValue	DomainType	CodedValue

Code	Description
Bend	Fitting - Bend
Coupling	Fitting - Coupling
Cross	Fitting - Cross
Flange	Fitting - Flange
FP	Fitting - Flush Point
Plug	Fitting - Plug
Reducer	Fitting - Reducer
Saddle	Fitting - Saddle
Tee	Fitting - Tee
Wye	Fitting - Wye
MH	Manhole
CTRLMH	Manhole - Control
DMH	Manhole - Drop
PMH	Manhole - Perched
MHT	Manhole - Tee
Other	Other
BG	Structure - Backflow Gate
Chamber	Structure - Chamber
Cleanout	Structure - Cleanout
Inlet	Structure - Inlet
SG	Structure - Sluice Gate
Weir	Structure - Weir
Valve	Valve
ARV	Valve - Air Release
BV	Valve - Butterfly
CV	Valve - Check
GV	Valve - Gate
IV	Valve - Isolation
PRV	Valve - PRV
VV	Valve - Vacuum
VB	Valve - with Bypass

Code	Description
FM	Force Main
LP	Low-pressure
Other	Other
SC	Service Connection
Siphon	Siphon
SS	Sanitary Sewer
ST	Sanitary Trunk

Code	Description
Chamber	Chamber
HT	Holding Tank
LS	Lift Station
MP	Mud Pit
Other	Other
RT	Rock Trap
SHT	Sewage Holding Tank
SL	Sewage Lagoon
STF	Sludge Treatment Facility
WWTP	Wastewater Treatment Plant

Stormwater Systems Domains

Node types

DomainName	***ds_stN***
Description	Storm sewer node types
FieldType	String
DomainType	CodedValue

Code	Description
CB	Catch Basin
Bend	Fitting - Bend
Outlet	Fitting - Outlet
Plug	Fitting - Plug
Reducer	Fitting - Reducer
Saddle	Fitting - Saddle
MH	Manhole
CBMH	Manhole - Catch Basin
CTRLMH	Manhole - Control
DMH	Manhole - Drop
PMH	Manhole - Perched
MHT	Manhole - Tee
Other	Other
Structure	Structure
Chamber	Structure - Chamber
Cleanout	Structure - Cleanout
Inlet	Structure - Inlet
Outfall	Structure - Outfall
SG	Structure - Sluice Gate
STS	Structure - Storm Treatment System (small)

Line types

DomainName	***ds_stLN***
Description	Storm line types
FieldType	String
DomainType	CodedValue

Code	Description
CBL	Catch Basin Lead
CS	Concrete Swale
Culvert	Culvert
Ditch	Ditch
FM	Force Main
LP	Low-pressure
OC	Open Channel
Other	Other
SC	Service Connection
Siphon	Siphon
SS	Storm Sewer

Polygon types

DomainName	***ds_stPY***
Description	Storm sewer polygon types
FieldType	String
DomainType	CodedValue

Code	Description
DP	Dry Pond
Other	Other
STS	Storm Treatment System
Wetland	Wetland
WP	Wet Pond

Utility Ducts Domains

Material types		Ducts line types		Ducts node types		List of Users	
DomainName	*suMATL*	DomainName	*udLN*	DomainName	*udN*	DomainName	*suUser*
Description	Shallow utilities material types	Description	Utility ducts line type	Description	Utility ducts node types	Description	Shallow utilities users
FieldType	String	FieldType	String	FieldType	String	FieldType	String
DomainType	CodedValue	DomainType	CodedValue	DomainType	CodedValue	DomainType	CodedValue
Code	**Description**	**Code**	**Name**	**Code**	**Name**	**Code**	**Description**
Cable	Cable	CS	Conduit (Single)	Bend	Bend	**Bell**	Bell Canada
CONC	Concrete	DB	Duct Bank	Chamber	Chamber	**Others**	Others
Copper	Copper	Other	Other	MS	Meter Socket	**Rogers**	Rogers Communications
Fiber	Fiber	Strand	Strand	PB	Pull Box	**Shaw**	Shaw Communications
Other	Other			Stub	Stub	**Telus**	Telus Communications
PVC	Polyvinyl Chloride			Vault	Vault	**RMWB**	Municipality
SC	Steel Casing			Other	Other		

Water_Node

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of node	*ds_wN*		true		
STATUS	Status	text	10	Facility status	*STAT*		true		
DIA	Diameter (mm)	short		The diameter of the facility (mm)			true	5	
MULTI_DIA	Multi-Diameter (mm)	text	20	For when facility has multiple diameters (e.g. 450x450x400)			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	*Rehab*		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Water_Line

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of water line	***ds_wLN***		true		
STATUS	Status	text	10	Facility status	***STAT***		true		
DIA	Diameter (mm)	short		The diameter of the facility (mm)			true	5	
MATERIAL	Material	text	10	Material type	***duMATL***		true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	***Rehab***		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
EUC	EUC ($/m)	double		Estimated unit cost ($/m)			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Water_Polygon

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of water polygon	*ds_wPY*		true		
STATUS	Status	text	10	Facility status	*STAT*		true		
DIM	Dimensions (m)	text	20	Dimensions of feature (e.g. 1.5mx2m)			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	*Rehab*		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		
DESC_	Description	text	100	Description of feature			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Sanitary_Node

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of node	*ds_ssN*		true		
STATUS	Status	text	10	Facility status	*STAT*		true		
DIA	Diameter (mm)	short	5	The diameter of the facility (mm)			true	5	
MULTI_DIA	Multi-Diameter (mm)	text	20	For when facility has multiple diameters (e.g. 450x450x400)			true		
SIZE	Barrel Size (mm)	short	5	Manhole barrel size			true	5	
RIM_ELEV	Rim Elevation (m)	double		The top elevation of manhole or catch basin frame, for instance			true		
DEPTH	Depth (m)	double		Depth from top/ground (ie. rim) to lowest invert			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	*Rehab*		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		

*__Attribute Domain__ are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Sanitary_Line

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of water line	***ds_ssLN***		true		
STATUS	Status	text	10	Facility status	***STAT***		true		
DIA	Diameter (mm)	short		The diameter of the facility (mm)			true	5	
MATERIAL	Material	text	10	Material type	***duMATL***		true		
US_INVERT	Upstream Invert (m)	double		Upstream Invert Elevation			true		
DS_INVERT	Downstream Invert (m)	double		Downstream Invert Elevation			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	***Rehab***		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
EUC	EUC ($/m)	double		Estimated unit cost ($/m)			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Sanitary_Polygon

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of polygon	*ds_ssPY*		true		
STATUS	Status	text	10	Facility status	*STAT*		true		
DIM	Dimensions (m)	text	20	Dimensions of feature (e.g. 1.5mx2m)			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	*Rehab*		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		
DESC_	Description	text	100	Description of feature			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Storm_Node

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of node	*ds_stN*		true		
STATUS	Status	text	10	Facility status	*STAT*		true		
DIA	Diameter (mm)	short	5	The diameter of the facility (mm)			true	5	
MULTI_DIA	Multi-Diameter (mm)	text	20	For when facility has multiple diameters (e.g. 450x450x400)			true		
SIZE	Barrel Size (mm)	short	5	Manhole barrel size			true	5	
RIM_ELEV	Rim Elevation (m)	double		The top elevation of manhole or catch basin frame, for instance			true		
DEPTH	Depth (m)	double		Depth from top/ground (ie. rim) to lowest invert			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	*Rehab*		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Storm_Line

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of water line	***ds_stLN***		true		
STATUS	Status	text	10	Facility status	***STAT***		true		
DIA	Diameter (mm)	short		The diameter of the facility (mm)			true	5	
MATERIAL	Material	text	10	Material type	***duMATL***		true		
US_INVERT	Upstream Invert (m)	double		Upstream Invert Elevation			true		
DS_INVERT	Downstream Invert (m)	double		Downstream Invert Elevation			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	***Rehab***		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
EUC	EUC ($/m)	double		Estimated unit cost ($/m)			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Storm_Polygon

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of polygon	*ds_stPY*		true		
STATUS	Status	text	10	Facility status	*STAT*		true		
DIM	Dimensions (m)	text	20	Dimensions of feature (e.g. 1.5mx2m)			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
REHAB	Rehab Treatment	text	10	Type of rehab treatment	*Rehab*		true		
REHAB_YR	Rehab Treatment Year	text	4	Year of rehab treatment			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		
DESC_	Description	text	100	Description of feature			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Duct_Line

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of line	***udLN***		true		
STATUS	Status	text	10	Facility status	***STAT***		true		
MATERIAL	Material	text	10	Material type	***suMATL***		true		
FROM_ELEV	From elevation (m)	double		From elevation			true		
TO_ELEV	To elevation (m)	double		To elevation			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
NUM	Number of Conduits	short		Total sum of conduits			true		
NUM_USED	Conduits in Use	short		Sum of occupied conduits			true		
USERS	User List	text	10	List of conduit users (e.g. TELUS, SHAW, BELL,.... etc.)	***suUser***		true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
EUC	EUC ($/m)	double		Estimated unit cost ($/m)			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

Duct_Node

Field	AliasName	Datatype	Length	Description	Attribute Domain*	DefaultValue	IsNullable	Precision	Scale
TYPE	Type	text	10	Type of node	*udN*		true		
STATUS	Status	text	10	Facility status	*STAT*		true		
SIZE	Size (mm)	short	5	Size of feature			true	5	
DIM	Dimensions (m)	text	20	Dimensions of feature (e.g. 1.5mx2m)			true		
RIM_ELEV	Rim Elevation (m)	double		The top/ground elevation of manhole grate, for instance.			true		
DEPTH	Depth (m)	double		Depth from top/ground to bottom elevation of feature.			true		
INSTL_YR	Installation Year	text	4	Year of Installation			true		
CCC	CCC Year	text	4	The year that Construction Complete Certificate (CCC) issued			true		
FAC	FAC Year	text	4	The year that Final Acceptance Certificate (FAC) issued			true		
INSTL_C	Installation Cost	double		Total installation cost of feature			true		
DISP_YR	Disposal Year	text	4	Year feature was disposed (if disposed)			true		

***Attribute Domain** are rules that describe the legal values of a field type, providing a method for enforcing data integrity.

*Allowed attribute values listed in **Domains (Data Submission)** tab.

3.11 APPENDIX E – SUBMISSION COMPLIANCE CHECKLIST

ITEM	COMPLIANCE	NOTES
Adobe PDF:		
General:		
Drawing does not exceed maximum size (610x915mm)		
North Arrow correctly orientated		
Proper scale, includes bar scale and "half size" note		
Limits of Construction and matchlines clearly shown		
Stationing shown and in correct orientation		
Legal pins, monuments and survey geometrics included		
Street names clearly indicated		
Boxed construction notes		
Standard detail references		
Proposed works clearly stand out from existing works		
Existing conditions shown		
Decimal places shown correctly		
Dimensions shown where needed		
Drawing package elements included (cover, index, etc.)		
"Notes" as per Drafting Standards 3.4.3		
Title Blocks:		
Project Name correct and on all sheets		
Project Number correct and on all sheets		
Drawing Sheet Numbers correct and on all sheets		
Engineer's stamp and signature		
Lettering:		
Unobstructed by linework		
Correct text styles used – height and size (min. 2.0mm)		
Vertical upper case		
Plan/Profiles:		
Plan/Profile proper layout (plan on top/profile on bottom)		
Utilities labelled (size, type & material (&grade in profile))		
Horizontal curve info included (BC, EC, PI, delta, L, R)		
Profile centerline to run parallel with horizontal grid lines		
Profile grid with correct spacing and labelling		
Profile utility information at the bottom of profile		
Profile road information located at top of profile		
Vertical curve information included (BVC, EVC, PI, L,		

ITEM	COMPLIANCE	NOTES
K)		
Profile and Plan view lined up vertically (where possible)		
Service connection inverts and locations table (includes inverts at property line and main)		
Services shown with dimensions to property line		
Information shown for crossings, property lines, etc.		
Roadwork, Underground, Details and Cross Sections:		
As per Engineering Servicing Standards and Development Procedures Manual		
DIGITALS:		
General:		
Same as above including:		
Provided a digital copy of drawing and project files		
Title sheets in paper space on individual layouts		
No purge or audit items – clean drawing		
RECORD (AS-CONSTRUCTED) SUBMISSIONS		
Adobe PDF:		
“Proposed” removed from all notes		
Record Drawing Revision shown in revision box with note		
Engineer’s stamp and signature		
Digitals:		
As-Constructed survey points file with description code list		
Correct AutoCAD version provided (including x-refs)		
Additional imagery, pen settings, etc. included if used		

3.12 APPENDIX F – SHEET TEMPLATES

REGIONAL MUNICIPALITY
OF WOOD BUFFALO

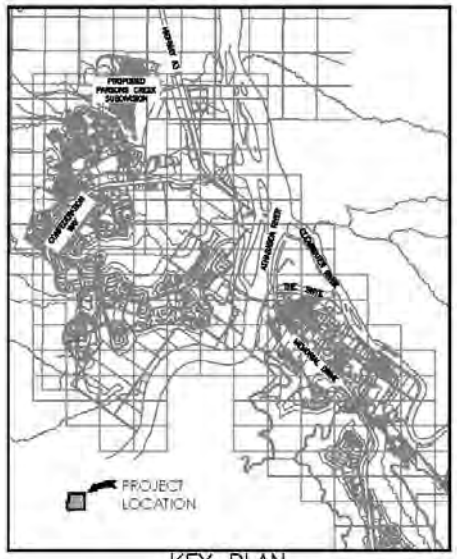
PROJECT NAME

CONTRACT NAME

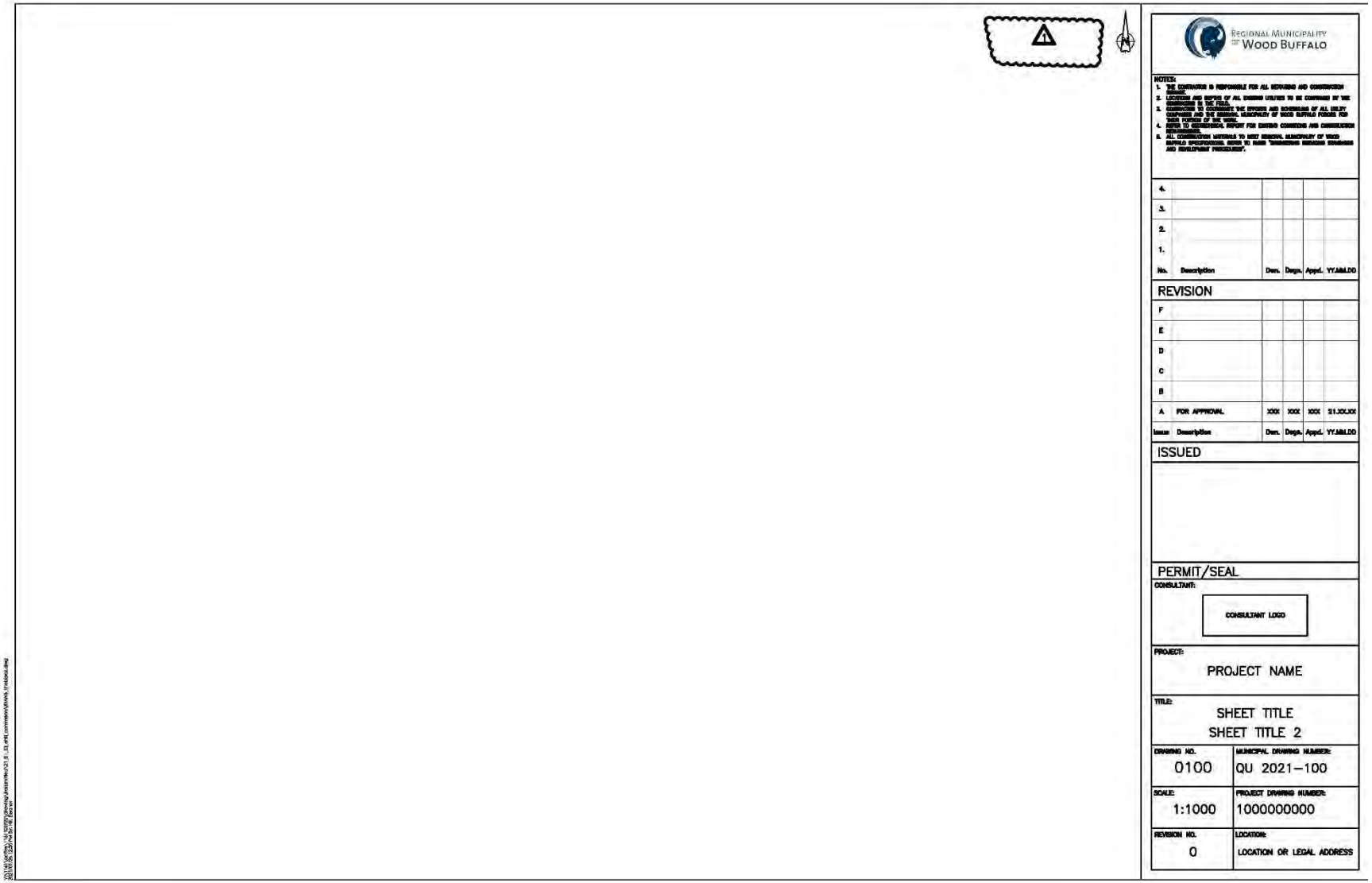
CONTRACT No. QU # XXXX

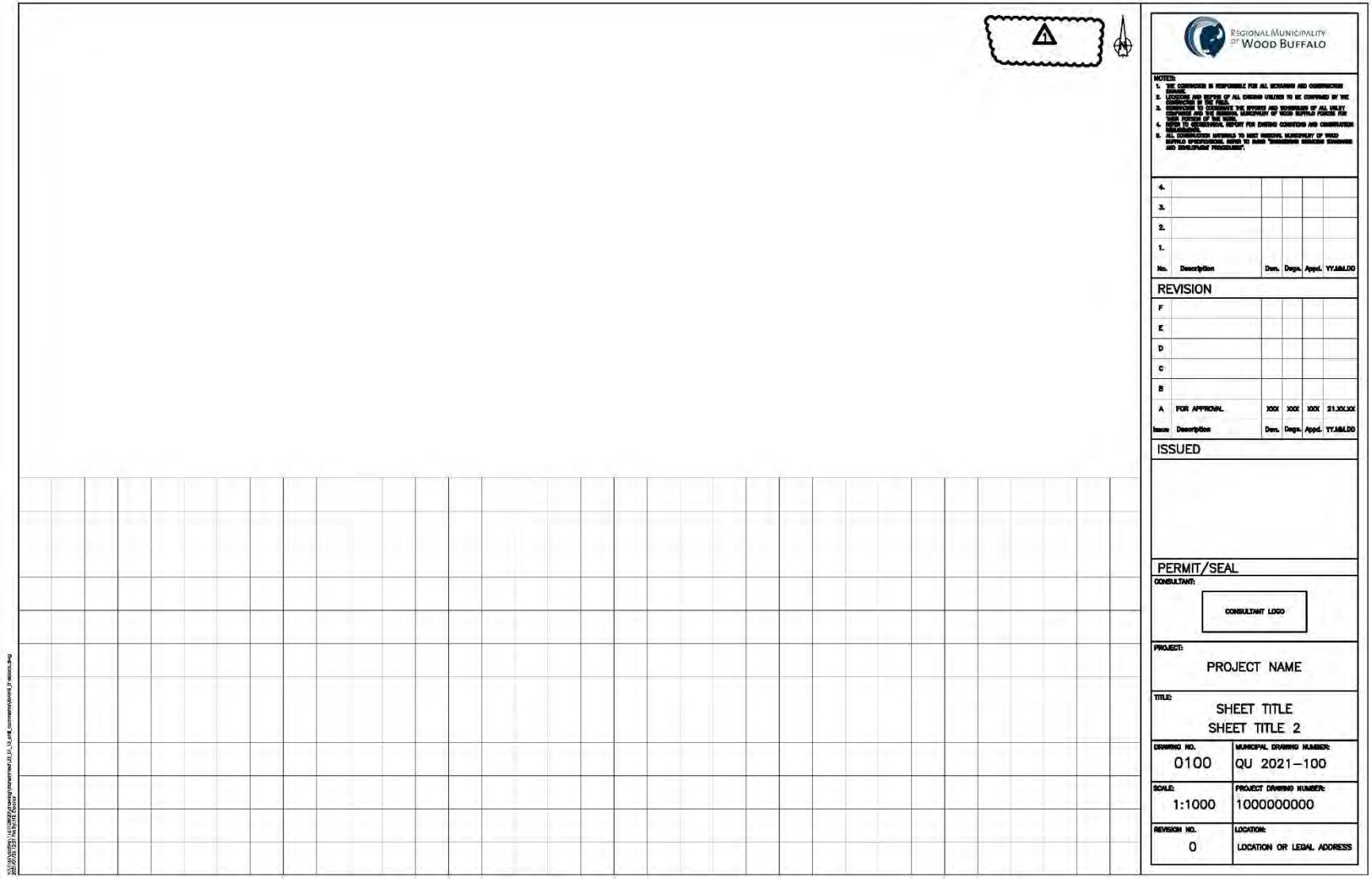
CONSULTANT PROJECT No. 1000000000

Date: YYYY-MMM-DD



KEY PLAN
SCALE: 1:5000


REGIONAL MUNICIPALITY OF WOOD BUFFALO
NOTES:
1. THE CONTRACTOR IS RESPONSIBLE FOR ALL REPAIRING AND CONSTRUCTION WORKS.
2. LOCATIONS AND DEPTHS OF ALL EXISTING UTILITIES TO BE CONFIRMED BY THE CONTRACTOR IN THE FIELD.
3. CONSTRUCTION TO CONFORM TO THE STUDIES AND DRAWINGS OF ALL UTILITY COMPANIES AND THE REGIONAL MUNICIPALITY OF WOOD BUFFALO FORMS FOR THIS PORTION OF THE WORK.
4. REFER TO GEOTECHNICAL REPORT FOR EXISTING CONDITIONS AND CONSTRUCTION RECOMMENDATIONS.
5. ALL CONSTRUCTION MATERIALS TO MEET REGIONAL MUNICIPALITY OF WOOD BUFFALO SPECIFICATIONS. REFER TO PART "ENGINEERING DESIGNS STANDARDS AND DEVELOPMENT PROCEDURES".
No. Description Dwn. Dsgn. Appd. YY.MM.DD
REVISION
Issue Description Dwn. Dsgn. Appd. YY.MM.DD
A FOR APPROVAL XXX XXX XXX 21.XX.XX
ISSUED
PERMIT/SEAL
CONSULTANT:
CONSULTANT LOGO
PROJECT:
PROJECT NAME
TITLE:
SHEET TITLE
SHEET TITLE 2
DRAWING NO.
0100
MUNICIPAL DRAWING NUMBER:
QU 2021–100
SCALE:
1:1000
PROJECT DRAWING NUMBER:
1000000000
REVISION NO.
0
LOCATION:
LOCATION OR LEGAL ADDRESS


REGIONAL MUNICIPALITY OF WOOD BUFFALO
NOTES:
1. THE CONTRACTOR IS RESPONSIBLE FOR ALL EXCAVATION AND CONSTRUCTION SAFETY.
2. LOCATIONS AND DEPTHS OF ALL EXISTING UTILITIES TO BE CONFIRMED BY THE CONTRACTOR IN THE FIELD.
3. CONTRACTOR TO COORDINATE THE EXTENT AND SCHEDULING OF ALL UTILITY CONSTRUCTION AND TIE SERVICES. INSPECTION BY WOOD BUFFALO FORCES FOR THESE PORTIONS OF THE WORK.
4. PRIOR TO CONSTRUCTION, REPORT FOR EXISTING CONDITIONS AND CONSTRUCTION SURVEY AS REQUIRED.
5. ALL CONSTRUCTION MATERIALS TO MEET REGIONAL MUNICIPALITY OF WOOD BUFFALO SPECIFICATIONS. REFER TO MOST "ENGINEERING SERVICING STANDARDS AND DEVELOPMENT PROCEDURES".
No. Description Dwn. Dsgn. Appd. YY.MM.DD
4.
3.
2.
1.
REVISION
F
E
D
C
B
A FOR APPROVAL XXX XXX XXX 21.XX.XX
Issue Description Dwn. Dsgn. Appd. YY.MM.DD
ISSUED
PERMIT/SEAL
CONSULTANT:
CONSULTANT LOGO
PROJECT:
PROJECT NAME
TITLE:
SHEET TITLE
SHEET TITLE 2
DRAWING NO.
0100
MUNICIPAL DRAWING NUMBER:
QU 2021-100
SCALE:
1:1000
PROJECT DRAWING NUMBER:
1000000000
REVISION NO.
0
LOCATION:
LOCATION OR LEGAL ADDRESS

4 Transportation, Roads and Sidewalks

4.1 GENERAL

This guideline covers the general design and construction standards of roads, lanes, curbs & gutters, sidewalks, boulevards, and accessories to be built or re-built in the Regional Municipality Wood Buffalo. Pedestrian trails and bike paths are covered in Section 10 – Landscape and Park Development Standards. Standard Drawings relating to roadway design and construction are provided at the end of this section.

4.1.1 Related Municipal Documents and Standards

The following municipal documents provide further details on the design, materials specifications, and installation procedures of traffic and transportation related infrastructure:

- Transportation Master Plan
- Traffic Impact Assessment Guidelines
- Standard Construction Specifications
- Guidelines for Design and Installation of Traffic Signals
- Utility Installation and Traffic Control Manual
- Area Structure Plan (ASP)

Further to these Engineering Servicing Standards, the Municipal Public Works Operational Standards document may apply to smaller work areas, such as patch work and street repairs, sidewalk and curb repairs, and other miscellaneous works. These Operational Standards may also apply to Infrastructure Rehabilitation projects. Contact the Public Works Department for more information.

4.2 TRAFFIC AND TRANSPORTATION ENGINEERING

4.2.1 General

All traffic and roadway designs shall ensure the safe and efficient movement of vehicular traffic and multimodal transportation including pedestrians, cyclists and persons with limited mobility.

The road network shall conform to the current Area Structure Plan and the Transportation Master Plan. The roadway design shall provide sufficient capacity for the anticipated traffic loads with consideration given for the following factors:

1. **Roadway Geometrics:** Road right-of-way, road width, lane width, turning lane storage lengths, road geometry, grade and curvature, intersection configuration,
2. **Traffic Characteristics:** Traffic volume, design speed, traffic composition, traffic fluctuations, level of service, saturation flow;
3. **Road "Frictions":** Traffic control measures, parking conditions, access locations and spacing, driver sight distance, street furniture, school zones, transit zones, etc.

4.2.2 Traffic Impact Assessment (TIA)

A Traffic Impact Assessments (TIA) is to be provided by the Consulting Engineer whenever a capital project or development proposal has a significant impact on traffic operations and on other components of the transportation system, or upon request of the Municipality. The TIA methodology is to meet the “Traffic Impact Assessment Guidelines” (January 2011 or latest), available on the Municipality website or from request to the Engineering Department.

The TIA is to clearly identify transportation improvements required, and the threshold at which these improvements must be implemented. These improvements may include additional lanes, left or right turning bays, signalizations, roundabout designs, etc.

4.2.3 Means of Access

Developments shall be designed in general conformance with the requirements of NFPA 1141 “Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas”, in particular Chapter 5 “Means of Access”

4.2.4 Intersection Spacing

Intersection spacing shall subscribe to Transportation Association of Canada (TAC) standards.

4.2.5 Auxiliary Lanes

An auxiliary lane will be required where access is required from an arterial to a proposed development. These auxiliary lanes to be designed in accordance with Transportation Association of Canada (TAC) standards and to have a minimum lane width of 3.7 meters.

Double left turn bay bill be permitted in some circumstances but the outside turning lane must be a minimum of 4.0 meters wide. Triple left turn bays will not be permitted because of safety concerns. The traffic volumes that would require a triple left turn shall be considered to trigger the need for a grade-separated interchange.

4.2.6 Roundabouts

Roundabout design shall be performed in accordance with Transportation Association of Canada's (TAC) Canadian Roundabout Design Guide. If TAC's guide does not provide the required information, then "Roundabout: An Informational Guide, Second Edition" (NCHRP Report 672, December 2010) should be referred to.

The design must depict the functional aspect of the roundabout, including but not limited to, horizontal geometry, design vehicle right turns, design vehicle left turns, entry path radii, path overlap tangents, entry angle and sightlines to the left, speed radios calculation and geometric design summary. The design must also include capacity analysis, traffic volumes, movements of design vehicles, safe pedestrian movements to cross the approaches, signage, road markings, illumination, grading, drainage, and landscaping.

AutoCAD drawings must be submitted for design review.

4.2.7 Roadside Safety

Roadside safety design is one component of roadway design. Roadside safety is defined as the design of the area between the outer edge of the roadway and the right of way limits. There are many reasons why a vehicle will leave the pavement and encroach on the roadside. Regardless of the reason for the vehicle leaving the roadway, a roadside environment free of fixed objects with stable, flattened slopes enhances the opportunity for reducing crash severity.

Design options for reducing roadside obstacles, in order of preference, are as follows:

1. Remove the obstacle
2. Redesign the obstacle so if can safely be traversed
3. Relocate the obstacle to a point where it is less likely to be struck
4. Reduce impact severity by using the 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 alternates are not appropriate

Design features, such as horizontal and vertical curvature, lane and shoulder widths, signing, pavement marking, etc. Play an important role in keeping the motorist on the travelled way.

Establishing a traversable and unobstructed roadside area (clear zone) extending beyond the edge of the traveled way, particularly on high-volume, high speed roadways will help prevent collisions with fixed objects. The term "clear-zone" is used to designate the unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles. The clear zone includes any shoulders or auxiliary lanes.

Roadside design features shall be designed in accordance with the Transportation Association of Canada Guide for Canadian Roads, and the latest Alberta Transportation Roadside Design Guide.

4.2.8 Traffic Calming

The use of traffic calming measures should be considered for new residential developments.

Traffic Calming as defined by Institute of Transportation Engineers as the combination of mainly physical measures that reduce the negative efforts of motor vehicles use, alter driver behavior and improve conditions for non-motorized street users." The purpose of traffic calming is to reduce vehicular speeds, discourage through traffic, minimize conflicts between street users, and improve the overall neighborhood environment.

The design of traffic calming measures, including speed humps, to be based on the Canadian Guide to Traffic Calming (Second Edition). The proposed measures will be approved on a case by case based on the submitted drawing details and other supporting documentation required by the Municipality.

4.2.9 Vertical Alignment

4.2.9.1 Roadway Grades

The minimum roadway grade for all new urban roadway classifications to be 0.5% and 0.3% for rehabilitated roadways. For curved roadways, expanded bulbs, cul-de-sacs, etc. the centerline roadway grade to be increased to ensure a minimum grade of 0.5% is maintained along the gutter pan. Maximum roadway grades are, for the different roadway classifications, is highlighted in table 4.1.

4.2.9.2 Vertical Curves

A vertical curve should be included in the design when a roadway grade change occurs in accordance with the following and TAC standards:
Length of the Vertical Curve is L=KA

- K is the vertical curve calculation factor (see table 4.1)
- A for K factors based on roadway classifications) A is the algebraic difference between the two grades.

Crest vertical curves are not required if length of the vertical curve is less than 20m on local roadways, 30m on collector roadways, and 40m on arterial roadways. Sag vertical curves are not required on any roadway if L is less than 15m.

4.2.10 Design Vehicles

Based on recommendations included in Transportation Association of Canada's (TAC) Geometric Design Guide for Canadian Roads (Chapter 2.4), the following design vehicles have been selected as being representative of vehicles operating in Canada:

1. Passenger Cars (P)**
2. Light Single-Unit Trucks (LSU)
3. Medium Single-Unit Trucks (MSU)
4. Heavy Single-Unit Trucks (HSU)**
5. WB-19 Tractor Semitrailers (WB-19)
6. WB-21 Tractor Semitrailers (WB-21)
7. A-Train Doubles (ATD)
8. B-Train Doubles (BTD)
9. Standard Single-Unit Buses (B-12)**
10. Articulated Buses (A-BUS)
11. Intercity Buses (I-BUS)

**Designates design vehicles selected as being representative of vehicles operating in the Regional Municipality of Wood Buffalo. The Engineering Consultant may specify the use of smaller or larger WB design vehicles in special circumstances.

NOTE: The minimum travel way designs for the HSU design vehicle will accommodate the single-unit truck, city transit bus, fire truck, garbage truck and other vehicles with similar wheelbase.

In addition to those vehicles listed above, the WB-21 semitrailer combination is common on Alberta roadways. As noted in the AT-HGDG, the WB-21 has the greatest off-tracking and may be used on any highway throughout the province without special permit. Therefore, this is generally the design vehicle that should be used at intersections or other locations where semitrailers are turning.

4.3 ROAD CLASSIFICATION AND GEOMETRIC STANDARDS

The classification and designation of roads and walkways shall be undertaken during the subdivision design stages, commencing with the outline plan and Area Structure Plan, in order that roads and walkways, utility and right-of-way requirements can be coordinated, established, and approved in the design stages of subdivision development.

4.3.1 General

1. Roads are classified in a functional hierarchy. The road classifications are local, collector and arterial for urban, and collector and local for rural.
2. The design standards for urban and rural streets shall be in accordance with the geometric design Standards outlined in the latest edition of the “Geometric Design Guide for Canadian Roads” - Transportation Association of Canada (TAC). In some instances, if not covered by TAC then the Alberta Transportation Highway Geometric Design Guide may be referenced.
3. Typical cross-sections are provided in Standard Drawings at the end of this section. The following Table - Road Classifications and Geometric Guidelines - provides a summary of the design Standards.
4. Alternatives to the Standard Road Classifications and Road Cross-Sections described in the Standard Drawings may be approved by the Municipality provided that the Developer is able to demonstrate that all functional, safety, operational, statutory, and architectural requirements can be met for all stakeholders and occupants on the street, including but not limited to the public, shallow and deep utilities, residents and occupants, street maintenance and transit.
5. For roadway rehabilitation in an existing neighbourhood, it may not be possible to meet the standard road cross-sections, because of right-of-way or other restrictions. In these situations, the Engineering Consultant shall provide a detailed cross-section for review and approval by the Municipality.
6. Intersections, including lane (back alley) approaches onto local and collector roads, are to be designed to consider the movement of municipal operation and emergency vehicles, Contact the Engineering department for specifics and design vehicles for the application.
7. No-Parking signs shall be installed to accommodate sightlines and vehicle movements. Signs are to be installed in new multi-lot subdivisions at the cost of the Developer.

Table 4.1A - 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
Parking	No	No	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted
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		
ESALS (2)	Note 2		1.35×10^6	5.4×10^5	2.7×10^6	9.0×10^4	8.6×10^5	8.6×10^5
Design Speed (km/h)	80	70	60	60	60	50	50	50
Posted Speed (km/h)	60-70	60	50	50	50	50	50	50
Road Width (m) (3)	23.0	16.0	13.0	11.5	14.0	10.0	12.0	13.0
Travel Lanes (m)	4 to 6@3.7	4 to 6@3.7	2 @ 3.7	N/A	2 @ 3.7	N/A	N/A	2 @ 3.7
Parking Lanes (parallel)	N/A	N/A	2 @ 2.55	N/A	2 @ 3.05	Permitted	Optional	2 @ 2.55
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	Multi-Use Trail (MUT) 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.		
Sidewalk Width (m)	3.0 Conc. or 3.0 ACP		1.5 Conc. or 3.0 ACP	1.5 Conc.	1.5 Conc. or 3 ACP(4)	1.5 Mono or Separate	1.5 Mono or Separate. (5)	
Min ROW Width (m)	37.0	30.0	25.0	20.5	26.0	Varies (5)	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 Stop Sight Dist (m)	139.4	110.8	84.6	84.6	84.6	62.8	62.8	62.8
K. Crest (m)	36	23	13	13	13	7	7	7
k. Sag (m)	16	12	9	9	14	6	6	6
Max super-elevation(m/m)	0.06	0.06	0.06	0.06	0.06	crowned	crowned	crowned

Notes: see notes, next page

Table 4.1B – Road Classifications and Geometric Guidelines - RURAL						
Classification	Rural Arterial / Municipal Highway		Collector (3)		Local (3)	
Sub-classification	Divided		Residential	Industrial / Commercial (1)	Residential	Industrial (1)
TAC Designation	RAD		RCU	RCU	RLU	RLU
Parking	No		No	No	No	No
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	
ESALS (2)	Note 2		1.35×10^6	2.7×10^6	9.0×10^4	8.6×10^5
Design Speed (km/h)	90		80	80	60	60
Posted Speed (km/h)	70-80		70	70	50	50
Road Width (m)	26.0		8.0	9.0	7.0	8.0
Travel Lanes (m)	4 to 6 @3.7		N/A	N/A	N/A	N/A
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 or 800 Semi-mountable		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	Regional Trail on back slope, where specified		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.			
Sidewalk Width (m)	3.0 Conc. or 3.0 ACP		2.5 ACP	2.5 ACP	1.5	1.5
Min ROW Width (m)	44.0		30.0	30.0	30.0	30.0
Max/Min Gradient (%)	8.0/0.5		6.0/0.5	6.0/0.5	8.0/0.58	8.0/0.5
Min Stop Sight Dist (m)	170		139.4	139.4	84.6	84.6
K. Crest (m)	55		36	36	13	13
k. Sag (m)	40		16	16	9	9
Max super-elevation(m/m)	0.08		0.08	0.08	0.02	0.02

Notes:

1. Industrial applies to light industrial. For heavy industrial application, provide suitable design.
2. Equivalent Single Axle Loads (ESALS) for arterial roadways are to be determined by engineering analysis by the Developer's engineer and approved by the Municipality.
3. For emergency access roads use the Rural Local Standard. For Commercial Service Roads use Rural Collector Standard.
4. For commercial land uses with street frontage, consider hard surfacing the entire boulevard space from curb to building face.
5. Refer to Standard Detail Drawings 4-100 and 4-101.
6. If the Area Structure Plan or Outline Plan contemplates a wider (2.5 m) sidewalk in Urban Commercial Areas, then the overall right of way for the road may increase to accommodate the wider sidewalk.
7. 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.

4.3.2 Arterial Roadways

Arterial roads generally serve as primary transportation corridors between regional hubs and activity centers, and should include consideration for the movement of people, vehicles, and goods. Arterials will connect to other arterials, highways, and collectors, but not local roads. Arterial roads can be subdivided into two categories:

1. Undivided carries up to 12,000 vehicles per day.
2. Divided carries more than 12,000 vehicles per day.

At the direction of the Municipality, divided arterial may be required where road geometry, grades, curvature, or other safety concerns warrant the inclusion of median separation.

On-street parking is not normally permitted on an arterial roadway.

Arterial Roadway Boulevard treatment refer to Section 10 Landscape and Park Development Standards.

4.3.3 Collector Roadways

Collector roads provide an interface between the arterial roadway system and several local roadways, collecting and distributing traffic through the transportation network. They also facilitate bus routes and transit shelters, and provide access to commercial and industrial developments, and other neighbourhood-level origin / destination hubs. A collector road can connect with local roadways, other collectors or with arterial roadways; however, their spatial layout should minimize the potential use as a short-cut between arterial roadways.

Parallel parking may be allowed on these roads. Single Family Residential driveways are not permitted on collector roadways.

4.3.4 Local Roadways

The local roadway is intended solely to provide access to individual properties and should be designed to accommodate a low volume of traffic. Traffic calming measures to reduce volumes and speeds are encouraged along local roadways, including minimizing the use of long straight lengths, and avoiding road layouts that would encourage short-cutting between collector roadways. The maximum length of a local roadway between adjacent intersections should be 600 m. A local roadway can connect with other local roads, collector roads, and back alleys. Subdivision layout should consider the use of cul-de-sacs, crescents, and “P-loops” consisting of local roads, connected to other local roads and collectors, as appropriate for the intended form and function of the subdivision. Local roadways are not intended to serve municipal transit or industry bus routes. School buses may be permitted.

Parallel parking on local roads will be permitted, both as a traffic calming measure and to supplement the on-site parking options for local users. However, all sites along local roads must meet the on-site parking requirements as described in the applicable zoning of the Land Use Bylaw.

Where Residential lots are rear loading (i.e., there is a back alley to facilitate access), the fronting road is to have straight-faced curb, and may have either monolithic sidewalk or separate sidewalk.

Where Residential lots are front-loading, the fronting road may follow one of two options:

1. Straight-faced curb with dropped curb sections at pre-determined driveway locations, and separate walk on a 19 m Right-of-Way: or
2. Rolled-faced curb with either monolithic sidewalk (on 18 m Right-of-Way) or separate sidewalk (on 19 m Right-of-Way).

4.3.5 Parking

All parking and parking stall dimensions shall meet the requirements of the Land Use Bylaw. All parking stalls should be graded such that no continuous slope in any direction is less than 0.5% and not more than 4.0%.

To accommodate parallel parking on urban local streets, adjacent driveways must be separated by either 2.0 m or a minimum of 9.0 m. Separation distances of between 2.0 m and 9.0 m, which do not accommodate the legal parking of a 6.0 m design vehicle, will not be permitted. The driveway location plan must be submitted with the Tentative Plan of Subdivision for review and approval.

The driveway separation requirement described above may be relaxed around the bulb of the cul-de-sac, as on-street parking will not be permitted.

Parking restrictions shall be applied around the bulb of cul-de-sacs. The Developer shall install No-Parking signs at the throat of the bulb of the cul-de-sac prior to the first occupancy.

Angle parking is generally not permitted on public streets. Reverse-in angle parking may be permitted on local commercial / industrial roads, subject to carriage width availability and approval by the Municipality.

4.3.6 Service Roads

Services roads may be acceptable to the Municipality for Highway commercial access. Service roads shall conform to the rural collector standard, with the additional requirement of providing for parking on at least one side. Separation between the Highway pavement and the Service Road pavement shall be sufficient to meet all drainage and infrastructure requirements. The Developer shall be responsible for coordination with Alberta Transportation, and for obtaining all required approvals prior to commencing work.

4.3.7 Curb Returns

Curb return radius, measured at the Face-of-Curb, shall be minimum R = 6m for residential roads (local and collector), R = 9 m for commercial / industrial roads (local and collector), and R = 15 m for arterial roads. Where roads of differing minimum curb return radius intersect, the larger radius shall apply.

4.4 TRANSIT AND BUS STOPS

4.4.1 Bus Rapid Transit (BRT)

At the direction and discretion of the Municipality, new developments may be required to incorporate the principles of Bus Rapid Transit (BRT). The BRT system may consist of buses in mixed traffic with priority queuing, dedicated lanes on surface streets, and/or busways completely separated from traffic, with the appropriate right-of-way width and carriage way for the required infrastructure. BRT should also integrate transit service and bus stop locations with appropriate land uses. It shall be incumbent on the Developer to work with the Engineering Department along with Transit Services and other Municipal Departments to develop a BRT system that provides a level of service appropriate for the benefitting population, to the satisfaction of the Municipality.

The Municipality may consider a deviation to the Level of Service (LOS) standards for vehicular traffic, if it can be demonstrated by the Developer that the implementation of BRT will provide a net positive benefit for the movement of people, and the right-of-way and infrastructure for the implementation of BRT is provided by the Developer.

4.4.2 Subdivision Layout and Transit Planning

Refer to Transit-Oriented-Development guidelines and Municipal Transit Master Plan / Bus-Rapid Transit Plan for bus route and transit planning, and locations of proposed supporting infrastructure including stop locations, bus pull-outs and/or dedicated bus-lane requirements.

In general, urban residential subdivisions should be designed to allow transit routes to follow arterial and collector roadways, and not on local roads. The network of local roads, collector roads, and the overlay of bus stop locations and pedestrian connectivity network should be such that the furthest residential homes are within 400 m walking distance to the nearest bus stop.

4.4.3 Bus Stops

Refer to the Standard Detail drawings for bus stop details, including required furniture.

Transit bus stops should be on arterial and collector roads only. On arterial roads, the bus stop will require a bus bay pull-out to not impede through-traffic. Bus stops should be situated strategically to service origin / destination hubs, with consideration for connectivity between transportation modes, and connection to sidewalks and active transportation networks.

Industrial plant site buses shall use transit bus stops. Industrial plant site buses stopping at non-designated stops, blocking intersections and/or impeding the flow of traffic may be subject to bylaw infractions.

4.4.4 School Buses

School buses may be permitted on local roads.

Where local and collector roads are adjacent to schools, bus bay pullouts will be required. Design and location of bus bays are to follow TAC Standards.

4.5 ROAD CONSTRUCTION REQUIREMENTS

4.5.1 General

Roadway construction must be in accordance with the plans and design approved by the Engineering Department. The work shall always be carried out in an efficient manner with approved equipment and capable personnel. The Engineering Department or an appointed representative shall always have access to the site and will promptly be provided with all test results and all information necessary to assess the road construction quality.

For General Construction Requirements refer to the Standard Construction Specifications.

4.5.2 Temporary Roads and Access

Plans for temporary roads, access and detours shall be approved by the Municipality. All weather type construction will be required, and the Developer is responsible for all maintenance of temporary roads, access, and detours.

All signing, channelization, detours, closures, etc., shall be in accordance with the Manual of Uniform Traffic Control devices as published by the Transportation Association of Canada (TAC) and the Regional Municipality of Wood Buffalo Utility Installation and Traffic Control Manual.

4.6 ROAD CONSTRUCTION MATERIALS

4.6.1 General

Materials used in construction of roadways shall be from sources approved by the Engineering Department. Manufactured goods shall meet the standard manufacturer's specifications and the approved roadway specifications. Under no circumstances shall defective, rejected, or substandard materials be used in the construction of roadways. Construction methods and materials are specified in the Standard Construction Specifications unless otherwise specified herein.

4.6.2 Pavement Structures

A geotechnical investigation and independent pavement design is required for all private developments and capital works projects shall be based on a 20-year design life for in-situ conditions and projected traffic volume. Minimum pavement structures presented below are required unless an alternative design is provided by a licensed geotechnical engineer and approved by the Municipality at the detailed design submission stage. Additional pavement structure strengths and/or materials 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 for heavy industrial applications.

The pavement structure shall meet the higher load criteria where road use is mixed (i.e. commercial and residential).

Table 4.2 - Minimum Pavement Structure Requirements Dimensions in mm of thickness						
Classification	Max. Aggregate Size (mm)	Urban			Rural	
		Residential		Industrial / Commercial	Residential	Industrial / Commercial
Arterial		Divided	Undivided			
Asphalt Concrete Pavement		120	120	120	-	-
Final Lift	12.5	50	50	50	-	-
Base Course	16	70	70	70	-	-
Granular Base Course	20	300	300	300	-	-
Granular Sub-base	75 minus	400	400	400	-	-
Cement Stabilized Subgrade Preparation*	-	300	300	300	-	-
Collector		Major	Minor			
Asphalt Concrete Pavement		100	100	120	100	120
Final Lift	12.5	40	40	50	40	50
Base Course	16	60	60	70	60	70
Granular Base Course	20	500	400	300	400	300
Granular Sub-base	75 minus	-	-	300	-	300
Cement Stabilized Subgrade Preparation*	-	300	300	300	300	300
Local						
Asphalt Concrete Pavement		100		100	100	100
Final Lift	12.5	40		40	40	40
Base Course	16	60		60	60	60
Granular Base Course	20	250		250	250	250
Granular Sub-base	75 minus			300	-	300
Cement Stabilized Subgrade Preparation*	-	300		300	300	300
Lane						
Asphalt Concrete Pavement	12.5	75		90	75	90
Granular Base Course	20	250		300	250	300
Granular Sub-base	75 minus	-		-	-	-
Cement Stabilized Subgrade Preparation*	-	250		300	300	300

*Note: Geogrid may be substituted for cement stabilized subgrade with the addition of subbase course material as required to achieve the equivalent structure. This modification must be supported by documentation from a Geotechnical Engineer verifying to the Municipality satisfaction that this modification is a pavement structural equivalent.

Table 4.3 - Minimum Pavement Density Requirements	
Minimum Density	Type of Paving
98%	All stages in staged paving for freeways, arterials, industrial/commercial roadways and residential collector roadways.
97%	All stages in paving local residential roadways.
97%	All stages in alley paving
97%	Overlay mat (Min 40 mm thick); asphalt walkways

For the asphalt Design Mix refer to the Standard Construction Specifications.

Roadways in all urban subdivision developments shall be surfaced with asphaltic concrete pavement (hot mix asphalt). The exception, with the approval of the Municipality, is in rural residential/industrial subdivisions where Asphalt Stabilized Base Course may be permitted, provided the subdivision is not subject to heavy wheel loads.

Only in remote non-urban, locations gravel surfacing may be approved by a Deviation to these standards. In such instances, appropriate standards from Alberta Transportation and Transportation Association of Canada (TAC) must be applied.

Irrespective of the roadway surface finish approved, good roadway industry construction practices and techniques shall be employed. Furthermore, roadway base and sub-base construction shall be undertaken with the view that an asphaltic pavement surface will ultimately be the final finished surface.

4.6.3 Subgrade and Granular Base Course

1. Subgrades under roadway structure shall be constructed of suitable soils free from organic and frost susceptible materials. Subgrade preparation shall typically include scarification to a depth of 300mm and cement stabilization with Normal Portland Cement applied uniformly at a rate of between 16kg/m^2 – 30kg/m^2
2. Other methods of subgrade preparation may be approved by the Municipality through the detailed design submission stage or trough the deviation process.
3. Subgrade preparation and granular base course shall extend to a minimum 300 mm beyond the back of curb, or the back of monolithic sidewalk, as appropriate.

4.6.4 Base Course and Final Lift

For new development areas, the final lift of asphaltic concrete pavement shall be placed at a minimum of twenty (20) months spanning two winter seasons following base course, as part of the completion of the Warranty Period. The interim pavement structure must be adequate to handle the traffic loading during this interim period. This includes construction activity, municipal operations, and buses if the road is on a transit route.

For capital projects or urban rehabilitation projects, where cuts into the new asphalt mat are not anticipated to be required to accommodate services or new utilities, the final lift may be applied immediately following the base course.

The interim interface between base course and an existing road structure shall be tapered over a distance of 0.5 m. This taper is to be ground out immediately before applying final lift.

Adjustable manhole frames and covers (F-80 or equivalent) are to be used and adjusted to match the asphalt surface between the base course and final lift.

4.6.5 Asphalt Sampling

Refer to the Standard Construction Specifications.

4.6.6 Asphalt Payment Penalties

Refer to the Standard Construction Specifications.

4.6.7 Concrete

Concrete for roadways, including sidewalks, walkways, and structures, shall:

1. Be to a C-2 exposure classification (CSA-A23.1)
2. Have a minimum compressive strength of 32 MPa in 28 days
3. Type HS (unless specified differently) 5% to 8% air content
4. Nominal maximum size aggregate of 14-20 mm
5. Maximum water/cement ratio of 0.45 and curing compound.

Allowable curing regime for Type 2 – Additional is 7 days ≥ 10°C and for a time necessary to attain 70% of specified strength.

Where practical, consideration should be given to using aggregate with low ironstone content (maximum 0.2%).

For further information, refer to the Standard Construction Specifications.

4.7 RECYCLED AND RECLAIMED MATERIALS

The Regional Municipality of Wood Buffalo acknowledges that there are environmental, economic and resource management reasons for considering the use of recycled and reclaimed materials. It is also acknowledged that the greatest challenge with recycled and reclaimed materials is to maintain consistency of the material properties, including strength, gradation, and purity, given the variability of the raw materials.

4.7.1 Quality Control

On account of the recycled and reclaimed material variability, the quality control measures for the placement of materials have to be adapted to the specific material being used and the particular application. The specific quality control tests and acceptability criteria for a particular project shall be recommended by the Consultant and accepted by the Municipality at the detailed design stage, as part of the material specification, prior to commencing construction. Consideration can be given to the following quality control methods:

- Witness of proof-rolling by a qualified engineer
- One-point Proctor tests
- California bearing ratio (CBR)
- Witness and documentation of “best efforts” for compaction
- Other, at the discretion of a geotechnical engineer.

4.7.2 Contaminants and Impurities

The quality of the recycled and reclaimed material itself will depend on the original raw source material, among other factors. Contamination by impurities including reinforcing steel and other metals, soil and clay, chlorides, glass, gypsum board (drywall), sealants, plastics, paper, plaster, wood, and roofing materials will also affect quality. Care must be taken during the separation and transportation of the raw material, and the production, storage, and application of the recycled and reclaimed material to limit these impurities, to the greatest extent possible. Unless otherwise specified, these impurities should be limited to 1% by mass.

The supplier of recycled and reclaimed materials shall certify the material before the Municipality can accept it. The certification documentation is to be provided to the Municipality prior to ordering materials.

4.7.3 Accepted Applications

The following applications for recycled and reclaimed materials will be considered acceptable by the Municipality:

- Reclaimed Asphalt Pavement (RAP)
  - RAP may be used, to a maximum of 25% by mass, on base course hot mix asphalt paving.
  - RAP shall not be permitted to be used on Final Lift of hot mix asphalt paving
  - RAP may also be used as cold mix for patching and pothole repairs.
- Crushed recycled concrete aggregates (RCA)
  - RCA may be used for trench backfill, road subbase material and bulk fill, where the crushed concrete meets the following conditions:
    - Gradation shall meet Alberta Transportation 6-80 specification, per the following gradation requirements:

Metric Sieve (µm)	Percent Passing (%)
80,000	100
50,000	55-100
25,000	38-100
16,000	32-85
5,000	20-65
315	9-22
160	5-15
80	0-10

    - Reinforcing steel removed via magnetic separation or other industry-accepted process.
  - RCA will not be accepted for pipe bedding material, road base, or levelling course.

4.7.4 Additional Applications

Additional applications may be permitted subject to a geotechnical report which describes the specific application and the specific quality control measures to be applied. Submissions must be made and approved by the Municipality as part of the detailed design stage of a project.

Additional applications for consideration may include the blending of recycled and reclaimed materials with other raw or processed materials to produce an engineered material, suitable for the intended application and purpose.

4.8 TRAFFIC CONTROL DEVICES, STREET SIGNS AND PAVEMENT MARKINGS

4.8.1 General

Traffic control devices, street signs and pavement markings are the primary means regulating, warning, and guiding all traffic. These devices, signs and markings should fulfill a need, command attention, convey a clear simple meaning, command respect, and give adequate time for proper response.

Traffic control devices, street signs and pavement markings shall be installed in accordance with the latest edition of the “Manual of Uniform Traffic Control Devices for Canada”, issued by the Transportation Association of Canada. See Standard Drawings at the end of this section.

4.8.2 Signage

4.8.2.1 Advanced Street Name Signs

1. Use Hi-Intensity grade reflective sheeting with white lettering on a green background (white sheeting with green overlay). Single line signs shall have a 1cm wide white border. Two-line signs shall have a 1.5cm wide white boarder.
2. Where a sign has more than 10,000 cm^2 of facial area, it shall be provided with a 1.9 cm thick pressure treated wood substrate, painted green on all sides.
3. Where a sign is more than 100cm wide, it will be provided with a pressure treated wood or metal cross brace to provide rigidity. If a wood cross brace is used, it must be the same size and shape as the sign and it will be painted green on all sides.
4. Where two street names are to be displayed on the same sign:
    - The street to the left shall be listed on top with a “left arrow” preceding name; and
    - The street to the right shall be listed below with a “right arrow” following the name.
5. A 30cm high single line or a 60cm two-line sign shall be used. If more than two lines are required, then a second sign must be used. The length of the sign will be determined by the length of the message to be incorporated on the sign. Use flat aluminium sheeting with a minimum thickness of 0.2cm.

4.8.2.2 Arterial Street Name Signs

1. Arterial Street name lettering shall be 19cm nominal Highway Alphabet “E” Series mixed case letter and/or numeral. Supplementary descriptions, such as Street, Road, and Avenue shall be abbreviated as shown in Section 2. These shall be bottom justified.
2. Use Hi-Intensity grade reflective sheeting with white lettering on a blue background.

4.8.2.3 Urban Collector and Local Street Name Signs

1. Urban and Collector Street name signs shall be 15cm in the vertical dimension. The length of the sign shall be determined by the length of the message to be incorporated on the sign. The maximum length shall be 100cm. Where a length of more than 100cm is required, a second sign shall be used. The street name blade will be of extruded aluminium with an “I” cross section.
2. Street name lettering shall be 10cm nominal Highway Alphabet “B” Series upper case letter and/or numeral.
3. Supplementary descriptions, such as Street, Road, and Avenue shall be abbreviated. These shall be 7.5cm nominal Highway Alphabet “B” Series upper case letters. These shall be vertically center justified.
4. Where “c” or “ac” are used in such names as McLeod or MacLean, the “c” or “ac” will be 7.5cm nominal Highway Alphabet “B” Series upper case. These shall be bottom justified.
5. Use Hi-Intensity grade reflective sheeting with white lettering on a blue background.

4.8.2.4 Mounting Posts and Fasteners

1. Mounting height/setbacks shall be done in accordance with the Manual of Uniform Traffic Control Devices for Canada or the Engineering Servicing Standards which ever provides the greater standard, with due regard for visibly and protection for pedestrian/cyclists.
2. Mount street name blades on 4.5cm x 4.5cm square galvanized metal pre-punched telescoping tube (Telespar or approved equal). See Standard Drawings for sign support and installation details.
3. Where advanced street name signs are post mounted:
    a. Signs with a facial area of not more than 3,600cm2 shall be mounted on a tubular metal post or on a 9 cm x 9 cm pressure treated wood post.
    b. Signs with a facial area of more than 3,600cm2 and less than 5,625cm2 shall be mounted on one (1) 9 cm x 14 cm pressure treated wood post.
    c. Signs with a facial area of more than 5,625cm2 shall be mounted in accordance with Alberta Transportation Specifications and Standards in consideration for mounting, break-away requirements, and foundation.
4. Advanced Street Name signs to be bolted to wood posts will use lag bolts. Signs mounted on lamp standard or traffic signal poles or arms will use Band-it or equivalent strapping and buckles, or side mount brackets as appropriate. Signs mounted on square metal tube posts will use top-of-post mounting hardware.
5. High intensity grade reflective street name signs and traffic control high density signs of the type and colour, satisfactory to the Regional Municipality of Wood Buffalo, mounted on galvanized “TELESPAR” or approved sign supports shall be installed as per the “Approved” Traffic Control Devices and Street Sign plans. Diamond grade reflective signs required on stop signs only.

6. Single line Arterial street name signs may be face mounted (Band-it and buckles) on lamp standard poles, traffic signal poles, or traffic signal arms with due regard for visibility of any traffic signal or pedestrian displays. Collector street name signs may be side mounted (Band-it and bracket) on lamp standard or traffic signal poles.
7. For local street and collector street intersections, one or two street name sign blades may be posted on the same post, above a traffic control device (stop, yield, one-way sign), mounted in accordance with manufacturers specifications for the mounting hardware. Preference to locating a street name sign should be given to the near right hand corner of the intersection for the street with the higher traffic volume.
8. Parking Restriction Signs to be mounted with galvanized metal brackets at a 45-degree angle to curb.
9. The mounting of signs on wood power poles is not permitted.

4.8.2.5 Number of Signs

1. Only one (1) street name blade is required for each street for local @ local, local @ collector cross and “tee”, and at collector @ collector “tee” street intersections.
2. Two (2) street name signs for each street are required to be posted at collector @ collector cross intersections. These will be posted on opposite corners.
3. Each approach will be posted for collector @ arterial and arterial @ arterial intersections.
4. Arterial @ arterial and arterial @ collector intersections where the names of the side street are different on each side require advanced street name signs.

4.8.3 Pavement Markings

1. Pavement markings including lane markings, intersection channelization's, stop lines and pedestrian crossings shall be provided at locations specified by the Engineering Department. Pavement marking shall be of a permanent type, “hot poured” thermoplastic for all development and capital projects inlaid into top course asphaltic concrete surfaces at the time of construction.
2. All stop lines shall be perpendicular to the curb line.
3. Refer to Standard Detail Drawings for pavement marking locations and requirements.
4. Refer to the Land Use Bylaw for additional pavement markings required for handicap stalls.
5. System 300 Thermoplastic inlaid permanent markings shall be used on all Urban standard Arterial and Collector roadways and all crosswalks and stop bars on any urban roadways.
6. System 400 Cold Plastic permanent markings may be considered for all Rural roadways at the discretion of the Municipality.
7. Paint markings shall be used for asphalt pathways, parking lots and may be considered for Rural roadways at the discretion of the Municipality.

4.8.4 Traffic Signals

Traffic control signals and pedestrian crossing signals shall be provided at all traffic and pedestrian points on arterial roads and as otherwise warranted. Where traffic control signals are required for future development but not warranted as part of the current phase of development, the conduits for the future signals must be installed. Refer to the “Guidelines for the Design and Installation of Traffic Signals.”

Traffic signal kiosks and related street furniture shall have an anti-graffiti coating or decorative vinyl wrap.

4.8.5 Mid-Block Crosswalks and Illumination Warrants

1. Based on Transportation Association of Alberta (TAC) and subject to a Crosswalk Warrant Analysis and Illumination Warrant Analysis, mid-block crossings including pedestrian-controlled traffic signals, Rectangular Rapid Flashing Beacon (RRFB)shall be installed on Arterial and Collector roadways where they form part of the regional pedestrian corridor network, or at locations where a high volume of pedestrian traffic is expected to cross. Refer to the TAC “Pedestrian Crossing Control Guide”.
2. Crosswalk Illumination shall be based on TAC Guide for Design of Roadway Lighting.
3. Pedestrian crossing signs are to be white background with black legend (RA-4), and doubled mounted, back-to-back at crossing location. Place advanced warning signs for pedestrian crossing as warranted by sight line conditions or traffic characteristics.
4. Mid-Block crosswalk markings to be 0.6m zebra type as per typical drawings.

4.8.6 Pedestrian Actuated Signals and Crossings

Where pedestrian control pushbuttons are used, they should be capable of easy activation and conveniently located near each end of the crosswalks, as follows:

1. Unobstructed and adjacent to a level all-weather surface to provide barrier-free access. Furthermore, there must be an all-weather barrier-free accessible route from the pushbutton to the sidewalk ramp,
2. Between the edge of the crosswalk line (extended) farthest from the center of the intersection and the side of a sidewalk ramp (if present), but not greater than 1.5 m from said crosswalk line.
3. Between 0.5 m and 1.8 m from the edge of the curb, shoulder, or pavement.
4. With the face of the pushbutton mounted such that it is along the pathway of, and parallel to, the pedestrian’s path from the sidewalk to the crosswalk to be used; and
5. At a mounting height of approximately 1.0 m, but no more than 1.2 m, above the sidewalk.

4.9 ROADWAY ILLUMINATION

The Developer is responsible for the design of the roadway illumination through ATCO Electric, as well as to maintain safe levels of illumination during the construction and warranty periods.

Unless otherwise directed, roadway illumination is to use LED bulbs preferentially over HPS.

4.9.1 Urban

1. Street lighting shall be arranged for and coordinated to ensure they do not interfere with other utilities, street furniture and driveways. Streetlights in general shall be located on the projected common property line between two lots. Streetlight cables shall be installed underground with acceptable type of steel post streetlights complete with fixtures.
2. The location and density of streetlights shall be in accordance with Transportation Association of Canada (TAC) Guide for the Design of Roadway Lighting.
3. The use of non-light polluting fixtures is preferred. Review fixtures options and consider mitigation of obtrusive lighting such as spill light, glare and sky glow shall be considered in the lighting design. Full cut-off light fixtures shall be considered at specific locations for this purpose. However, the reduction or elimination of obtrusive light must never take precedence over proper illumination for transportation facilities as traffic safety is of paramount importance.
4. To minimize footprint of street furniture at intersections, streetlight davits may be mounted on top of traffic light poles. The power for streetlights shall be metered separately from the traffic lights. Developer to coordinate design with the utility company. Following CCC, the Municipality will take ownership of the traffic light infrastructure. Ownership of the streetlight shall remain with the utility company.
5. The street lighting layout and location of the buried lines shall be as shown on the Standard Drawings and approved by the Municipality.
6. Developer is responsible for paying the rental charges to the utility company for providing street lighting, for the operation of streetlights thus installed. The Municipality will pay after the Construction Completion Certificate is executed by the Municipality.
7. Streetlights shall be provided for each internal park area that does not abut onto a lighted street. A streetlight shall be located at the point where each walkway opens out onto the park area. Alternatively consider solar powered LED lights at all benches and along pathways.
8. In some special urban development settings, such as downtown redevelopment, consideration should be given to providing pedestrian level lighting adjacent to sidewalks. Refer to the City of Edmonton Winter City Design Guidelines.

   https://www.edmonton.ca/city_government/initiatives_innovation/winter-design-guidelines.aspx

4.9.2 Rural

1. Street lighting shall be installed in all subdivisions. The Developer shall install all streetlight infrastructure at the time of development at the Developer's cost. The existing rural streetlights will remain in place and will continue to be maintained.
2. The minimum requirements for new rural streetlights will be located as follows:
    a. Community Recreation Areas
    b. Corners and Intersections of roads in rural community, except where traffic is infrequent subject to the approval of the Municipality
    c. Intersections at access points to main roads, secondary highways, and primary highways
    d. Spacing between streetlights is to be a maximum of approximately 100m within school zones
    e. Spacing between streetlights is to be a maximum of approximately 300m within occupied residential areas
    f. One streetlight in each playground
    g. One streetlight within 5m of permanent bus shelters
    h. Designated trail crossings
    i. Mailbox pull-outs
    j. Bridges
    k. Potentially dangerous areas such as steep banks
    l. All high-density country residential subdivisions in accordance with TAC Rural standard
    m. Rural commercial and industrial areas shall use spot-lighting techniques to achieve the average recommended TAC illumination criteria (refer to Appendix A-1, TAC guideline). At minimum, lights shall be placed at or near all intersections, driveways, and lot entrances. The recommended streetlight standard in these areas is 12m – 150W steel davits, set 2m from the edge of pavement.
    n. At any additionally identified locations at the direction and discretion of the Municipality.

4.10 SOUND ABATEMENT

At the direction of the Municipality, a noise impact assessment may be required for all new developments that include and/or are adjacent to arterial roadways, highways and railways, or any other land use identified to generate noise. The threshold requiring noise mitigation measures shall be an A-weighted 24-hour equivalent sound level of 65 dB, measured 1.2 meters above ground level and 2 m inside of the property line (i.e. outside of the road right-of-way), adjusted for the 10-year planning horizon of the traffic loads on the adjacent arterial roadway.

The mitigation of noise can include berms or elevated contoured embankments along arterial roadways, highways and/or railways. Sound barrier fences or equivalent means of noise abatement may also be accepted by the Municipality upon approval of design submittal.

The side slopes of the embankment shall have a maximum gradient of 4H:1V. Pedestrian connectivity via a PUL shall work with the grades, by reducing the gradient and placing retaining walls where required along the adjacent property lines on the subdivision side and cutting a walkway diagonally along the embankment at a maximum 8% grade on the roadway side. The right-of-way may require widening to suit.

4.11 LANES / BACK ALLEYS

In general, the following Design Standards should be followed:

1. Lanes shall be provided for residential lots fronting directly on to collector roads.
2. Minimum 6m of right-of-way, where there is a maximum of one deep utility.
3. Minimum 9 m of right-of-way, where there are two or more deep utilities, subject to minimum utility separation, depth of installation, and respecting property lines and building setbacks in the Land Use Bylaw. See Standard detail drawing.
4. Where lane traffic is expected to be high, such as for certain commercial developments, a wider surfaced width and right-of-way may be required as determined by the Municipality.
5. Road structure as per Table Minimum Pavement Structure Requirements of this Section.
6. Residential lanes must be paved a minimum width of 5.7m, with a centreline swale complete a 2% cross-fall grade. Commercial/industrial lanes must be paved the entire width of right-of-way.
7. "Dead-end" lanes must be terminated with a means to turn around with standard size bulb and posted “No Exit” at the entrance of the lane and posted with adequate parking restrictions at the turn around.
8. Maximum length of lane between streets shall not exceed 200m. Lane layout should not encourage possible short cutting between roadways.
9. Internal lane intersections in residential areas require a minimum 4m cut-off at all corners. Internal lane intersections are not permitted in non-residential areas.
10. Maximum length of drainage in lanes shall be 200m cumulative to any one catch basin.
11. To alleviate the requirement of storm sewer in rear lanes, trap lows in lanes are to be avoided, unless otherwise approved by the Municipality.
12. Maximum longitudinal lane grade shall be 8.0%.
13. Minimum longitudinal lane grade shall be 0.5%.
14. Provide 1.5m paved flared ends where lanes abut roads.
15. All lane grades are to be at property line and are to tie to the back of walk/curb elevation of the intersecting street.
16. It may be necessary to remove sidewalk crossings and replace with depressed crossing.
17. Property line elevations are to be a minimum of 100mm above design lane grade for drainage purposes.

4.12 COMMUNITY MAILBOXES

The Developer shall accommodate community mailbox locations when identified as being required. In general, location criteria and requirements are as follows:

- Along flankage (side yard) of corner lots between the front and rear property lines
- Provide additional 0.5m x 5.0 m easement if encroaching on private property
- Next to open space or playground
- On the predominantly homecoming side of the street
- Adjacent sidewalk and accessible by sidewalk to the surrounding pedestrian connectivity network.
- Not along arterial roads
- Not closer than 10m from a fire hydrant or bus stop
- Not on a utility easement or above a utility
- The location shall not impede pedestrian and vehicle sight distances

Additional requirements for rural applications include:

- Road Widening
- Right-of-way widening where necessary

Refer to the standard drawings for typical layouts.

4.13 DEAD-END ROADS

1. Other than for an interim solution, dead-end roads shall not be allowed in industrial subdivisions.
2. In residential subdivisions, all dead-end roads shall be provided with a cul-de-sac or turnaround consistent with the requirements outlined in the Standard Drawings and the TAC Manual. The maximum length of dead-end roads that service residential lots shall be 300m.

4.14 APPROACHES AND DRIVEWAYS

4.14.1 Urban

Urban approaches and driveways shall be in accordance with the geometric Standards of the TAC Geometric Design Guide for Canadian Roads, and the “Access Route Design” section of the Alberta Building Code, and as per the following:

1. Maximum driveway widths shall be as follows:

Structure	Width
Residential	6.7m
Apartment	10.6m
Laneways	6.1m
Commercial	10.6m
Industrial	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 1.0 m clearance from any structure such as hydrants, light-standards, service pedestals, transformers, manholes and catch basins. The driveways and all street furniture shall be clearly shown on the design drawings.
4. Driveways for Residential Single Detached lots shall be offset a minimum of 1.0 m from the side yard property line to the adjacent lot. The intermediate driveway side yard area is to be soft landscaped.
5. The nearest edge of a commercial / industrial driveway must be a minimum horizontal distance of 12m from the end of the curb-return of the nearest road intersection. The driveway must be designed to accommodate the types of vehicles the business/industry will generate.

4.14.2 Rural

Rural road approaches and driveways shall be in accordance with the geometric Standards of the TAC Geometric Design Guide for Canadian Roads, and the “Access Route Design” section of the Alberta Building Code and as per the following:

1. A residential approach shall be a minimum width of 6m and a maximum width of 8m. An industrial / commercial approach shall be a minimum width of 9m and a maximum width of 11m.
2. All approaches shall be constructed with the same pavement or gravel structure as the adjoining roadway with the same surfacing extending to the property line.

3. Where trucked water and sanitary service is provided by the Municipality, internal private driveways/access lanes shall be designed to accommodate the expected wheel loads, and the driveway shall be constructed to the location of the water and sanitary service tanks.
4. All residential subdivision developments shall require the Developer to construct only one approach to each lot.
5. Approaches to industrial/commercial lots are not required to be constructed by the Developer unless the locations are known. The Lot Owner/Developer will be responsible for constructing such approaches to the Standards outlined standard drawing 4-1316.

4.15 SIDEWALKS

1. Concrete sidewalks measuring 1.5 m in width or an Asphalt Multi-Use Trail measuring 3.0 m in width will be required on both sides of all urban roads, with the exception of short cul-de-sacs (fewer than 18 lots, and less than 120 m in length) which require sidewalk on only one side of the road. Where practical, roads with sidewalk on one side only should have the sidewalk situated on the north or west side of the road.
2. The rehabilitation of sidewalks in an existing neighbourhood, it may not be possible to construct a sidewalk at minimum 1.5m width, because of right-of-way or other restrictions. In these situations, the sidewalk to be constructed to maximum width possible under the constraints with approvals from the Municipality.
3. Sidewalks will also be required to maintain continuity of the pedestrian network for future or existing development.
4. Separate sidewalks are preferred over monolithic walk as the intermediate boulevard provides an enhanced pedestrian corridor at a safer distance from the road surface, promotes infiltration of stormwater, serves as snow storage in the winter, provides adequate space for both a private tree and a public tree in front of each lot without impacting private utilities, and allows for an appropriately designed sidewalk ramp at intersections.
5. Cross-slope on sidewalks shall be 2%.
6. Sidewalks shall meet the intents of Section 3.8 of the National Building Code of Canada for accessibility and the Barrier-Free Design Guide (2008) from the Government of Alberta Safety Codes Council.
7. Construction joints contraction joints and expansion joints shall be installed per the Standard Detail Drawings 4-403.

4.15.1 Acceptance Criteria

4.15.1.1 New Development

1. During CCC inspection, the following deficiencies must be removed or repaired, prior to the issuance of CCC:
    a. Any identified tripping hazards
    b. Cracks measuring greater than 5 mm in width
    c. Four or more cracks in a single panel
    d. Longitudinal cracks that extend three or more panels
    e. Sidewalk panels with surface spalling greater than 25% of the panel area
2. During FAC inspection, the following deficiencies must be removed or repaired, prior to the issuance of FAC:
    a. Any identified tripping hazards
    b. Cracks measuring greater than 2 mm in width
    c. Three or more cracks in a single panel
    d. Longitudinal cracks that extend two or more panels
    e. Sidewalk panels with surface spalling greater than 10% of the panel area
    f. If more than 50 m^2 of continuous sidewalk is replaced as a result of FAC inspection deficiency repair work, the securities for the assets may be released only in exchange for the Developer providing an extra one-year warranty covering workmanship and materials, specific for the replaced assets. This FAC inspection acceptance criteria shall be re-applied at the end of the extended one-year warranty.
3. Further to the above acceptance criteria, any cracks, or deformations that in the opinion of the Engineering Department and/or Public Works representative create a tripping hazard must be immediately repaired by the Developer/Contractor during the Warranty Period.

4.15.1.2 Rehabilitation Projects

1. The following are general guidelines to be used when completing urban rehabilitation projects to determine concrete replacements on existing infrastructure:
    a. Any identified tripping hazards
    b. Cracks measuring greater than 5 mm in width
    c. Four or more cracks in a single panel
    d. Longitudinal cracks that extend three or more panel
    e. Sidewalk panels with surface spalling greater than 25% of the panel area
2. Inspections related to concrete work completed by the contractor as part of the urban rehabilitation projects will be subject to the same criteria as Private Development projects noted above Item 4.15.1.1.
3. During the FAC inspection, any new concrete damage to existing concrete may be requested to be repaired by the Municipality to improve the final product, however these repairs will be subject to a change order. Any warranty repairs due to deficient works by the contractor shall be at their cost.

4.15.2 Sidewalk Ramps

1. Sidewalk ramps shall be provided on sidewalks at all roadway intersections and at all pedestrian crossings in accordance with the standard details.
2. Ramps shall be installed in line with the sidewalk and crosswalk, with the width, orientation, and location to suit the corner conditions and to avoid directing the user on a 45-degree angle into the intersection. Refer to the Standard Detail Drawings.
3. Sidewalk ramps that direct pedestrians diagonally into an intersection are to be avoided. At the corner of mono-walk sidewalks, a 1.2 m landing must be provided between 1.8 m long ramps, with the 1.8 m ramps constructed along the length of the sidewalk on either side of the landing. Landscaping behind the back of walk may need to be locally depressed to suit the back-of-walk profile. For rehabilitation projects it may not be possible to meet these dimensions due to road right-of-way or other restrictions. The sidewalk ramps shall then be constructed to the maximum size possible under the constraints.
4. Maximum longitudinal slope of the sidewalk ramp shall be 8.0 %
5. Ramps shall be preceded by a 0.3 m wide border with 5 mm grooves, 20 mm on center.
6. Maximum cross-fall slope on sidewalk ramps and landings shall be 2%.
7. Where practical, catch basins are to be located to not conflict with sidewalk ramps.

4.16 PEDESTRIAN WALKWAYS, TRAILS AND SITE FURNITURE

Refer to Section 10, Landscape and Park Development Standards.

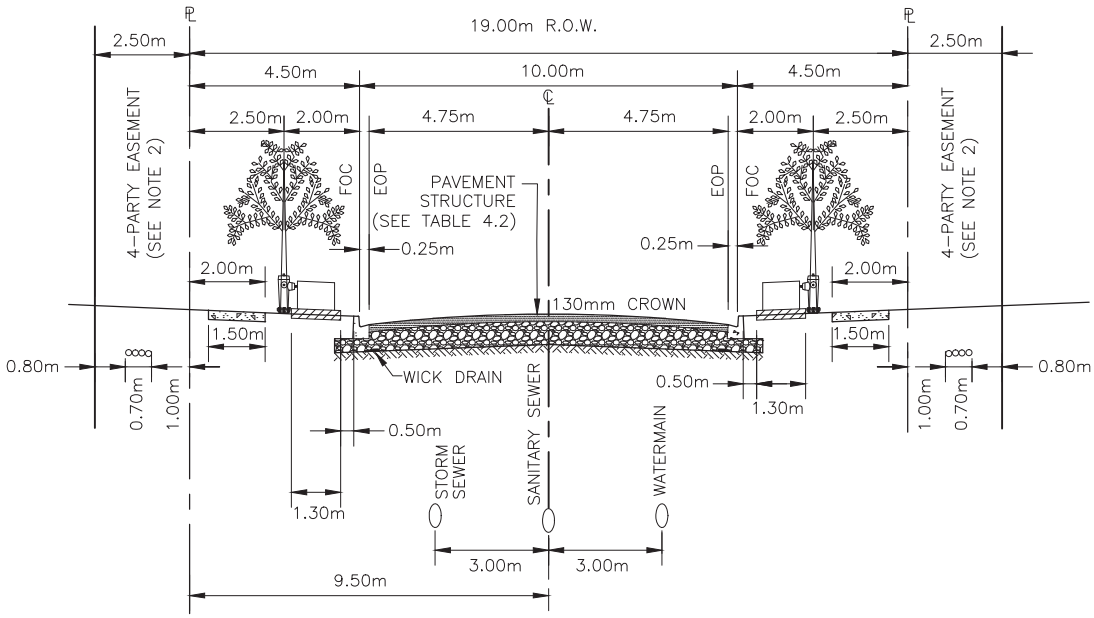
4.17 ROADWAY DESIGN AND CONSTRUCTION STANDARDS DRAWINGS

Dwg. No.	Title
4-100	Urban Local Residential Roadways
4-101	Urban Local Residential Cul-De-Sac
4-102	Urban Minor Collector Residential Roadways
4-103	Urban Major Collector Residential Roadways
4-104	Urban Local Industrial / Commercial Roadways
4-105	Urban Collector Industrial / Commercial Roadways
4-106	Divided Urban Arterial Roadways
4-107	Undivided Urban Arterial Roadways
4-108	Divided Rural Arterial Roadways
4-109	Typical Lane Cross Section
4-200	Standard 450 mm Curb and Gutter
4-201	Standard 700 mm Curb and Gutter
4-202	Rolled Face Curb and Gutter
4-203	Standard Barrier Curb (no Gutter)
4-204	Precast Concrete Curb/Wheel Stop
4-205	Asphalt Curb
4-206	Precast Concrete Barrier
4-207	Wick Drain and Wick Drain Entering Catch Basin
4-208	Semi-Mountable Curb and Gutter
4-300	Concrete Swale (Plan)
4-301	Concrete Swale (Cross Section)
4-305	Highway Concrete Swale (Cross Section)
4-306	Sidewalk and Boulevard Drainage Crossing for Separate Walk
4-307	Sidewalk Drainage Crossing for a Mono Walk
4-400	Rolled Face (RF) Monolithic Curb, Gutter and Sidewalk
4-401	Straight Face (SF) Monolithic Curb, Gutter and Sidewalk

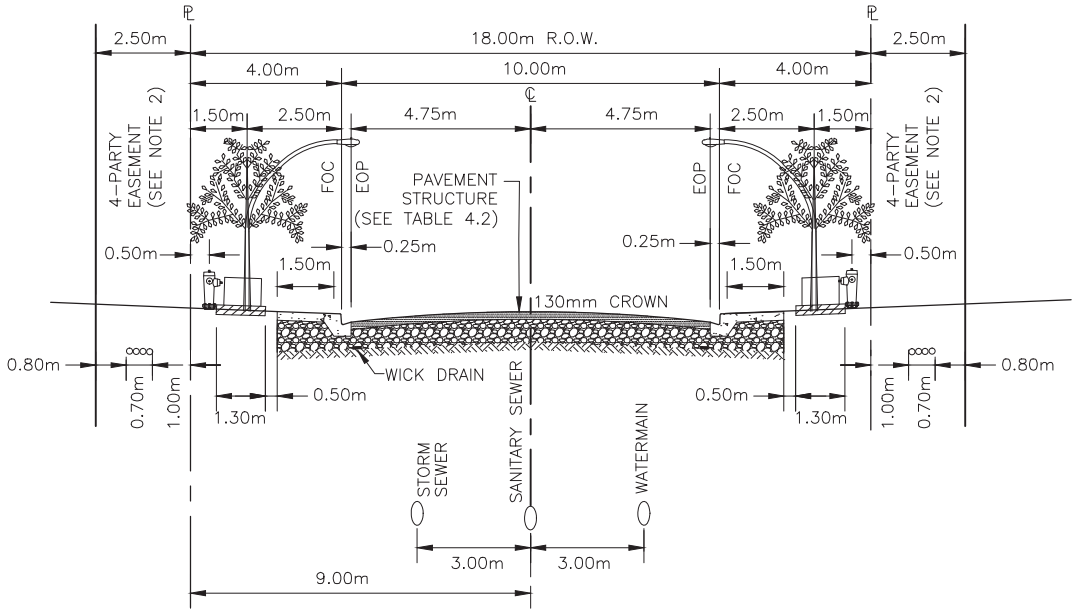
Dwg. No.	Title
4-402	1.5 m Separate Sidewalk
4-403	Sidewalk Joint and Finishing Details
4-404	Concrete Sidewalk Ramps
4-405	Ramp Access Locations
4-406	Monolithic Sidewalk Concrete Ramp Details
4-407	Separate Sidewalk Concrete Ramp Details
4-408	Urban Intersection Crosswalk and Sidewalk Ramps
4-409	Cul-De-Sac Sidewalk Requirements
4-500	Standard Driveway Approach (Mono, Curb, Gutter, Sidewalk)
4-600	Transit Details Location of Bus Stop (Unchannelized Intersection)
4-601	Bus Bay Pullout Arterial Roadway
4-602	Location of Bus Stop (Channelized Intersection)
4-603	Concrete Bus Stop Pad (Retrofit)
4-607	Bus Stop and Amenities Pad Mono Walk
4-608	Bus Stop and Amenities Pad Separate Walk
4-609	Bus Stop Pad Rural Roadway
4-610	Transit Guidelines Bus Stop Furniture Layout
4-611	Transit Turnaround (Offset)
4-612	Sawtooth Transit Bay Transit Terminal Site
4-620	Typical Urban Community Mail Box Layouts
4-700	Pavement Markings Dimensions
4-701	Pavement Marking Applications
4-702	Standard Intersection Crosswalk Pavement Markings
4-703	Standard Mid-Block Crosswalk Pavement Markings
4-704	Special Crosswalk Overhead Sign Basic Case Design (RA-5)
4-705	Pavement Arrows
4-760	Typical Street Signs
4-761	Standard Church Guide Sign
4-800	Sign Support Detail
4-801	Typical Sign Installation

Dwg. No.	Title
4-1300	Typical Cross Section Rural Roads
4-1301	Typical Cross Section Rural Roads with Walkway on Backslope
4-1302	Typical Cross Section Rural Roads Concrete Curb and Sidewalk
4-1303	Typical Rural Utility Layout
4-1306	Typical Rural Residential Cul-De-Sac
4-1310	Typical Rural Residential and Industrial/Commercial Approaches
4-1311	Typical Rural Community Mailbox Pullout Cross Section
4-1312	Typical Rural Community Mailbox Pullout Locations
4-1313	Typical Rural Hydrant Shoulder Widening Layout
4-1314	Typical Rural Municipal Addressing Sign (Minimum Requirements)
4-1316	Typical Rural Approach Driveway Locations
4-1318	Typical Mid-Block Rural Trail/Path Crossing Detail

STANDARD DETAIL:	4- 100
DATE: OCT 2016	REV: 11



19 m LOCAL WITH SEPARATE WALK



18m LOCAL WITH 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.

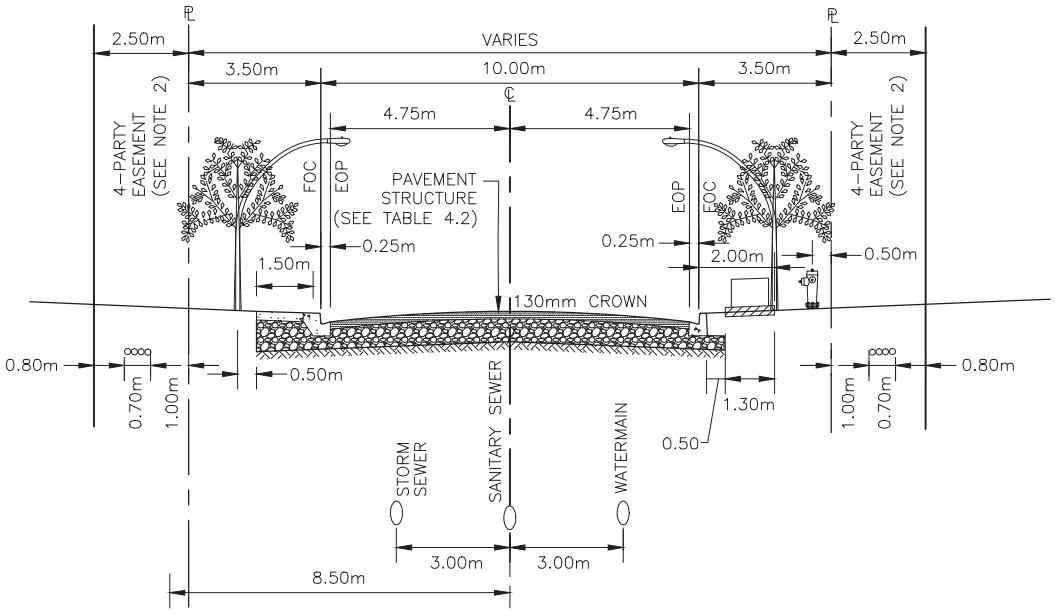
(4) FOC – FACE OF CURB.

(5) SHALLOW UTILITIES TO BE IN SOFT BOULEVARD SPACE, WITH NO OTHER STREET FURNITURE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

URBAN LOCAL RESIDENTIAL ROADWAYS

STANDARD DETAIL:	4- 101
DATE: OCT 2016	REV: 11



17 m MONO WALK ONE SIDE

APPLICABLE ONLY TO CUL-DE-SAC WITH FEWER THAN 18 LOTS, AND LESS THAN 120m LENGTH.

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.

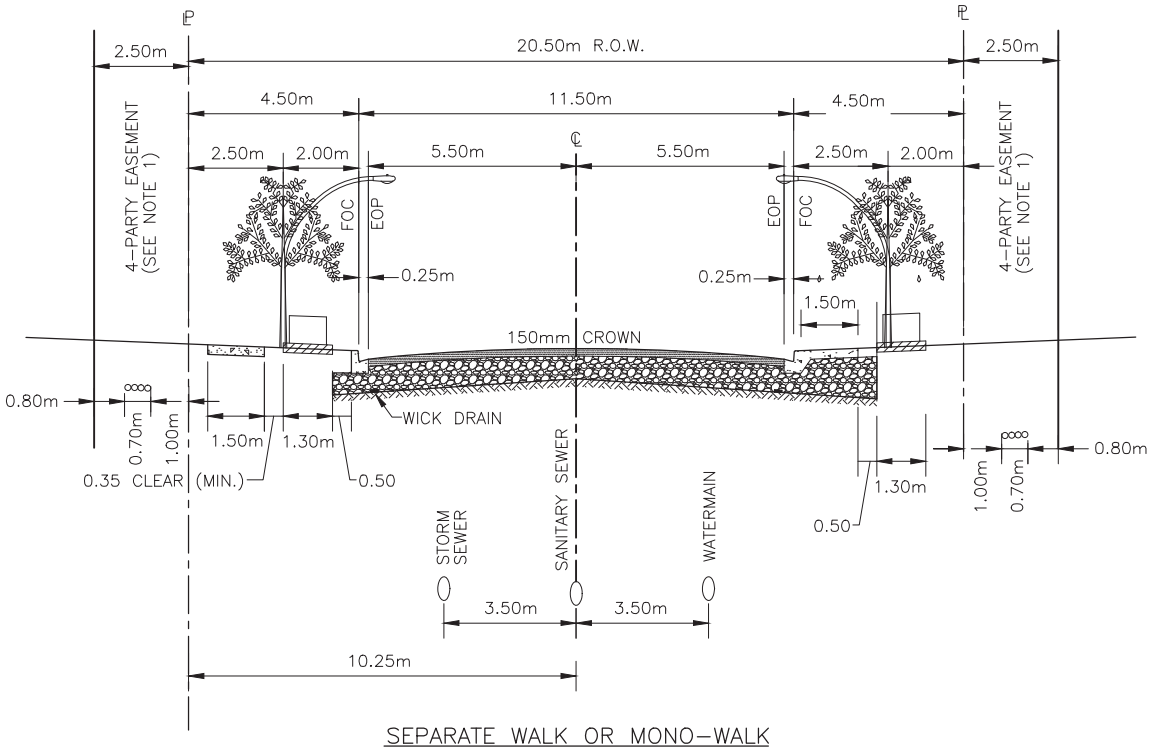
(4) FOC – FACE OF CURB.

(5) SHALLOW UTILITIES TO BE IN SOFT BOULEVARD SPACE, WITH NO OTHER STREET FURNITURE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

URBAN LOCAL RESIDENTIAL CUL-DE-SAC

STANDARD DETAIL:	4- 102
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SEPARATE WALK OR MONO–WALK

REFER TO CHAPTER 10.8 FOR BOULEVARD TREATMENT OPTIONS.

NOTES:

(1) 4–PARTY TRENCH CONTAINS GAS,POWER, PHONE AND CABLE LINES.

(2) EOP – EDGE OF PAVEMENT.

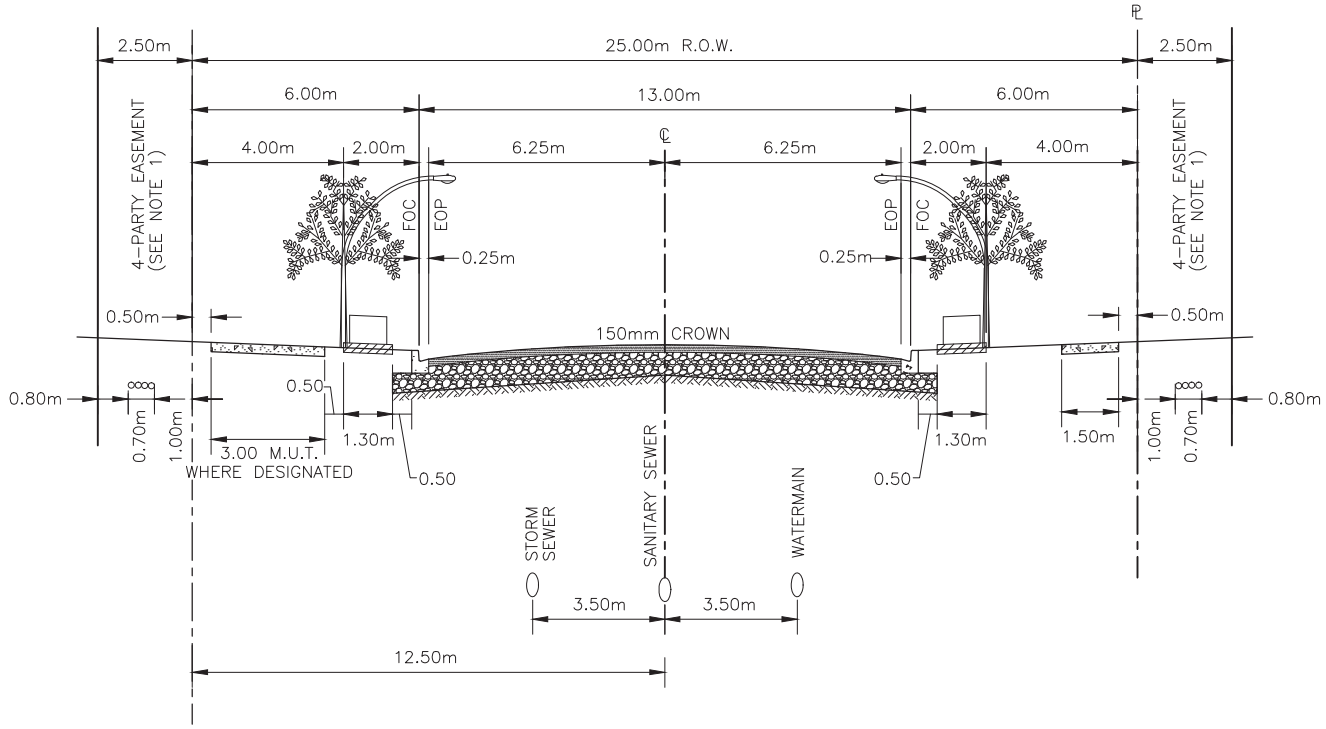
(3) FOC – FACE OF CURB.

(4) HARD SURFACING ENTIRE BOULEVARD MAY BE REQUIRED FOR COMMERCIAL AREAS WHERE STORE FRONTS FACE THE STREET.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

URBAN MINOR COLLECTOR RESIDENTIAL ROADWAYS

STANDARD DETAIL:	4- 103
DATE: OCT 2016	REV: 11



REFER TO CHAPTER 10.8 FOR
BOULEVARD TREATMENT OPTIONS.

NOTES:

(1) 4–PARTY TRENCH CONTAINS GAS, POWER, PHONE AND CABLE LINES.

(2) EOP – EDGE OF PAVEMENT.

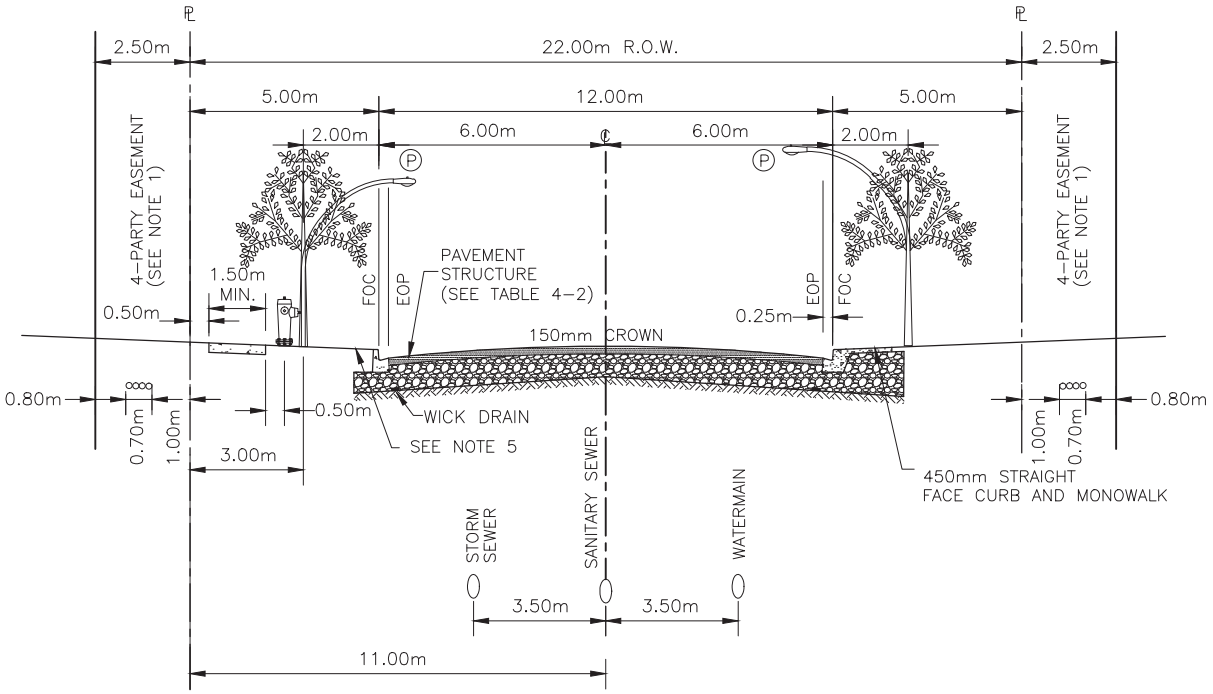
(3) FOC – FACE OF CURB.

(4) HARD SURFACING ENTIRE BOULEVARD MAY BE REQUIRED FOR COMMERCIAL AREAS WHERE STORE FRONTS FACE THE STREET.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

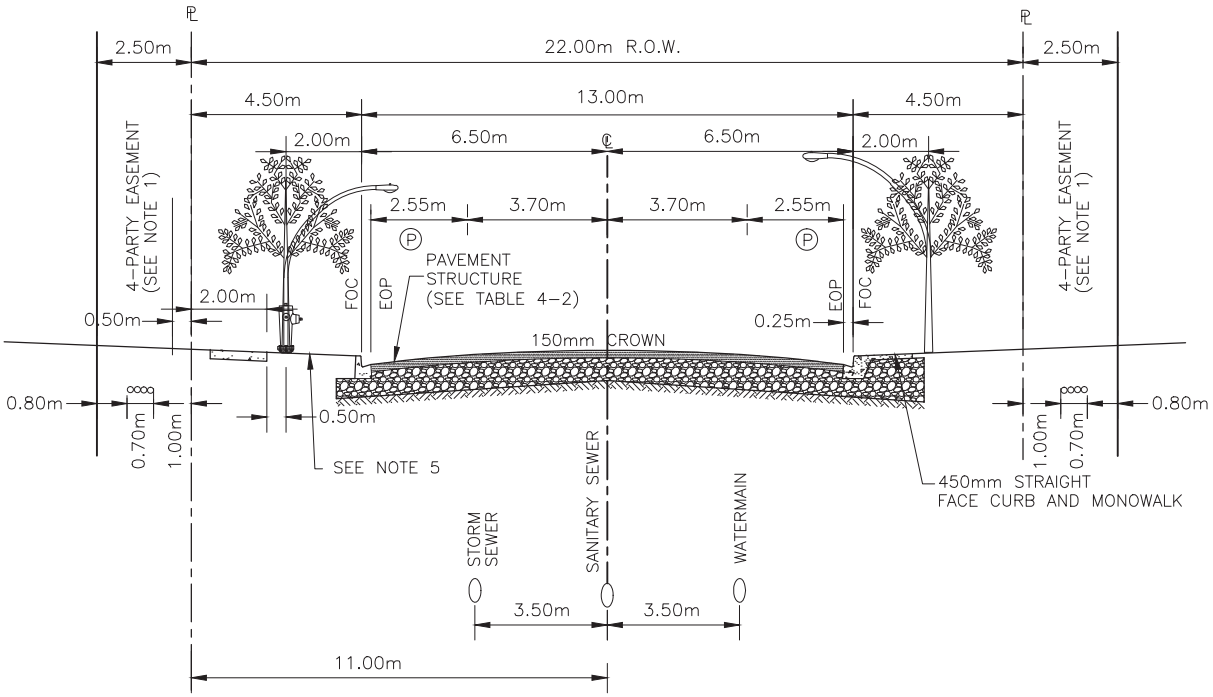
URBAN MAJOR COLLECTOR RESIDENTIAL ROADWAYS

STANDARD DETAIL:	4- 104
DATE: OCT 2016	REV: 4



URBAN LOCAL COMMERCIAL ROADWAY

SEPARATE OR MONO WALK



URBAN LOCAL INDUSTRIAL ROADWAY

SEPARATE OR MONOWALK

NOTES:

(1) 4–PARTY TRENCH CONTAINS GAS, POWER, PHONE AND CABLE LINES.

(2) EOP – EDGE OF PAVEMENT.

(3) FOC – FACE OF CURB.

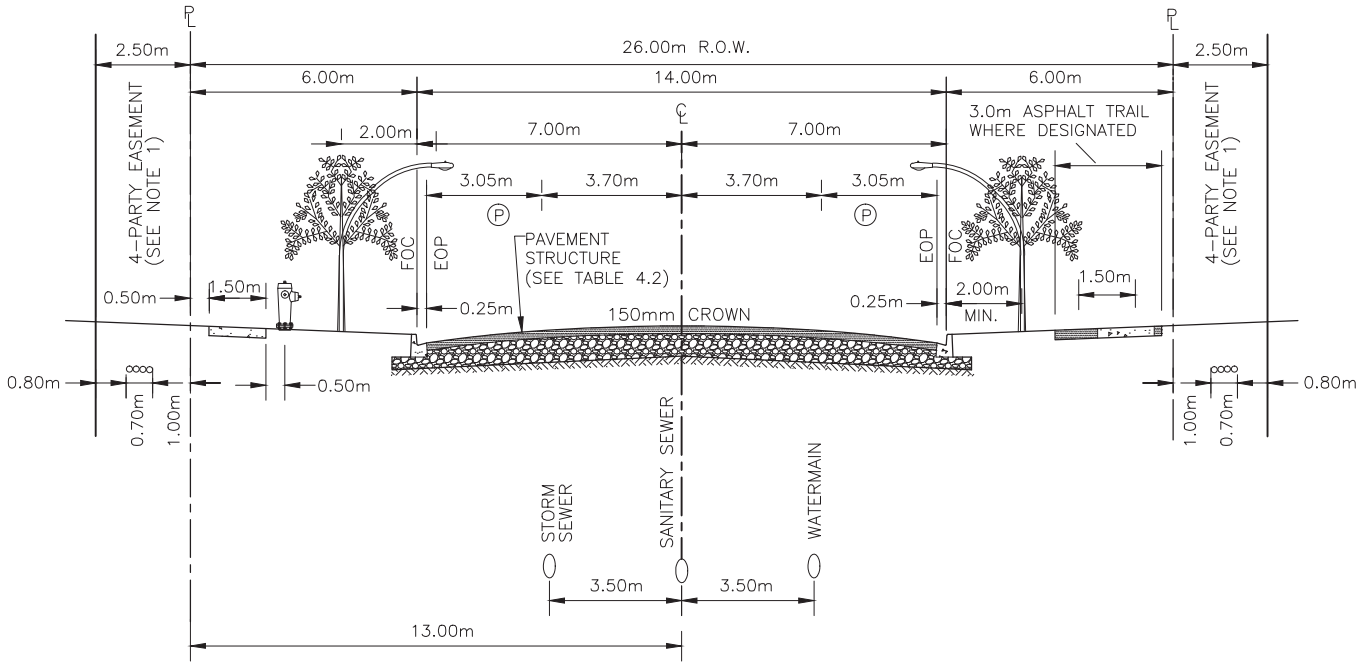
(4) HARD SURFACING ENTIRE BOULEVARD MAY BE REQUIRED FOR COMMERCIAL AREAS WHERE STORE FRONTS FACE THE STREET.

(5) SEE CHAPTER 10.8 FOR BOULEVARD TREATMENT OPTIONS

REGIONAL MUNICIPALITY OF WOOD BUFFALO

URBAN LOCAL INDUSTRIAL / COMMERCIAL ROADWAYS

STANDARD DETAIL:	4- 105
DATE: OCT 2016	REV: 4



URBAN COLLECTOR INDUSTRIAL/COMMERCIAL ROADWAY

NOTES:

(1) 4–PARTY TRENCH CONTAINS GAS, POWER, PHONE AND CABLE LINES.

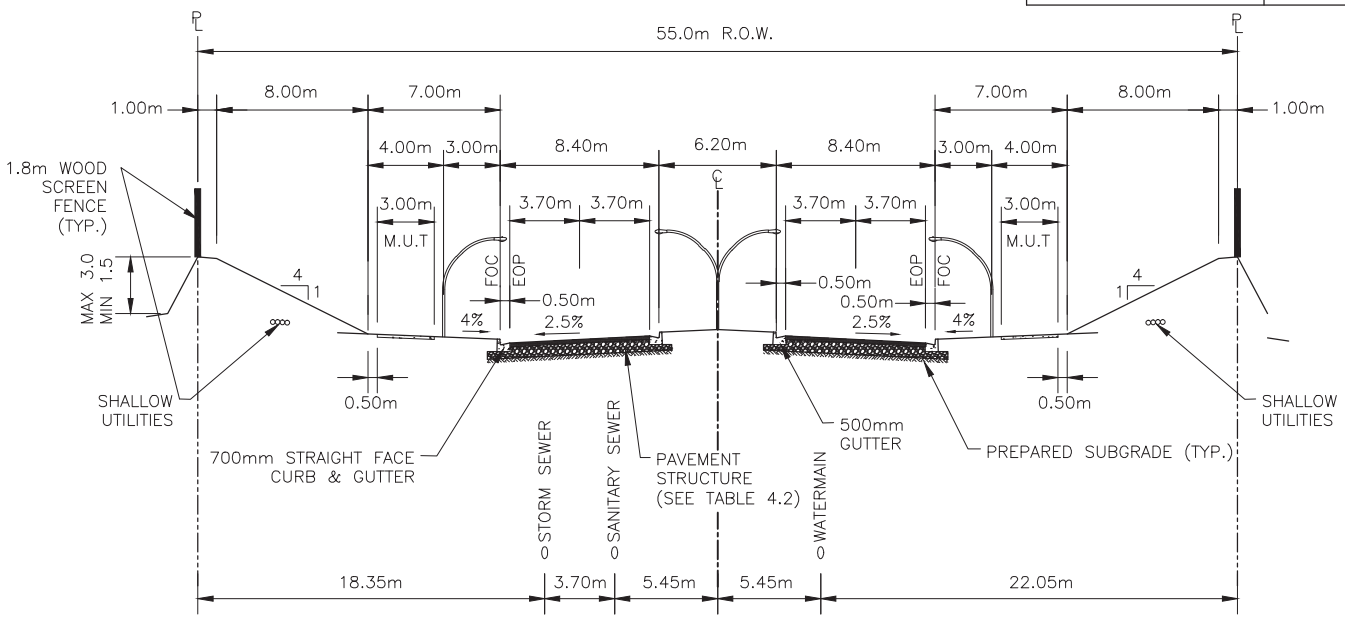
(2) EOP – EDGE OF PAVEMENT.

(3) REFER TO CHAPTER 10.8 FOR BOULEVARD TREATMENT OPTIONS.

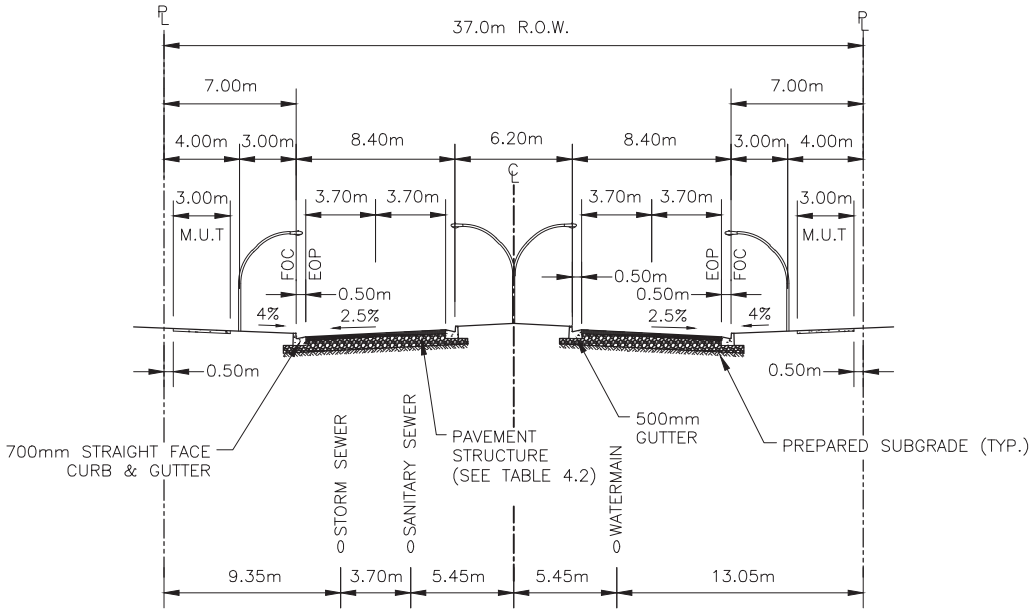
REGIONAL MUNICIPALITY OF WOOD BUFFALO

URBAN COLLECTOR INDUSTRIAL/COMMERCIAL ROADWAYS

STANDARD DETAIL:	4- 106
DATE: OCT 2016	REV: 10



4 LANE URBAN ARTERIAL DIVIDED ROADWAY (BERMED)



4 LANE URBAN ARTERIAL DIVIDED ROADWAY (NO BERM)

NOTES:

(1) FOC – FACE OF CURB.

(2) EOP – EDGE OF PAVEMENT.

(3) FOR A 6 LANE URBAN ARTERIAL, ADD 7.4m TO THE R.O.W.

(4) CO–ORDINATE WITH MUNICIPAL ENGINEERING DEPARTMENT FOR SHALLOW UTILITY LINE ASSIGNMENTS

(5) REFER TO SECTION 10.8 FOR BOULEVARD AND MEDIAN TREATMENT OPTIONS.

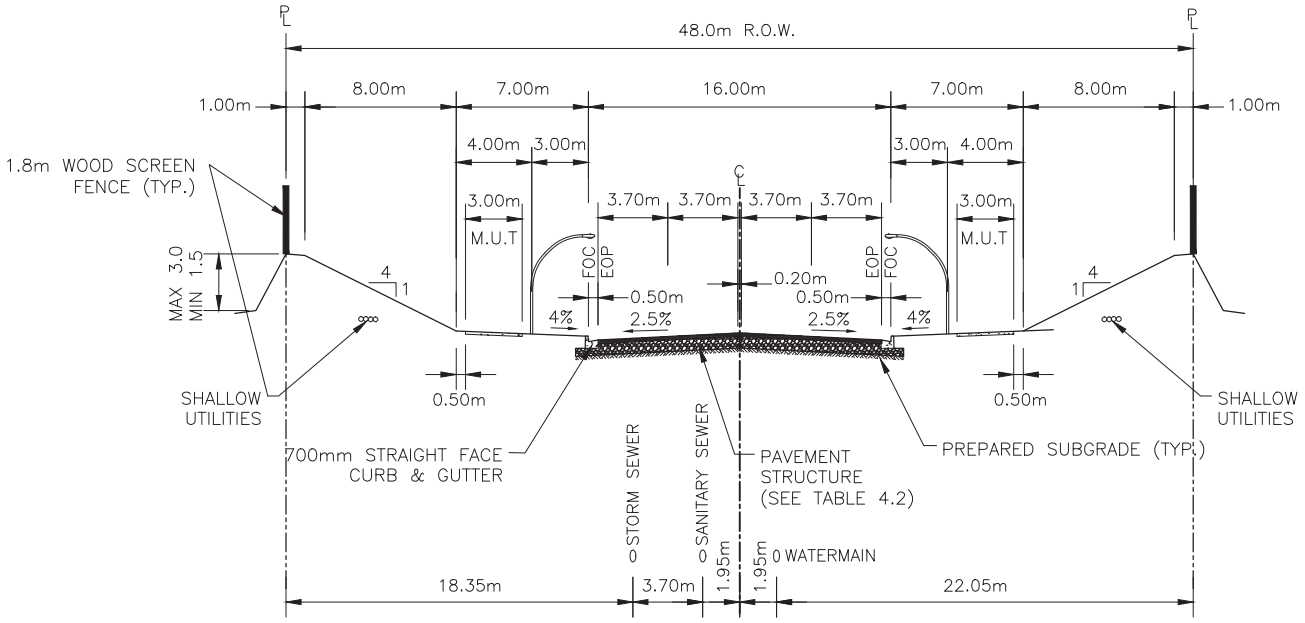
(6) MEDIAN DIMENSIONS SPACE MAY BE NARROWED TO ACCOMMODATE NO–POST BARRIER SEPARATION AT LOCATIONS WITHOUT LEFT TURN MOVEMENTS. REFER TO TAC STANDARDS.

(7) DEEP UNDERGROUND UTILITIES TO BE INSTALLED IN ALIGNMENT WITH CENTER OF DRIVING LANES

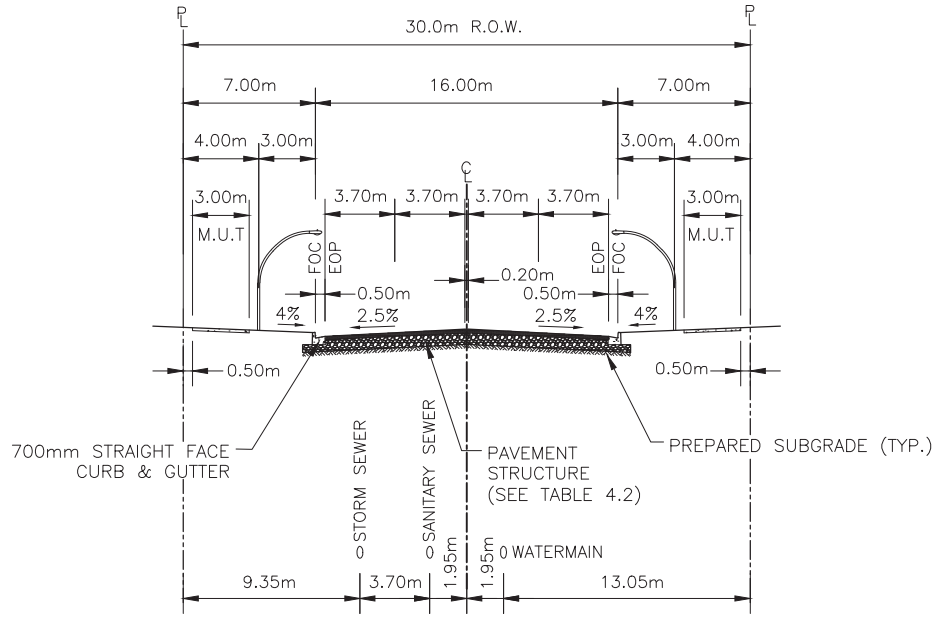
REGIONAL MUNICIPALITY OF WOOD BUFFALO

DIVIDED URBAN ARTERIAL ROADWAYS

STANDARD DETAIL:	4- 107
DATE: OCT 2016	REV: 10



4 LANE URBAN ARTERIAL UNDIVIDED ROADWAY (BERMED)



4 LANE URBAN ARTERIAL UNDIVIDED ROADWAY (NO BERM)

NOTES:

(1) FOC – FACE OF CURB.

(2) EOP – EDGE OF PAVEMENT.

(3) FOR A 6 LANE URBAN ARTERIAL, ADD 7.4m TO THE R.O.W.

(4) CO–ORDINATE WITH MUNICIPAL ENGINEERING DEPARTMENT FOR SHALLOW UTILITY LINE ASSIGNMENTS.

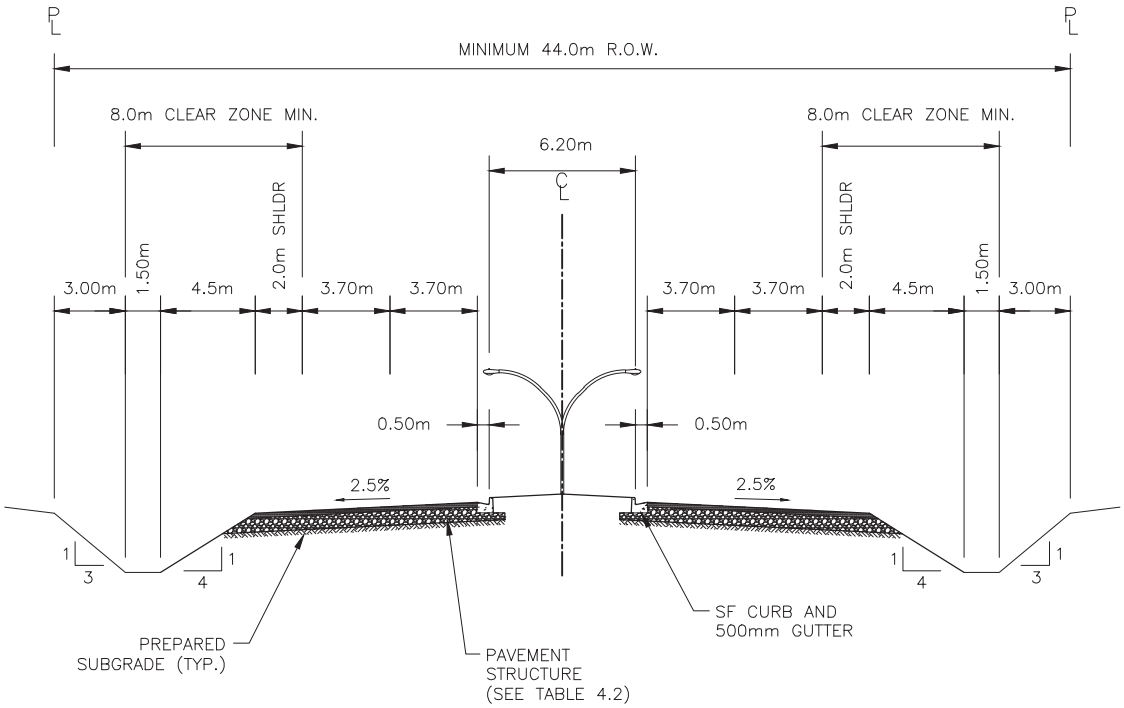
(5) REFER TO SECTION 10.8 FOR BOULEVARD TREATMENT OPTIONS.

(6) DEEP UNDERGROUND UTILITIES TO BE INSTALLED IN ALIGNMENT WITH CENTER OF DRIVING LANES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

UNDIVIDED URBAN ARTERIAL ROADWAYS

STANDARD DETAIL:	4- 108
DATE: OCT 2016	REV: 10



NOTES:

(1) FOC – FACE OF CURB.

(2) EOP – EDGE OF PAVEMENT.

(3) FOR A 6 LANE URBAN ARTERIAL, ADD 7.4m TO THE R.O.W.

(4) CO–ORDINATE WITH MUNICIPAL ENGINEERING DEPARTMENT FOR SHALLOW UTILITY LINE ASSIGNMENT.

(5) REFER TO SECTION 10.8 FOR BOULEVARD AND MEDIAN TREATMENT OPTIONS.

(6) MEDIAN DIMENSIONS SPACE MAY BE NARROWED TO ACCOMMODATE NO–POST BARRIER SEPARATION AT LOCATIONS WITHOUT LEFT TURN MOVEMENTS. REFER TO TAC STANDARDS.

(7) 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.

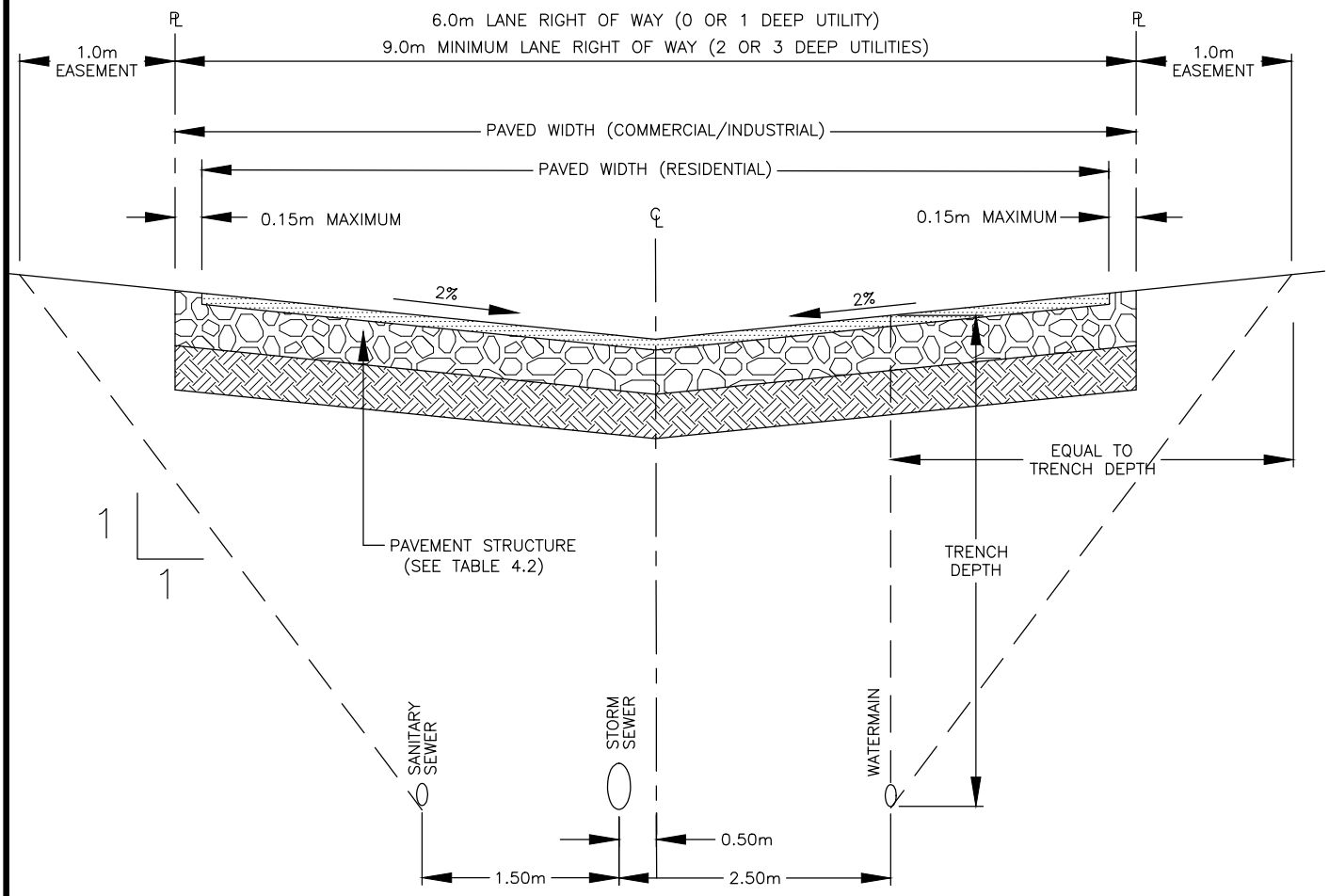
(8) CROSS SECTION AS SHOWN WILL ACCOMMODATE SINGLE 3.5m LEFT TURN BAY. IF DOUBLE LEFT TURN BAY IS REQUIRED, WIDEN MEDIAN TO 10.2m (FOC TO FOC) AND R.O.W. TO MIMUMUM 47.0m. OUTER TURNING LANE TO BE 4.0m WIDE.

(9) TRIPLE LEFT TURN BAY WILL NOT BE PERMITTED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

DIVIDED RURAL ARTERIAL ROADWAYS

STANDARD DETAIL:	4- 109
DATE.: JAN. 2021	REV: 8



NOTES:

(1) PROVIDE FULL DEPTH ASPHALT PAVEMENT STRUCTURE TO ADJACENT HARD SURFACED PARKING AREAS.

(2) WATER AND SANITARY SERVICING IN LANES ONLY UPON MUNICIPALITY APPROVAL.

(3) WIDTH TO BE MINIMUM 6.0m FOR LANES WITH UP TO ONE DEEP UTILITY.

WIDTH TO BE MINIMUM 9.0m FOR LANES WITH TWO OR THREE DEEP UTILITIES.

(4) LANE WIDTH TO VARY BASED ON TRENCH DEPTH OF THE DEEPEST MAIN.

(5) TYPICAL LANE CROSS SECTION FOR NEW LANE CONSTRUCTION. EXISTING LANES MAY VARY DUE TO EXISTING RIGHT-OF-WAY CONSTRAINTS.

(6) 1:1 SIDESLOPE SHOWN IS TO BE USED AS A GUIDELINE FOR ESTABLISHING LANE WIDTH REQUIREMENTS TO PROVIDE A MINIMUM SETBACK FOR EXISTING REAR YARD BUILDINGS (GARAGE, STORAGE SHED, ETC.)

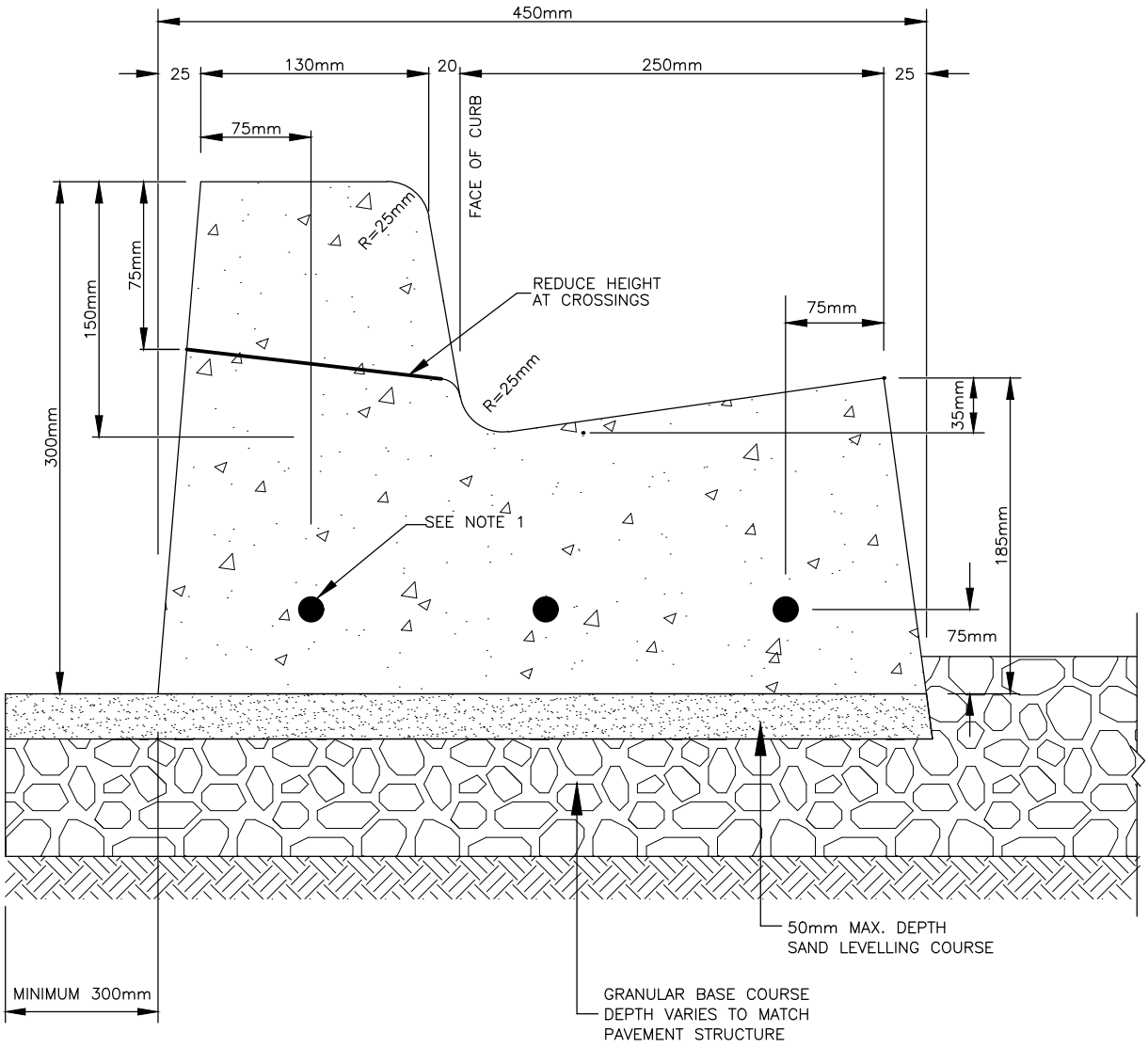
(7) ACTUAL TRENCH SIDESLOPES ARE TO BE BASED ON OCCUPATIONAL HEALTH & SAFETY GUIDELINES

(8) MINIMUM LONGITUDINAL LANE GRADE 0.5% AND MAXIMUM LONGITUDINAL LANE GRADE IS 8.0%

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL LANE CROSS SECTION

STANDARD DETAIL:	4- 200
DATE.: JAN. 2021	REV: 6



NOTES:

(1) 3–10M REINFORCEMENT AT ALL COMMERCIAL, INDUSTRIAL, LANES AND APARTMENT DRIVEWAY ENTRANCES.

(2) CONCRETE TO BE TYPE HS, 32MPa COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

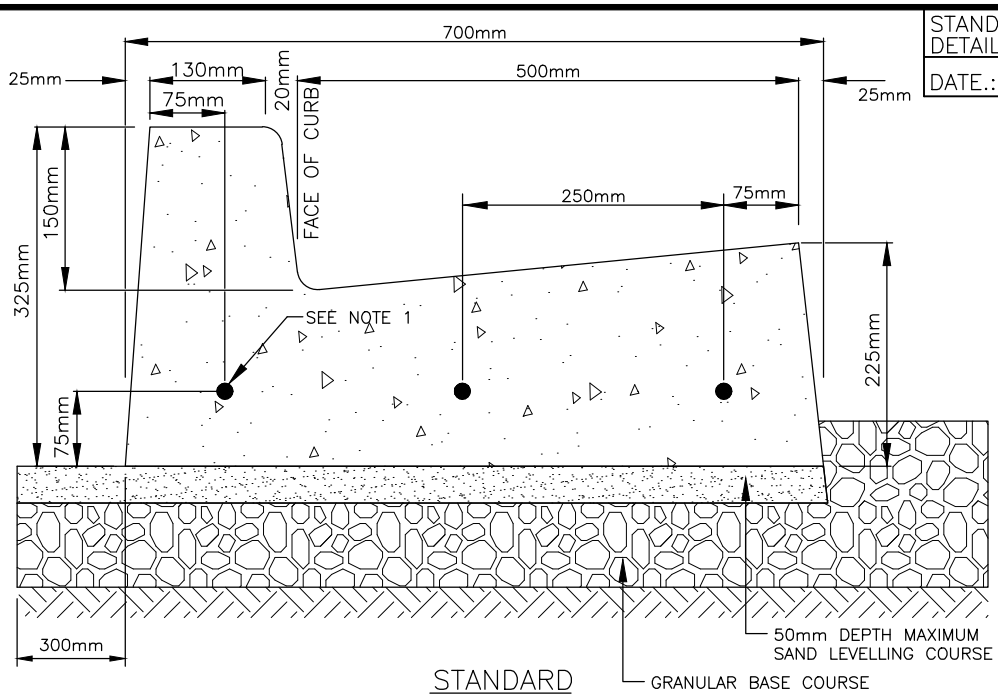
(3) COMPACT BACKFILL TO 95% FOR 300mm FROM BACK OF CURB.

(4) 250mm GUTTER FOR USE ON LOCAL AND COLLECTOR ROADS.

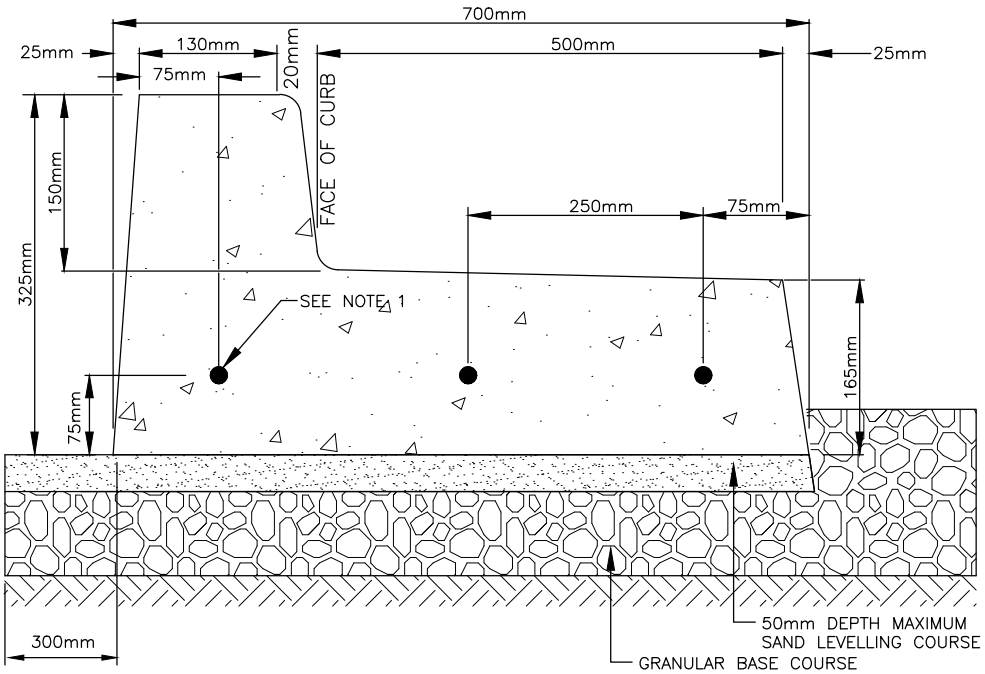
REGIONAL MUNICIPALITY OF WOOD BUFFALO

STANDARD 450mm CURB AND GUTTER

STANDARD DETAIL:	4- 201
DATE.: JAN. 2021	REV: 6



STANDARD



SUPERELEVATED

NOTES:

(1) 3–10M REINFORCEMENT AT ALL COMMERCIAL, INDUSTRIAL, LANES AND APARTMENT DRIVEWAY ENTRANCES.

(2) CONCRETE TO BE TYPE HS, 32MPa COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

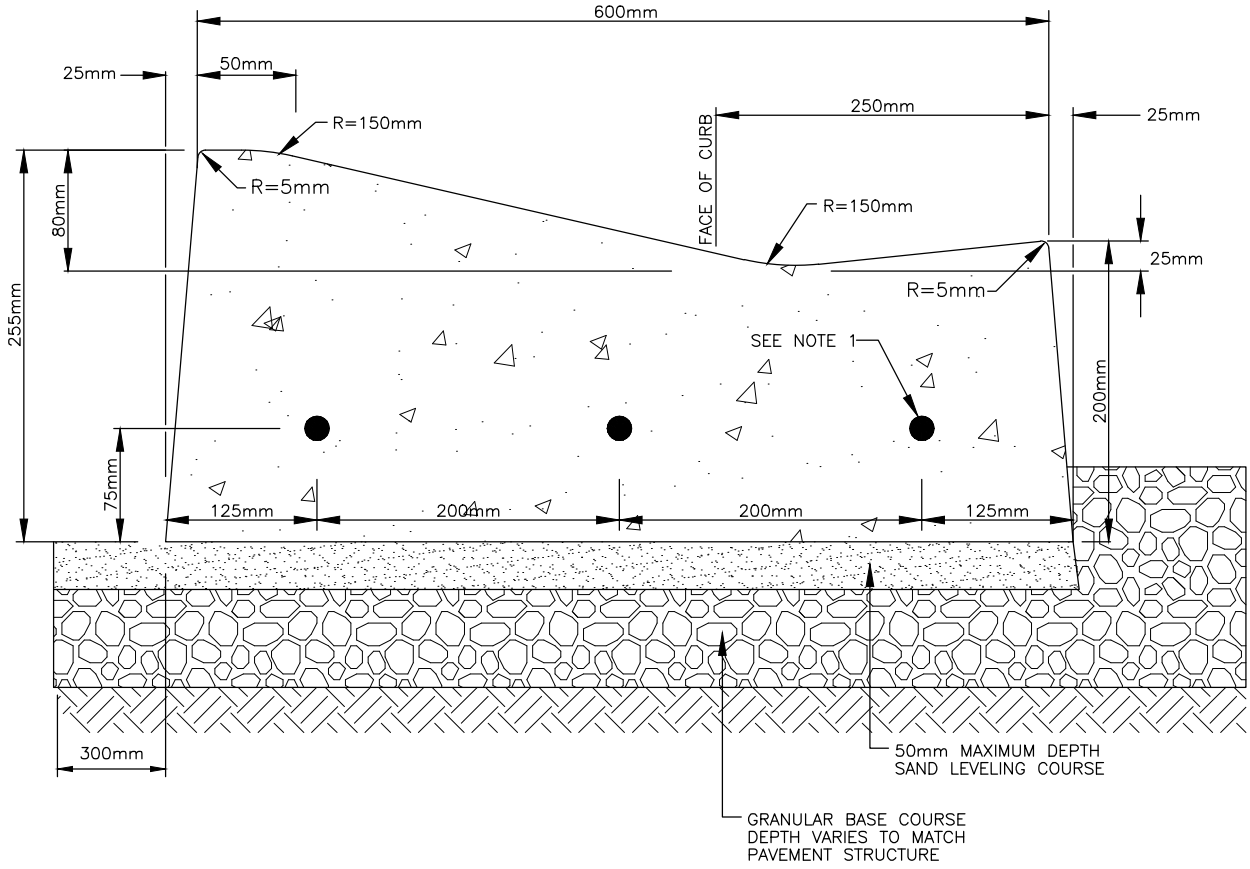
(3) COMPACT BACKFILL TO 95% FOR 300mm FROM BACK OF CURB.

(4) 500mm GUTTER FOR USE ON ARTERIAL ROADS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

STANDARD 700mm CURB AND GUTTER

STANDARD DETAIL:	4- 202
DATE.: JAN. 2021	REV: 7



NOTES:

(1) 3–10M REINFORCEMENT AT ALL COMMERCIAL, INDUSTRIAL, LANES AND APARTMENT DRIVEWAY ENTRANCES.

(2) CONCRETE TO BE TYPE HS, 32MPa COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

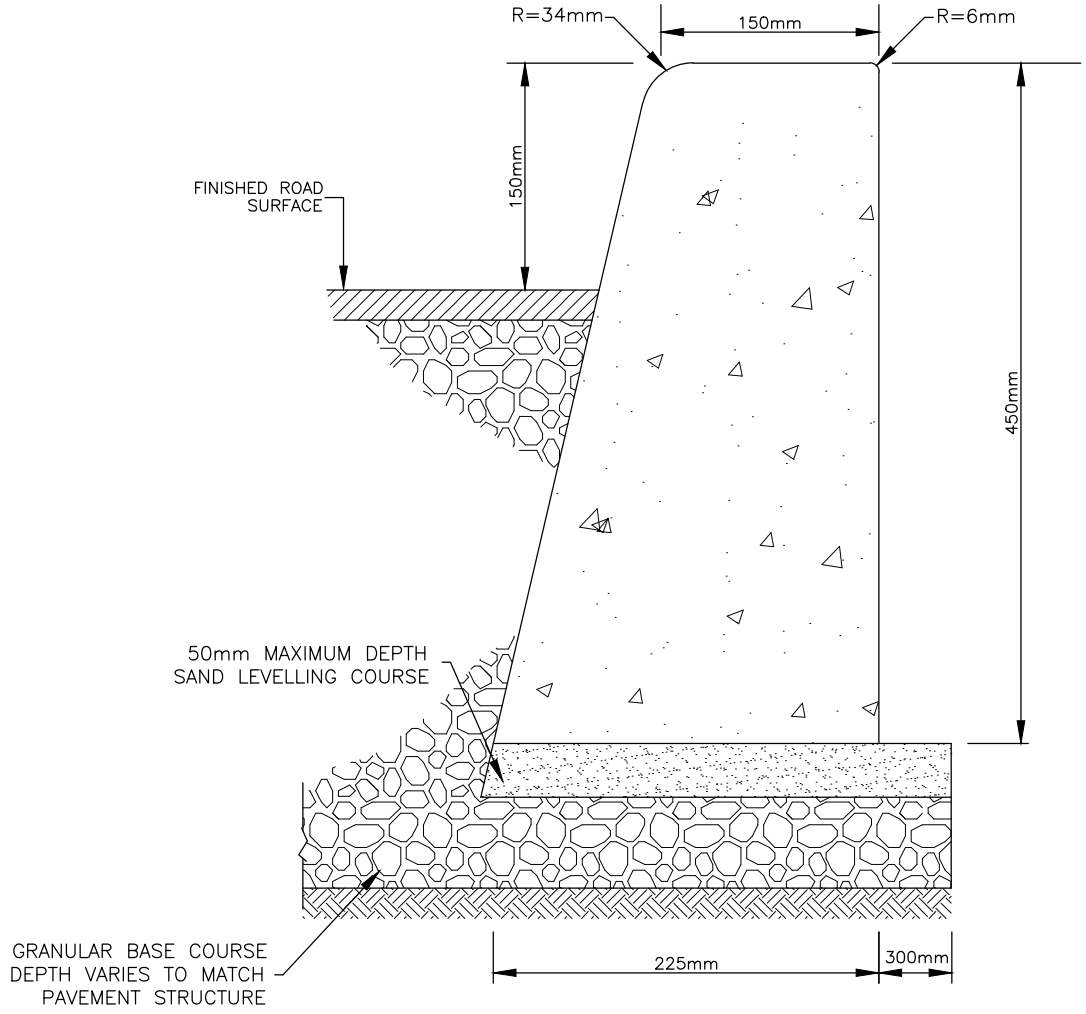
(3) COMPACT BACKFILL TO 95% FOR 300mm FROM BACK OF CURB.

(4) FOR USE ON MINOR COLLECTORS AND RESIDENTIAL LOCALS WHERE ROLLED FACE CURB IS SPECIFIED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

ROLLED FACE CURB AND GUTTER

STANDARD DETAIL:	4- 203
DATE.: JAN. 2021	REV: 5



NOTES:

(1) CONCRETE TO BE TYPE HS, 32MPa COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

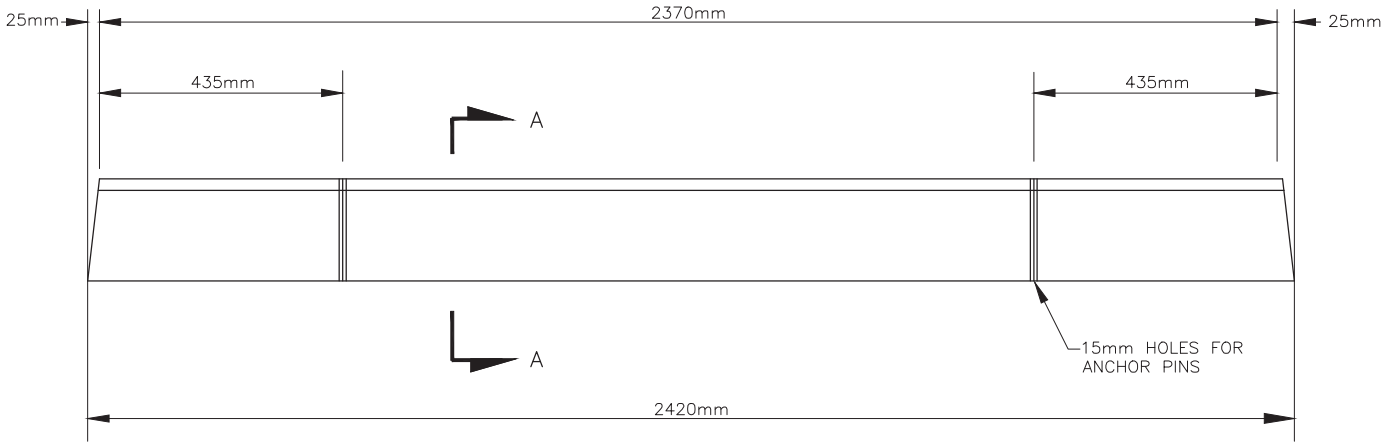
(2) COMPACT BACKFILL TO 95% FOR 300mm FROM BACK OF CURB.

(3) FOR USE ONLY AT THE APPROVAL OF THE RMWB IN INSTANCES WITHOUT GUTTER DRAINAGE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

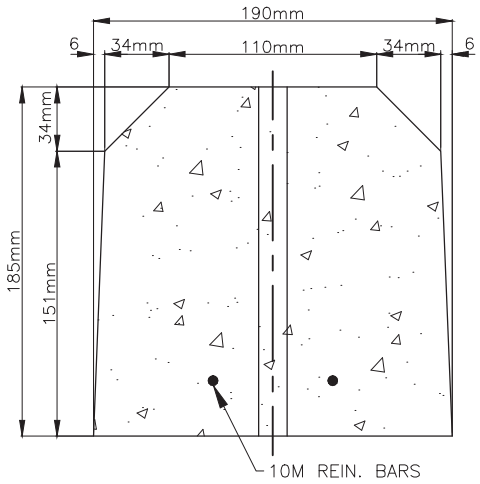
STANDARD BARRIER CURB (NO GUTTER)

STANDARD DETAIL:	4- 204
DATE: OCT 2016	REV: 5

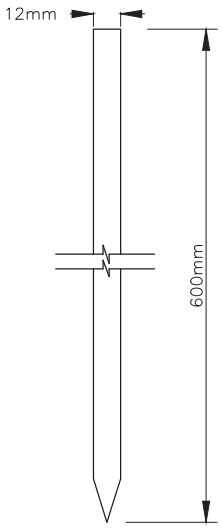


ELEVATION

NOTES



SECTION A–A



STEEL ANCHOR PIN

NOTES:

(1) CURB TO BE INSTALLED WITH 300mm CLEAR SPACE BETWEEN SECTIONS, END TO END.

(2) CONCRETE TO BE TYPE HS, 32MPa COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

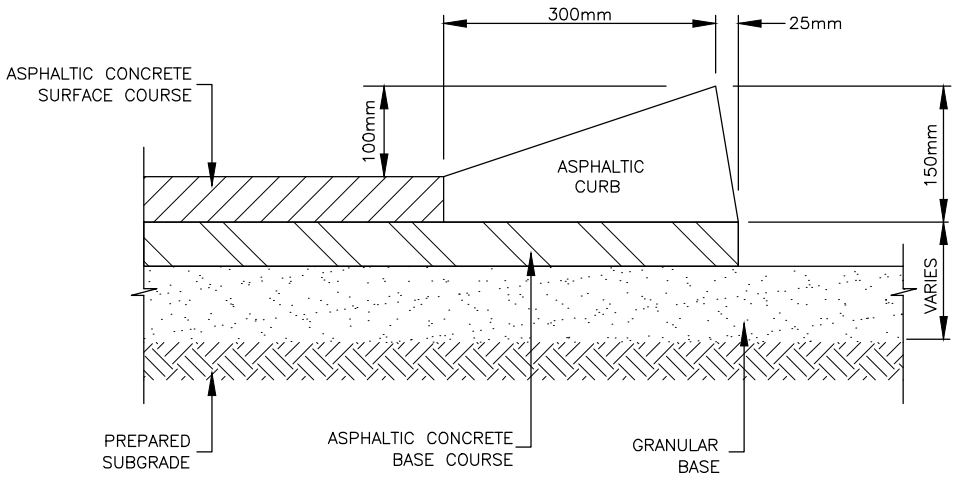
(3) FOR OFF ROADWAY USE ONLY.

(4) NOT PAINTED.

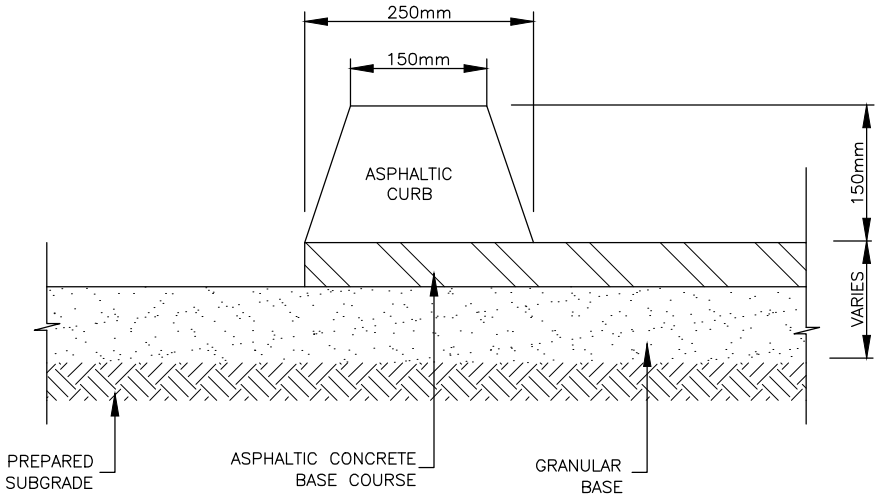
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PRECAST CONCRETE CURB/ WHEEL STOP

STANDARD DETAIL:	4- 205
DATE.: JAN. 2021	REV: 6



MACHINE LAID MOUNTABLE ASPHALT CURB



MACHINE LAID BARRIER ASPHALT CURB

NOTES:

(1) BACKFILL CURB WITHIN 24 HOURS TO MINIMUM 95% STANDARD PROCTOR DENSITY.

(2) TACK COAT SHALL BE PLACED BETWEEN ASPHALT LIFTS.

(3) COMPACT TO 95% FOR 300mm FROM BACK OF CURB.

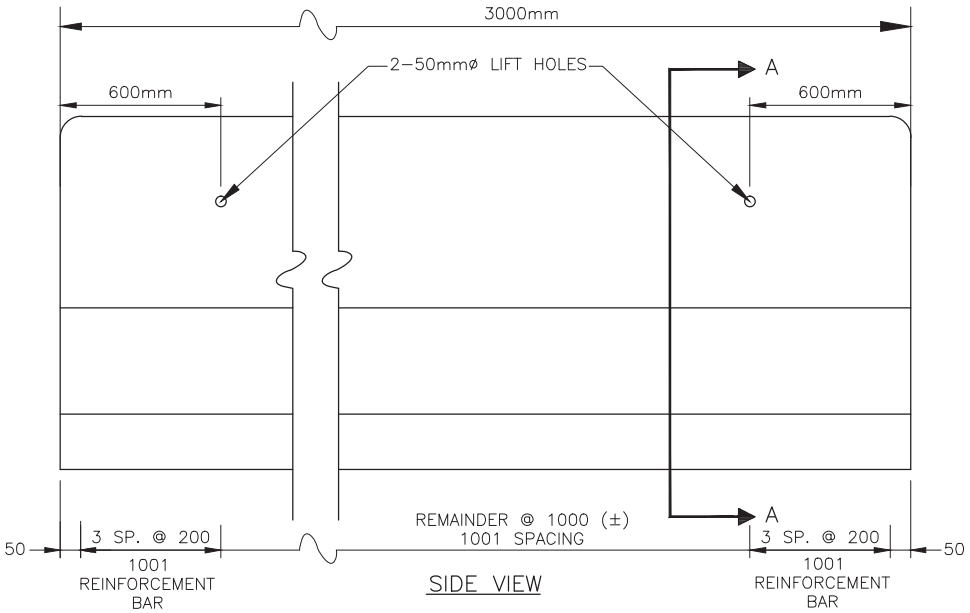
(4) FOR OFF-ROADWAY USE ONLY.

(5) FOR USE AT THE APPROVAL OF THE RMWB ONLY.

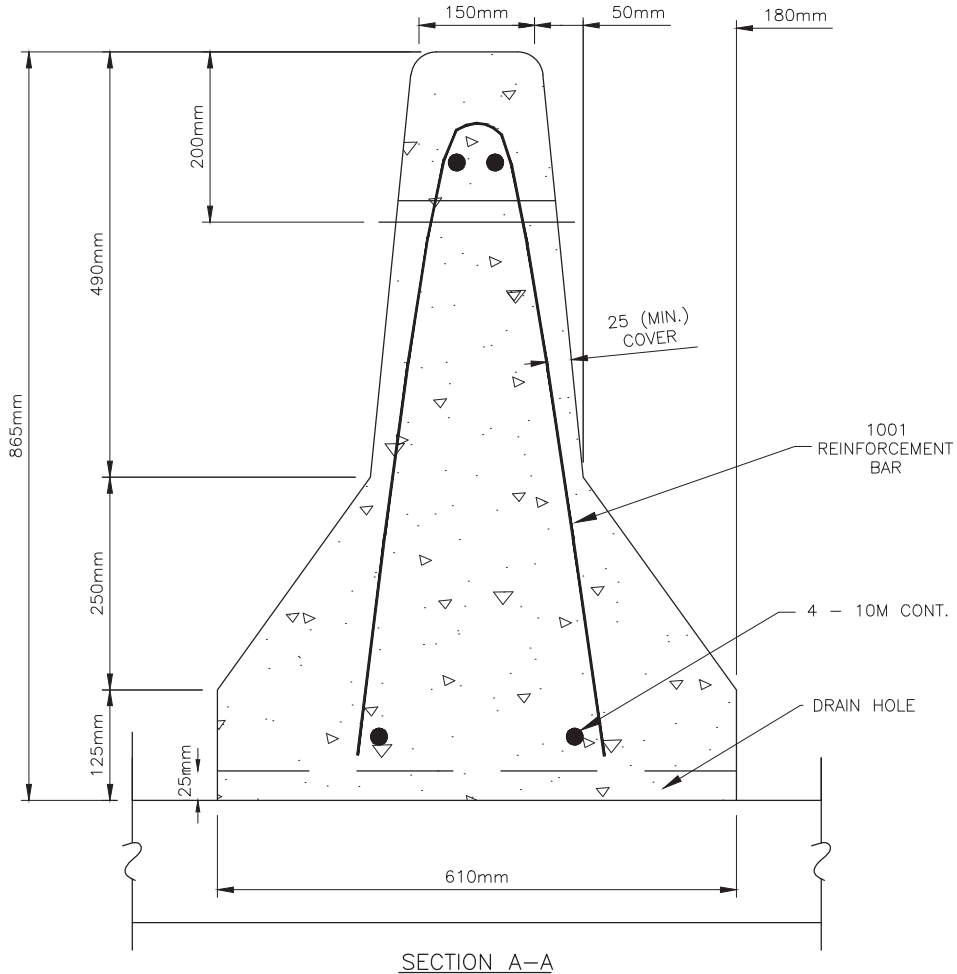
REGIONAL MUNICIPALITY OF WOOD BUFFALO

ASPHALT CURB

STANDARD DETAIL:	4- 206
DATE: OCT 2016	REV: 5



SIDE VIEW

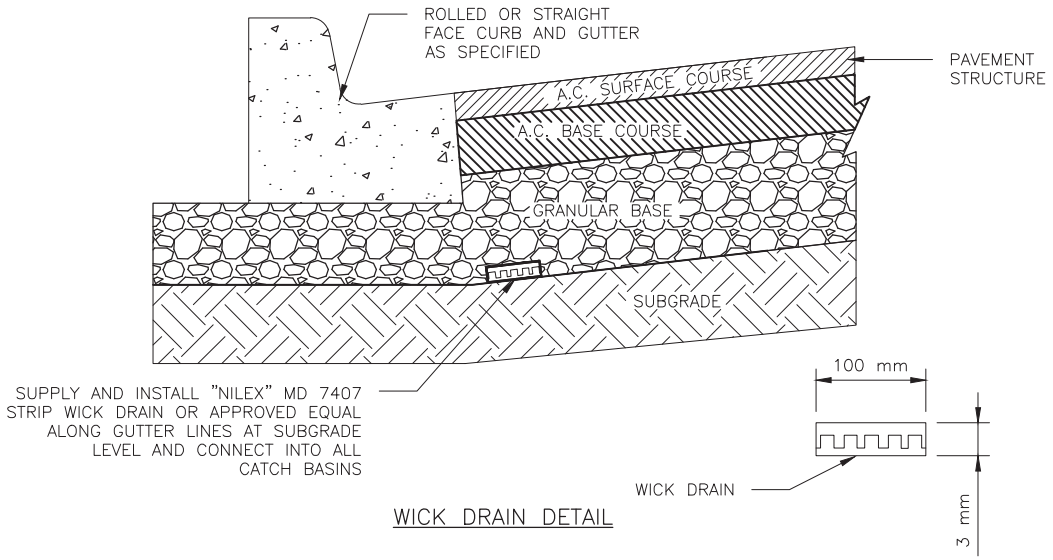


SECTION A–A

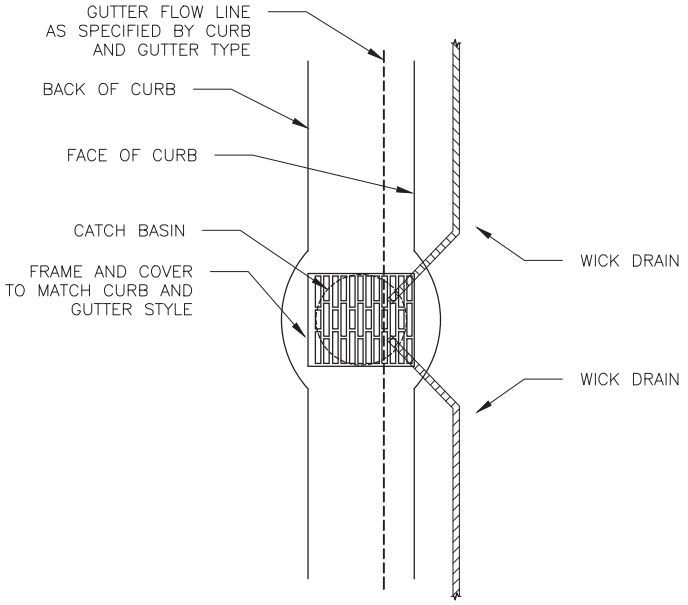
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PRECAST CONCRETE BARRIER

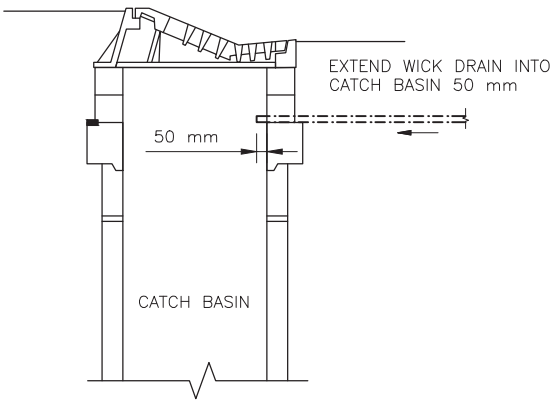
STANDARD DETAIL:	4- 207
DATE: OCT 2016	REV: 10



WICK DRAIN DETAIL



PLAN VIEW

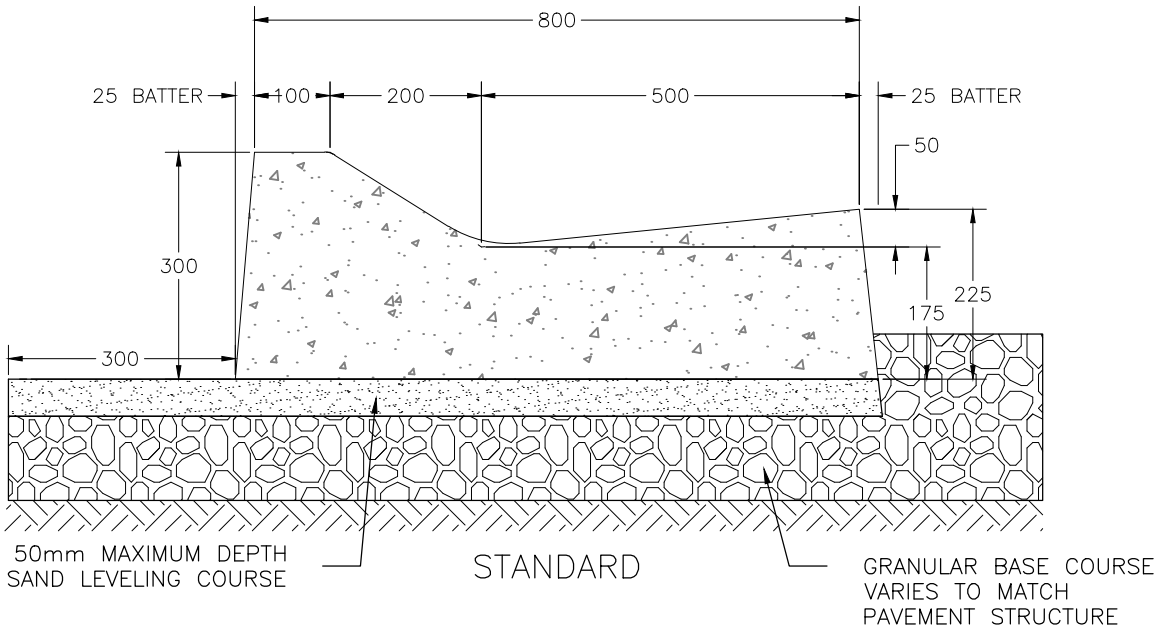


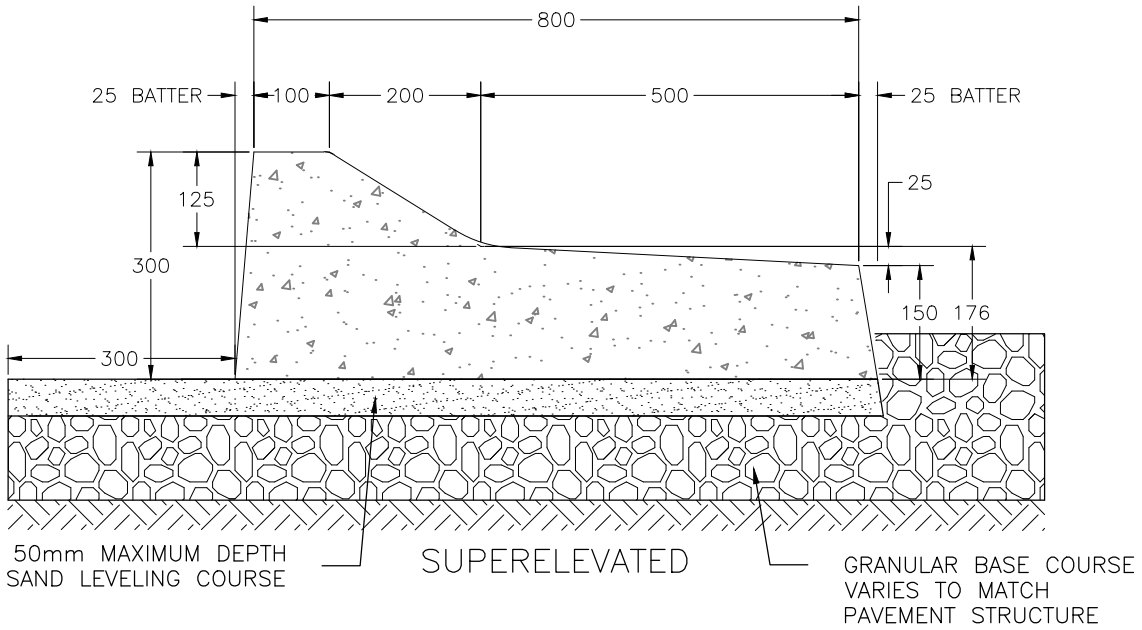
ELEVATION VIEW

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WICK DRAIN AND WICK DRAIN ENTERING CATCH BASIN

STANDARD DETAIL:	4- 208
DATE.: JAN. 2021	REV: 0





NOTES:

(1) CONCRETE TO BE TYPE HS, 32MPa COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

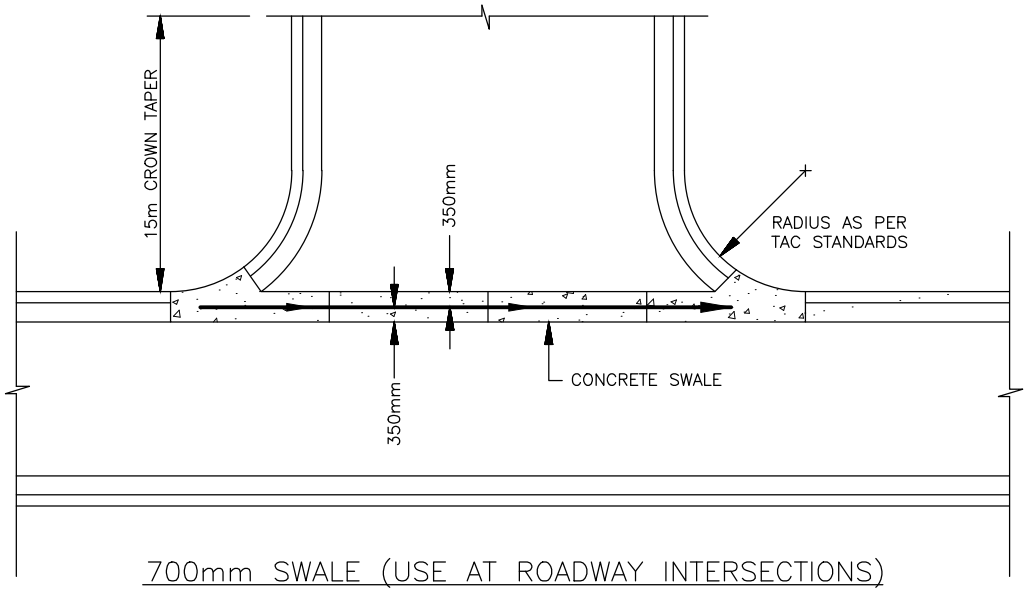
(2) COMPACT BACKFILL TO 95% FOR 300mm FROM BACK OF CURB.

(3) 500mm GUTTER SEMI-MOUNTABLE CURB FOR USE ON ARTERIAL ROADS WHEN POSTED SPEED 70km/hr OR GREATER.

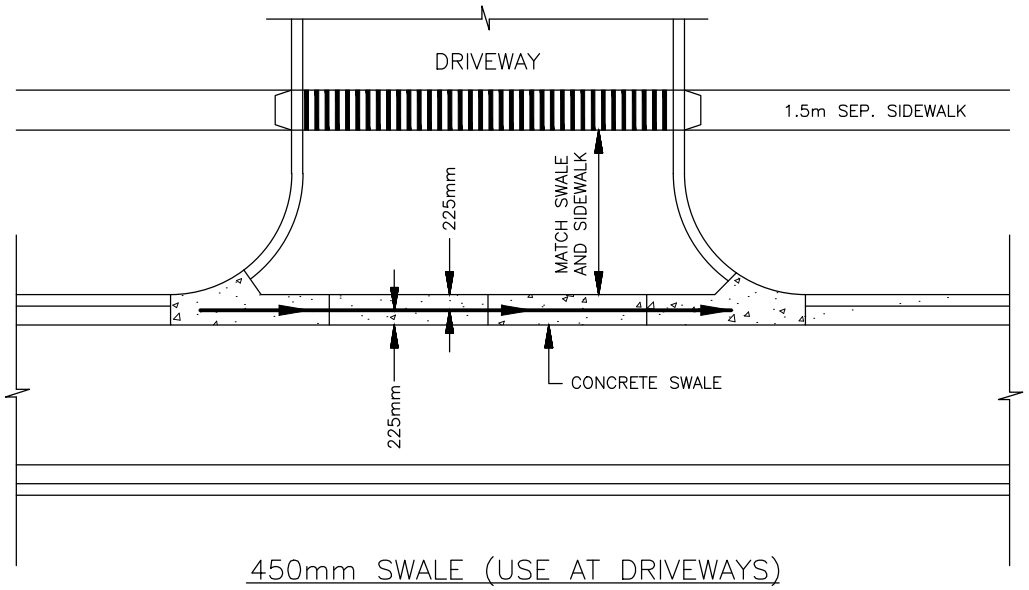
REGIONAL MUNICIPALITY OF WOOD BUFFALO

SEMI-MOUNTABLE CURB AND GUTTER

STANDARD DETAIL:	4-300
DATE.: JAN. 2021	REV: 8



700mm SWALE (USE AT ROADWAY INTERSECTIONS)



450mm SWALE (USE AT DRIVEWAYS)

NOTES:

(1) CROWN OF ROAD TO BE TAPERED STARTING 15m FROM SWALE EDGE.

(2) CONTRACTION JOINTS 50mm DEEP AND 5mm WIDE TO BE CONSTRUCTED ON 3m CENTRES 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) CONCRETE SHALL BE TYPE HS, 32MPa. COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

(6) ASPHALT SHALL BE FULL DEPTH AT FACE OF SWALE TAPERED TO DESIGN ROAD DEPTH IN 2m.

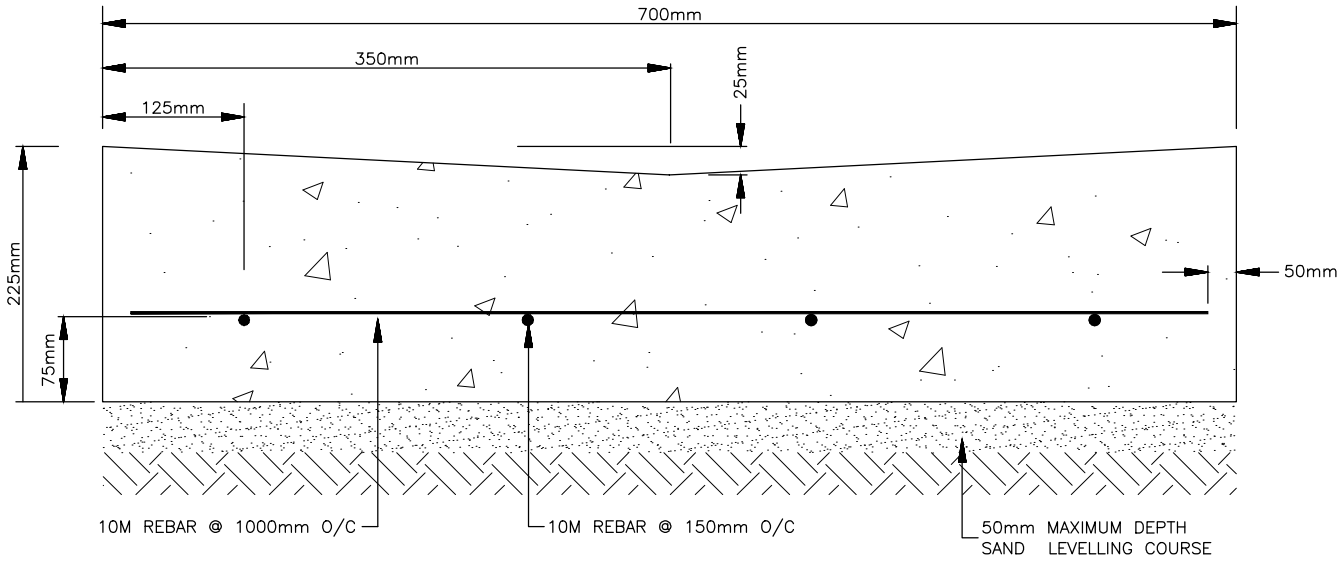
(7) SEE STANDARD DRAWING NO. 4-301 FOR SWALE CROSS-SECTION.

(8) SEE STANDARD DRAWING NO. 4-403 FOR JOINT DETAILS.

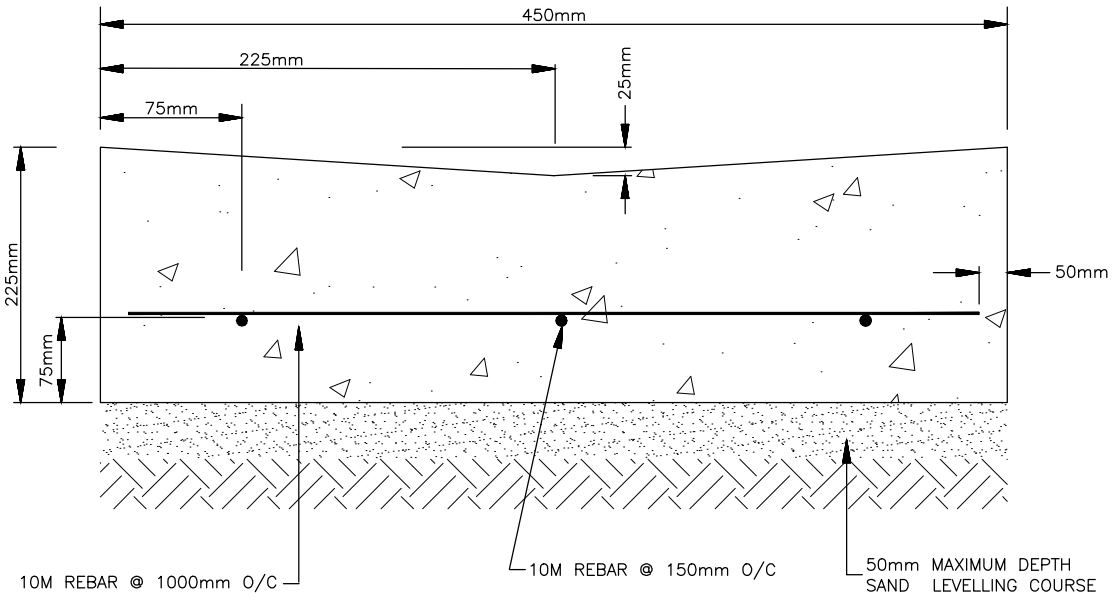
REGIONAL MUNICIPALITY OF WOOD BUFFALO

CONCRETE SWALE (PLAN)

STANDARD DETAIL:	4-301
DATE.: JAN. 2021	REV: 7



700mm SWALE (USE AT ROAD INTERSECTIONS)



450mm SWALE (USE AT DRIVEWAYS)

NOTES:

(1) C/L 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 C/L OF SWALE.

(3) EXPANSION JOINTS TO BE CONSTRUCTED AT ENDS OF SWALE WHERE SWALE ABUTS GUTTERS.

(4) CONTRACTION JOINTS 50mm DEEP AND 5mm WIDE TO BE CONSTRUCTED 3m ON CENTRES ALONG SWALE.

(5) CROWN OF ROAD TO BE TAPERED, STARTING 15m FROM SWALE,TO PROVIDE SMOOTH VEHICULAR CROSSING OF SWALE.

(6) CONCRETE TO BE TYPE HS, 32MPa COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

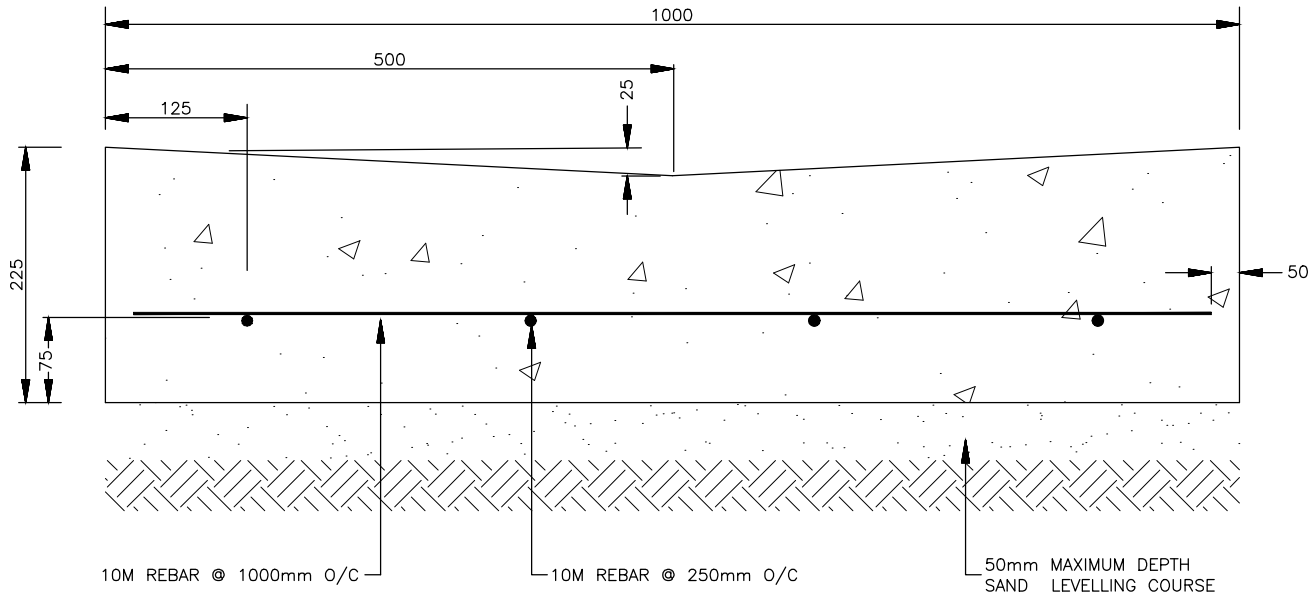
(7) SEE STANDARD DRAWING NO. 4-300 FOR SWALE PLAN.

(8) SEE STANDARD DRAWING NO. 4-403 FOR JOINT DETAILS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CONCRETE SWALE (CROSS SECTION)

STANDARD DETAIL:	4-305
DATE.: JAN. 2021	REV: 5



1000mm SWALE (USE AT HIGHWAY INTERSECTIONS)

NOTES:

(1) C/L 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 C/L OF SWALE.

(3) EXPANSION JOINTS TO BE CONSTRUCTED AT ENDS OF SWALE WHERE SWALE ABUTS GUTTERS.

(4) CONTRACTION JOINTS 50mm DEEP AND 5mm WIDE TO BE CONSTRUCTED 3m ON CENTRES ALONG SWALE.

(5) CROWN OF ROAD TO BE TAPERED, STARTING 15m FROM SWALE, TO PROVIDE SMOOTH VEHICULAR CROSSING OF SWALE.

(6) CONCRETE TO BE TYPE HS, 32MPa COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

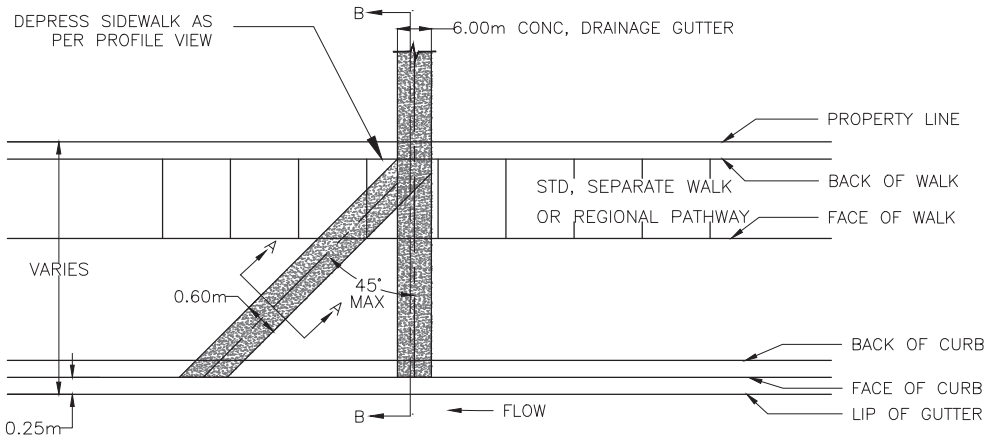
(7) SEE STANDARD DRAWING NO. 4-300 FOR SWALE PLAN.

(8) SEE STANDARD DRAWING NO. 4-403 FOR JOINT DETAILS.

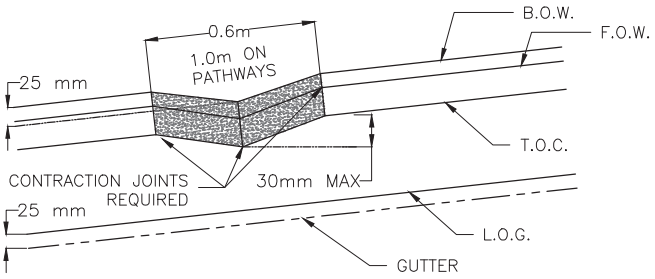
REGIONAL MUNICIPALITY OF WOOD BUFFALO

HIGHWAY
CONCRETE SWALE
(CROSS SECTION)

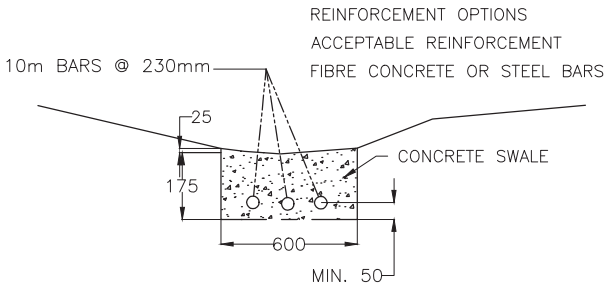
STANDARD DETAIL:	4- 306
DATE: OCT 2016	REV: 1



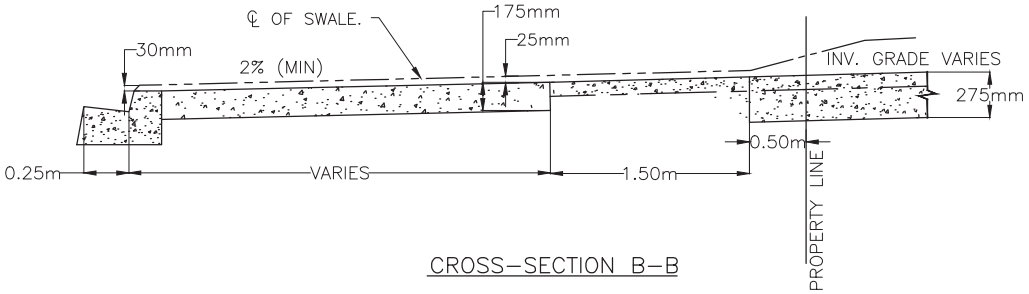
PLAN VIEW



PROFILE VIEW A–A



SECTION A–A TYPICAL



CROSS–SECTION B–B

NOTES:

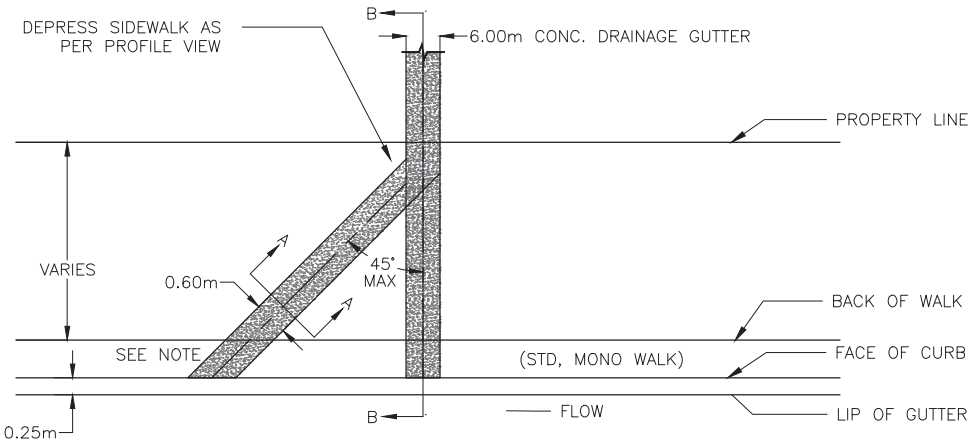
(1) ON ROAD WITH GRADE > 3% . THE SWALE MUST BE "OFFSET" TO ALLOW BETTER FLOW.

(2) ALL DIMENSIONS IN MILLIMETERS UNLESS SPECIFIED.

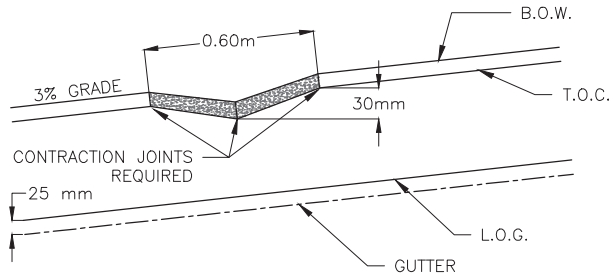
REGIONAL MUNICIPALITY OF WOOD BUFFALO

SIDEWALK AND BOULEVARD DRAINAGE CROSSING FOR SEPARATE WALK

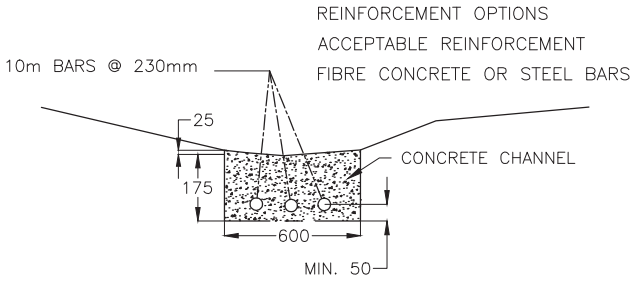
STANDARD DETAIL:	4- 307
DATE: OCT 2016	REV: 3



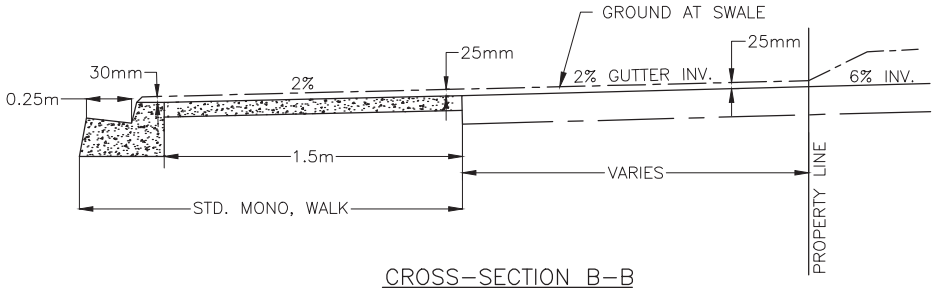
PLAN VIEW



PROFILE VIEW A–A



SECTION A–A TYPICAL



CROSS–SECTION B–B

NOTES:

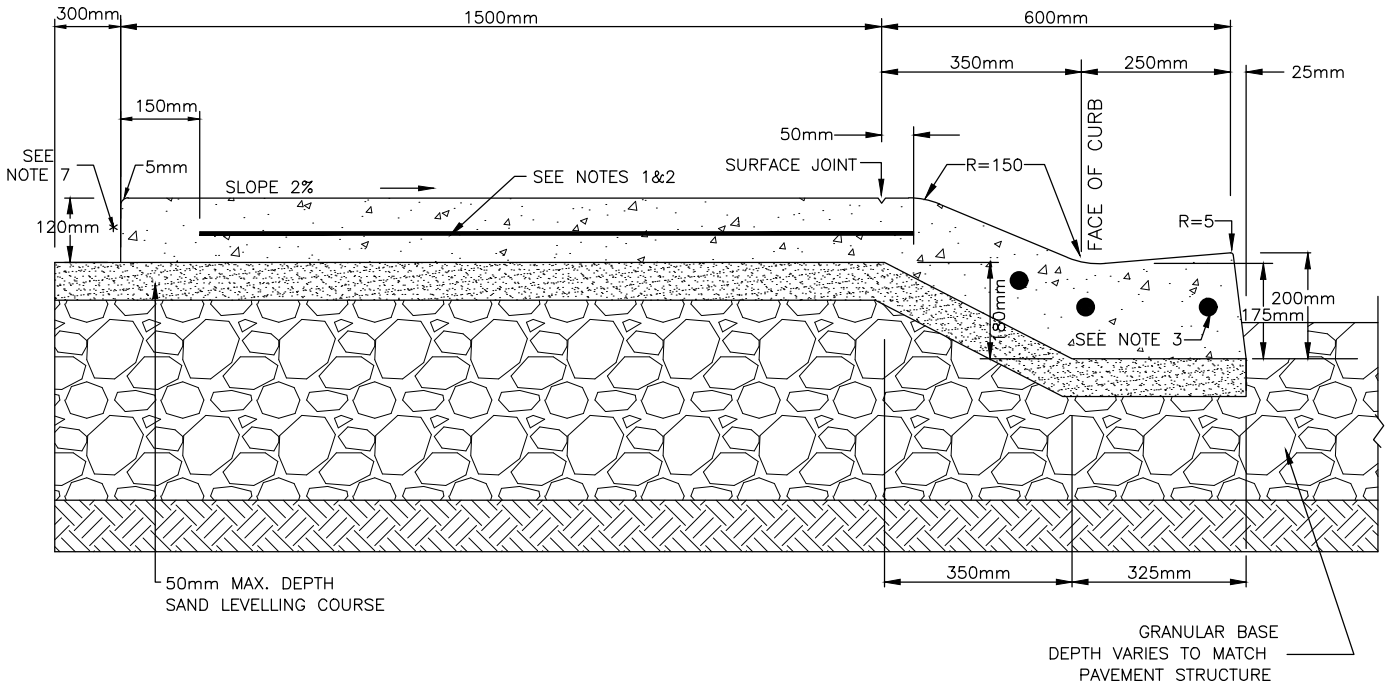
(1) ON ROAD WITH GRADE > 3% "ANGLED" SWALE MUST BE CONSTRUCTED TO ALLOW BETTER FLOW.

(2) ALL DIMENSIONS IN MILLIMETERS UNLESS SPECIFIED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SIDEWALK DRAINAGE CROSSING FOR A MONO. WALK

STANDARD DETAIL:	4- 400
DATE.: JAN. 2021	REV: 7



NOTES:

(1) 10M TRANSVERSE REINFORCEMENT AT 750mm O.C. IN ALL SIDEWALKS

(2) FOR ALL INDUSTRIAL, COMMERCIAL, LANE AND APARTMENT DRIVEWAY ENTRANCES:
(2.1) 150X150 P18/P18 GAUGE WELDED WIRE FABRIC
(2.2) OR 10M 300X300 REINFORCEMENT GRID ALTERNATIVE

(3) 3–10M REINFORCEMENT AT ALL INDUSTRIAL, COMMERCIAL, LANE AND APARTMENT DRIVEWAY ENTRANCES.

(4) CONCRETE TO BE TYPE HS, 32 MPa. COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

(5) SEE STANDARD DWG. NO. 4–202 FOR MORE DETAILED ROLLED FACE CURB & GUTTER

(6) SEE STANDARD DWG. NO. 4–403 FOR JOINT DETAILS

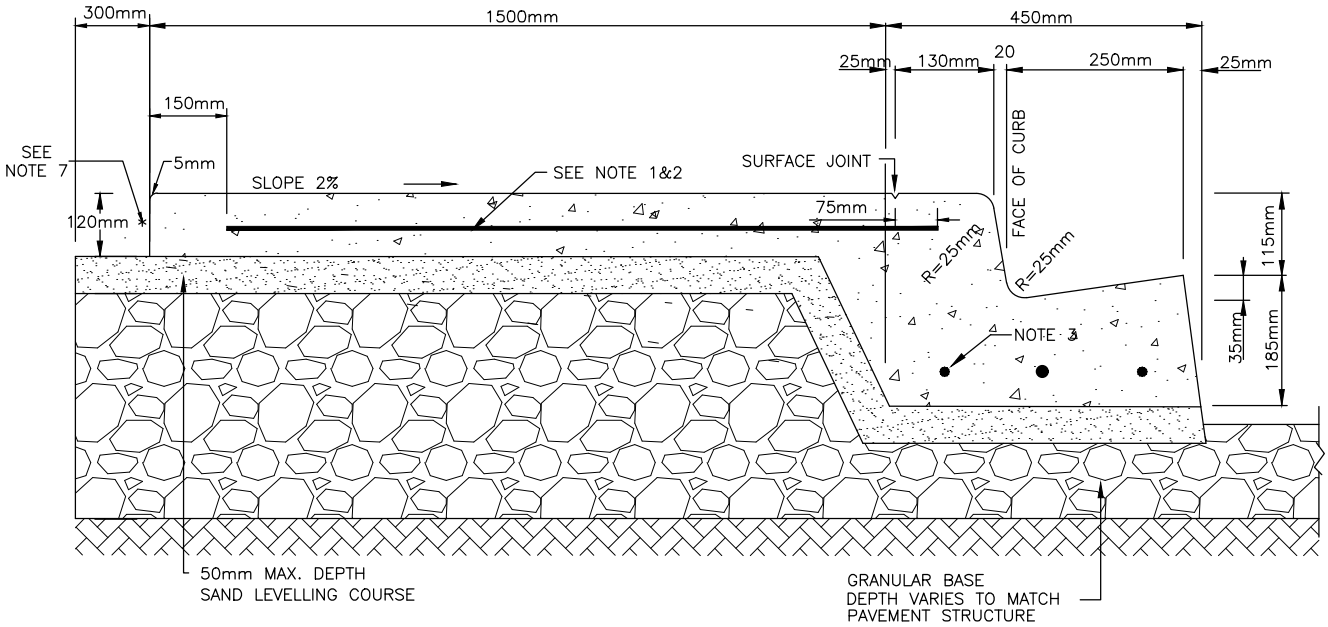
(7) 150mm THICK AT COMMERCIAL, INDUSTRIAL, LANES AND APARTMENT DRIVEWAY ENTRANCES

(8) COMPACT BACKFILL TO 95% FOR 300mm FROM BACK OF WALK.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

ROLLED FACE (RF) MONOLITHIC CURB, GUTTER AND SIDEWALK

STANDARD DETAIL:	4- 401
DATE.: JAN. 2021	REV: 7



NOTES:

(1) 10M TRANSVERSE REINFORCEMENT AT 750mm O.C. IN ALL SIDEWALKS

(2) FOR ALL INDUSTRIAL, COMMERCIAL, LANE AND APARTMENT DRIVEWAY ENTRANCES:
(1.1) 150X150 P18/P18 GAUGE WELDED WIRE FABRIC
(1.2) OR 10M 300X300 REINFORCEMENT GRID ALTERNATIVE

(3) 3–10M REINFORCEMENT AT ALL INDUSTRIAL, COMMERCIAL, LANE AND APARTMENT DRIVEWAY ENTRANCES.

(4) CONCRETE TO BE TYPE HS, 32 MPa. COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT.

(5) SEE STANDARD DWG. NO. 4–200 FOR MORE DETAILED ROLLED FACE CURB & GUTTER

(6) SEE STANDARD DWG. NO. 4–403 FOR JOINT DETAILS

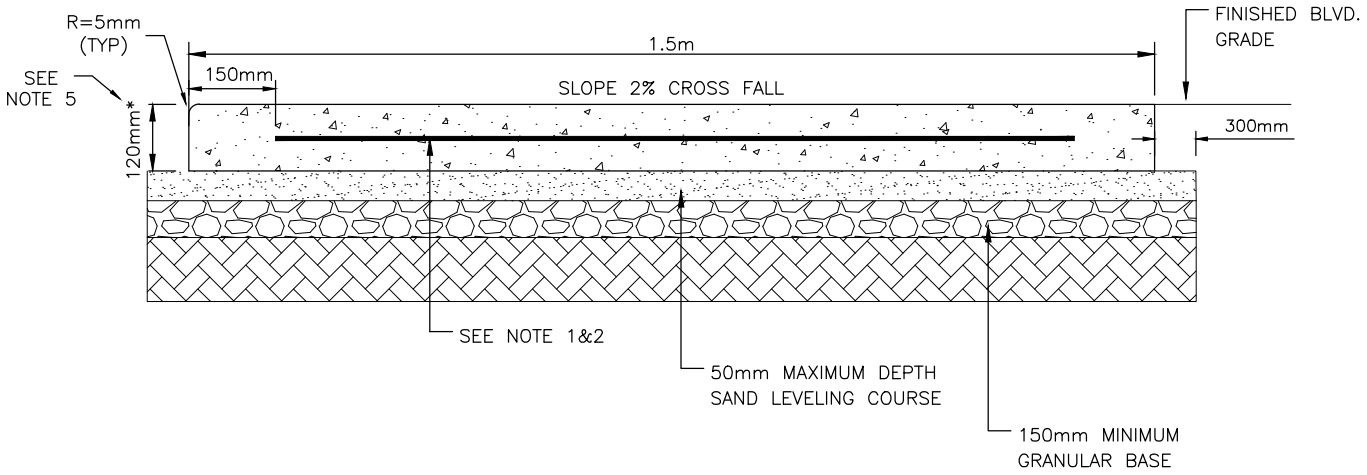
(7) 150mm THICK AT COMMERCIAL, INDUSTRIAL, LANES AND APARTMENT DRIVEWAY ENTRANCES

(8) COMPACT BACKFILL TO 95% FOR 300mm FROM BACK OF WALK.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

STRAIGHT FACE (SF) MONOLITHIC CURB, GUTTER AND SIDEWALK

STANDARD DETAIL:	4- 402
DATE.: JAN. 2021	REV: 6



NOTES:

(1) 10M TRANSVERSE REINFORCEMENT AT 750mm O.C. IN ALL SIDEWALKS

(2) FOR ALL INDUSTRIAL, COMMERCIAL, LANE AND APARTMENT DRIVEWAY ENTRANCES:
(1.1) 150X150 P18/P18 GAUGE WELDED WIRE FABRIC
(1.2) OR 10M 300X300 REINFORCEMENT GRID ALTERNATIVE

(3) CONCRETE TO BE TYPE HS, 32 MPa. COMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% ENTRAINMENT.

(4) SEE STANDARD DWG. NO. 4–403 FOR JOINT DETAILS

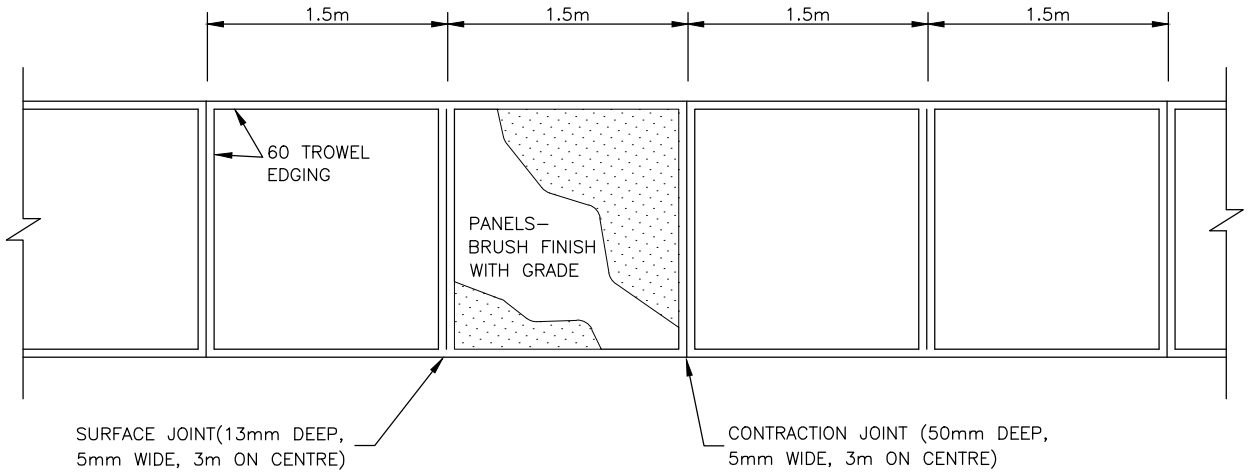
(5) 150mm THICK AT COMMERCIAL, INDUSTRIAL, LANES AND APARTMENT DRIVEWAY ENTRANCES

(6) COMPACT BACKFILL TO 95% FOR 300mm FROM BACK OF WALK.

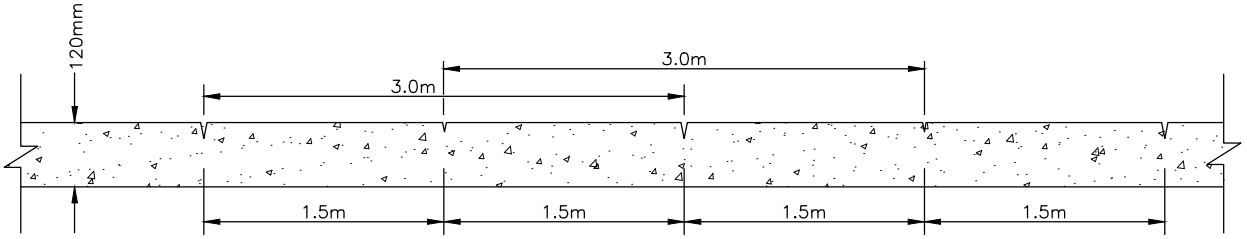
REGIONAL MUNICIPALITY OF WOOD BUFFALO

1.5m SEPARATE SIDEWALK

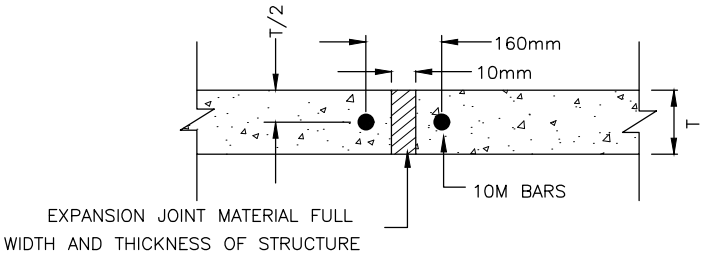
STANDARD DETAIL:	4- 403
DATE.: JAN. 2021	REV: 5



PLAN



SECTION



EXPANSION JOINT DETAIL

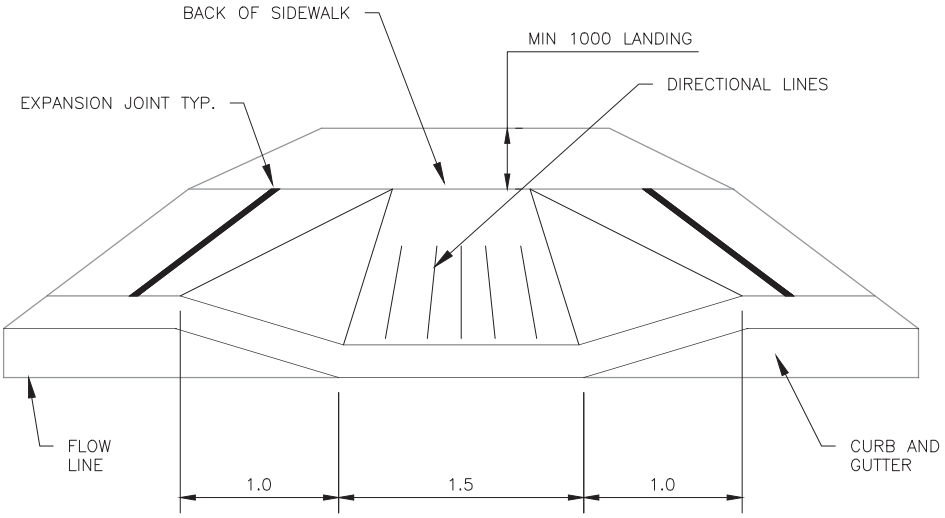
NOTE:

(1) ASPHALT IMPREGNATED EXPANSION BOARD TO BE PROVIDED WHERE NEW SIDEWALK ABUT EXISTING CONCRETE STRUCTURES AND EVERY 100 LINEAR METERS MINIMUM

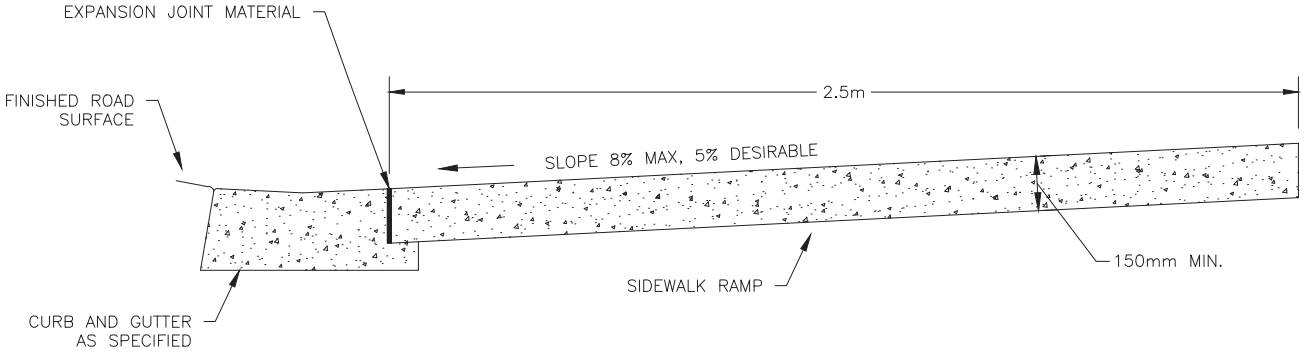
REGIONAL MUNICIPALITY OF WOOD BUFFALO

SIDEWALK JOINT AND FINISHING DETAILS

STANDARD DETAIL:	4-404
DATE: OCT 2016	REV: 10



RAMP ELEVATION



RAMP PROFILE

NOTES:

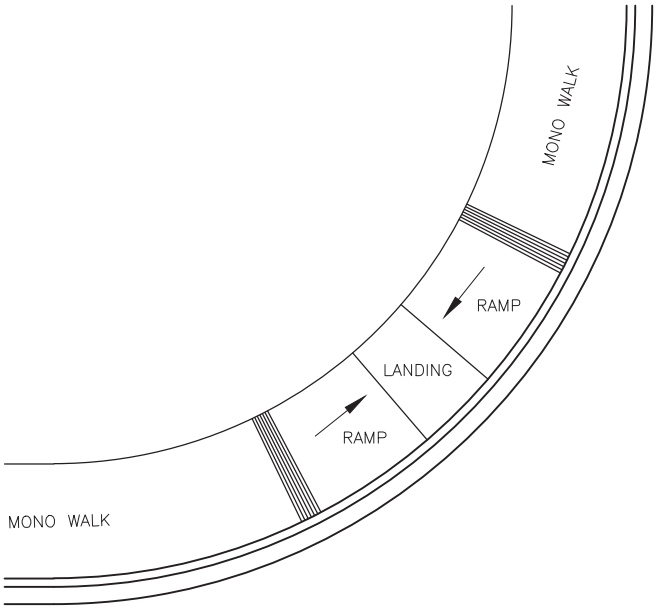
(1) DIRECTIONAL GROOVES SHALL BE 10mm BY 10mm MADE WITH GROOVING TOOL HAVING 15mm RADIUS.

(2) ALL DIMENSIONS ARE IN MILLIMETERS OR METRES UNLESS OTHERWISE SHOWN.

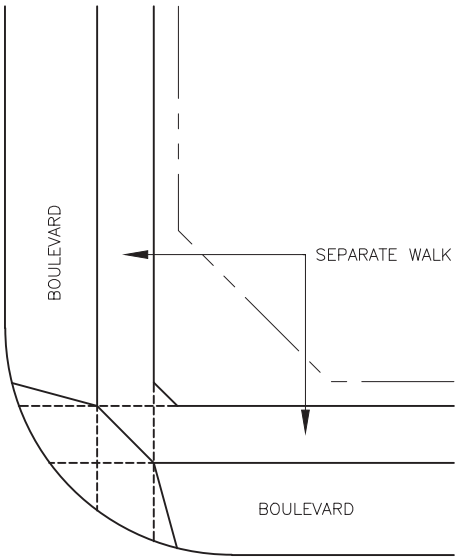
REGIONAL MUNICIPALITY OF WOOD BUFFALO

CONCRETE SIDEWALK RAMPS

STANDARD DETAIL:	4- 405
DATE: OCT 2016	REV: 6

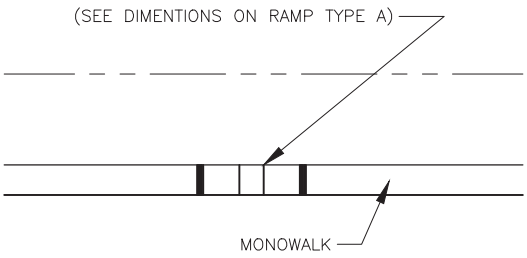


RAMP TYPE A
(MONO WALK)

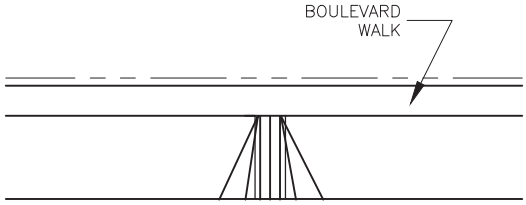


RAMP TYPE B
(SEPARATE WALK)

CORNER LAYOUT



RAMP TYPE C



RAMP TYPE D

TANGENT LAYOUT

NOTES:

(1) FOR TYPE A, LOCATE RAMPS ALONG SIDEWALK TO INTERMEDIATE LANDING.

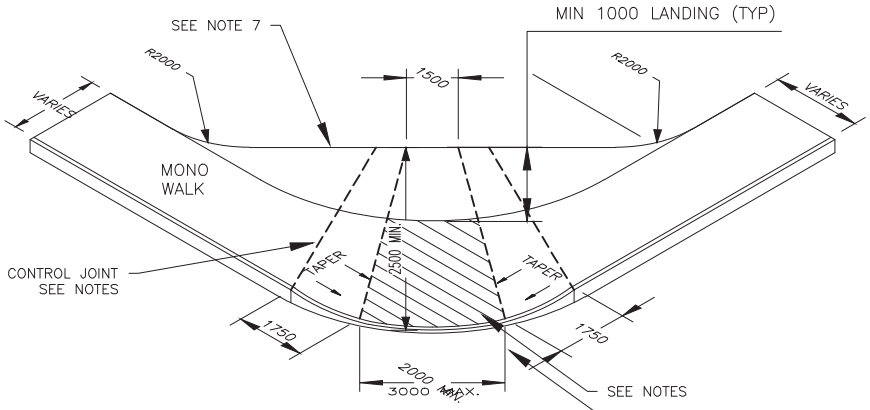
(2) FOR TYPE B, LOCATE RAMP ON EXTENSION OF SIDEWLAK ALIGNMENT. SEE DRAWINGS 4–404 THROUGH 4–406.

(3) FOR TYPE C AND D, LOCATE RAMP DIRECTLY ACROSS FROM OPPOSITE RAMP.

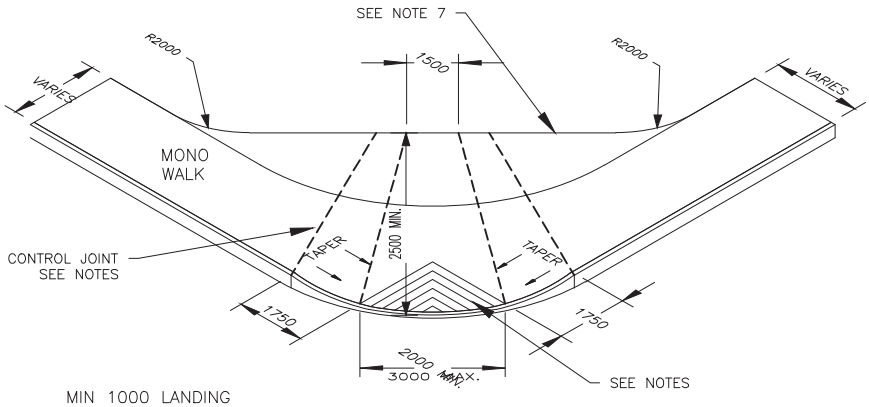
REGIONAL MUNICIPALITY OF WOOD BUFFALO

RAMP ACCESS LOCATIONS

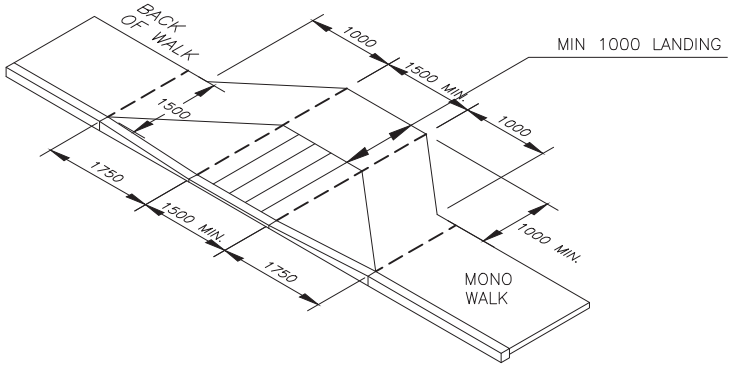
STANDARD DETAIL:	4- 406
DATE: OCT 2016	REV: 10



TYPE A1
(ONE DIRECTION)



TYPE A2
(TWO DIRECTIONS)



TYPE C

NOTES:

(1) ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED.

(2) TOOLED GROOVES SHALL BE 5mm WIDE BY 10mm DEEP, SPACED 150mm O/C, AND EXTENDED THE FULL WIDTH OF THE RAMP.

(3) SIDEWALK RAMP GROOVES TO BE IN DIRECTION OF PEDESTRIAN TRAVEL.

(4) CONTROL JOINT AND TOOLED GROOVES WITHIN SIDEWALK RAMP TO BE BROOM FINISHED AND PROVIDE A NON-SLIP SURFACE.

(5) CURBS AND RAMPS TO BE POURED MONOLITHICALLY.

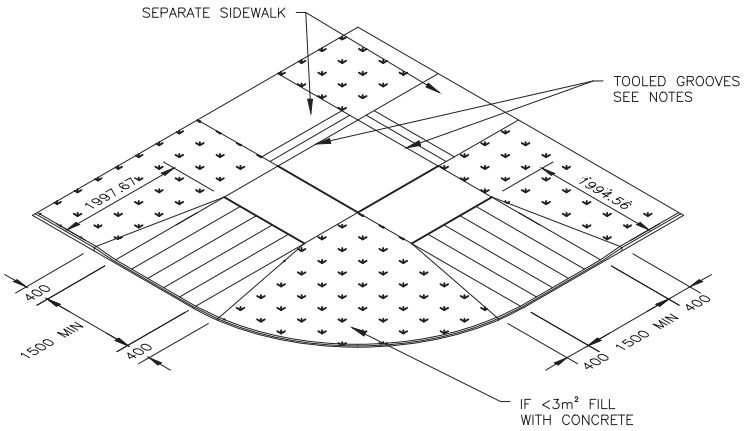
(6) WIDTH OF SIDEWALK TO RAMP MUST EQUAL WIDTH OF WALK (MINIMUM 1.5m, MAXIMUM 3.0m)

(7) LOCALLY DEPRESS LANDSCAPING AT BACK OF WALK OR INSTALL LOCAL RETAINING WALL AS REQUIRED TO MATCH GRADES.

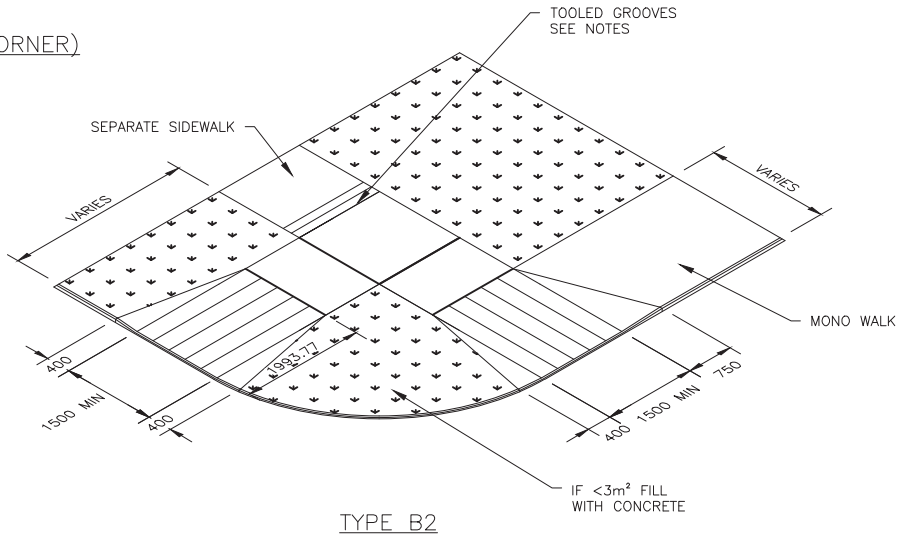
REGIONAL MUNICIPALITY OF WOOD BUFFALO

MONOLITHIC SIDEWALK CONCRETE RAMP DETAILS

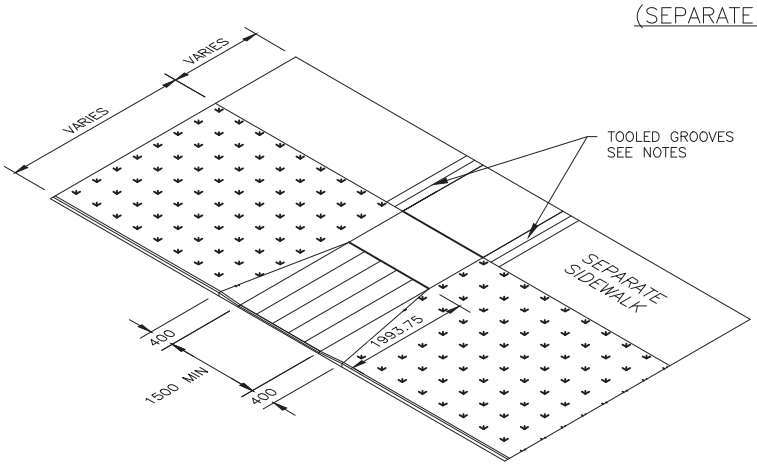
STANDARD DETAIL:	4-407
DATE: OCT 2016	REV: 10



TYPE B1
(SEPARATE WALK CORNER)



TYPE B2
(SEPARATE AT MONOLITHIC SIDEWALK)



TYPE D

NOTES:

(1) ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED.

(2) TOOLED GROOVES SHALL BE 5mm WIDE BY 10mm DEEP, SPACED 150mm O/C, AND EXTENDED THE FULL WIDTH OF THE RAMP.

(3) SIDEWALK RAMP GROOVES TO BE IN DIRECTION OF PEDESTRIAN TRAVEL.

(4) CONTROL JOINT AND TOOLED GROOVES WITHIN SIDEWALK RAMP TO BE BROOM FINISHED AND PROVIDE A NON–SLIP SURFACE.

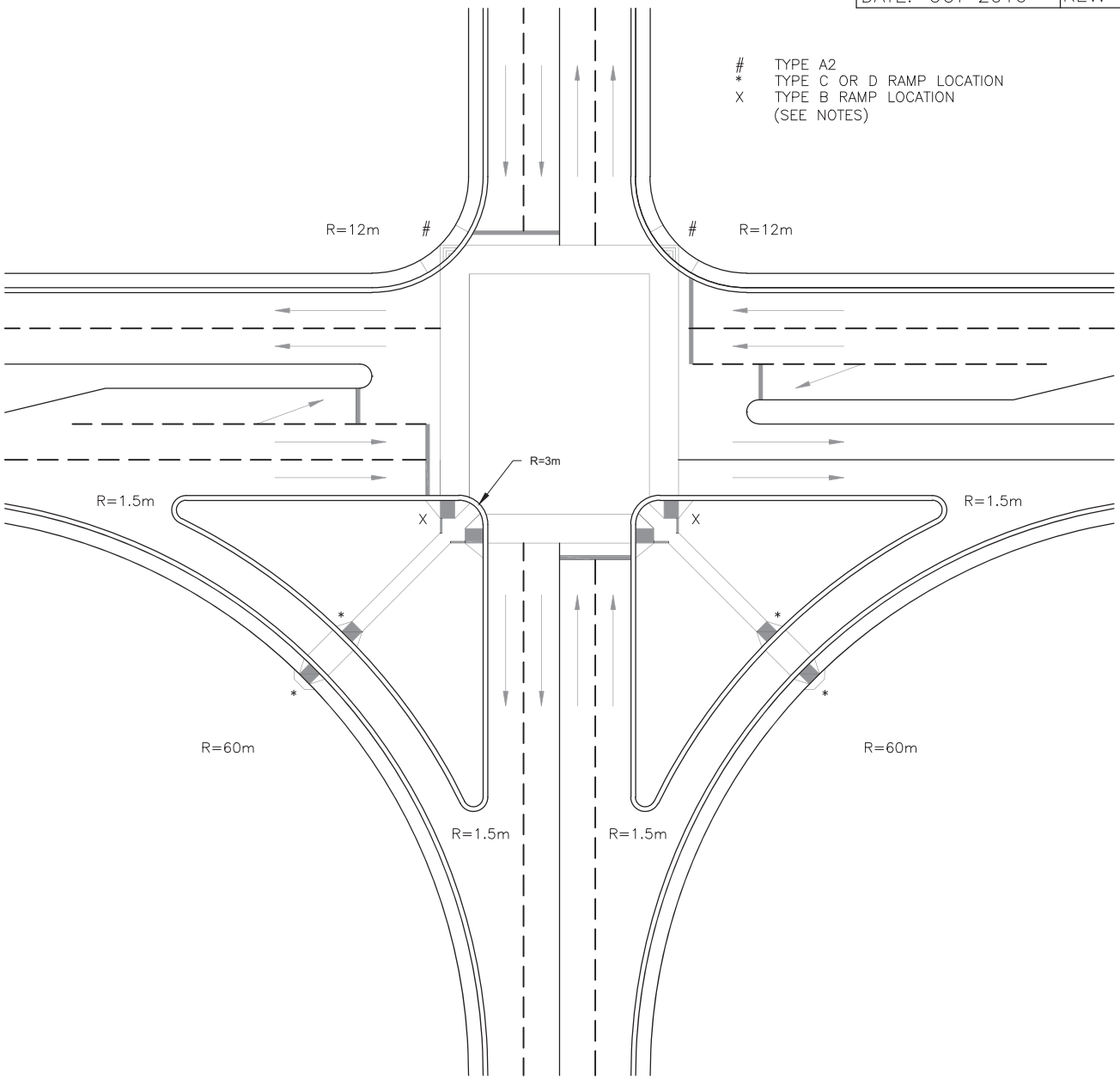
(5) CURBS AND RAMPS TO BE POURED MONOLITHICALLY.

(6) WIDTH OF SIDEWALK TO RAMP MUST EQUAL WIDTH OF WALK (MINIMUM 1.5m, MAXIMUM 3.0m)

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SEPERATE SIDEWALK RAMP DETAILS

STANDARD DETAIL:	4-408
DATE: OCT 2016	REV: 10



NOTES:

(1) ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

(2) SIDEWALK RAMPS MUST PROVIDE ACCESS DIRECTLY TO CROSSWALKS.

(3) THE SELECTION OF CURB RAMP TYPE IS DEPENDANT ON THE LOCATION OF THE CROSSWALK RELATED TO THE CURB FACE.

(4) WHERE CROSSWALKS ARE CONTROLLED BY SIGNALS WITH A PUSH–BUTTON SYSTEM, THE SIDEWALKS AND RAMPS MUST ALLOW ACCESS BY WHEELCHAIR TO THE PUSH–BUTTON.

(5) ON A SHARP CORNER WHERE TWO TYPE D2 RAMPS ARE BEING USED, THE SLOPE ON THE FLARED AREAS BETWEEN THE TWO RAMPS CAN BE LESS THAN THE 0.080m/m MAXIMUM SHOWN. THIS WILL PROVIDE A SMOOTHER SIDEWALK FOR GENERAL USE ESPECIALLY FOR PEDESTRIANS WHO ARE NOT CROSSING.

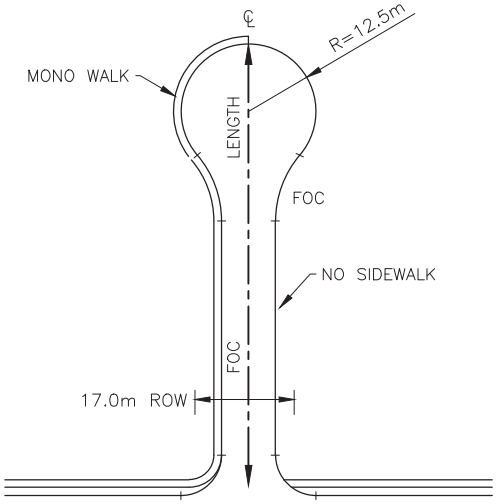
(6) SEE 4–403, 4–404, 4–405, 4–406 FOR SIDEWALK RAMP DETAILS.

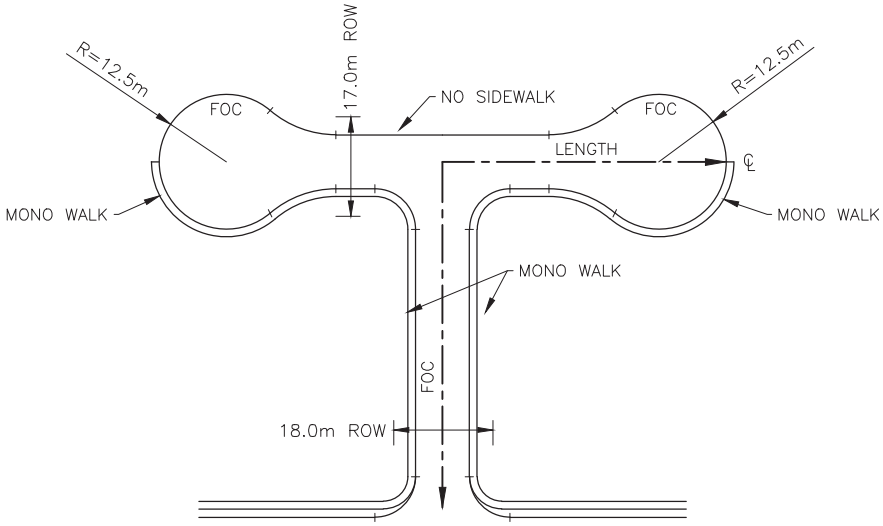
(7) SEE DETAIL 4–702 FOR CROSSWALK LOCATION AND MARKINGS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

URBAN INTERSECTION CROSSWALK AND SIDEWALK RAMPS

STANDARD DETAIL:	4- 409
DATE: OCT 2016	REV: 7





NOTES:

(1) WHERE POSSIBLE, PROVIDE PEDESTRIAN CONNECTIVITY FROM TERMINUS OF CUL–DE–SAC TO REGIONAL TRAIL OR WALKWAY NETWORK, VIA A P.U.L.

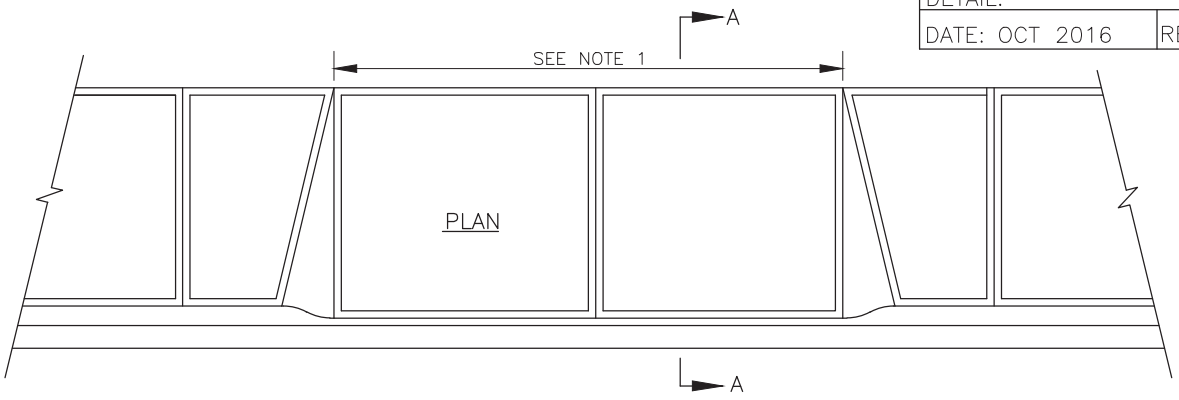
(2) ONLY APPLICABLE TO CUL–DE–SACS WITH FEWER THAN 18 LOTS AND LENGTH LESS THAN 120m. LARGER CUL–DE–SACS REQUIRE SIDEWALK ON BOTH SIDES.

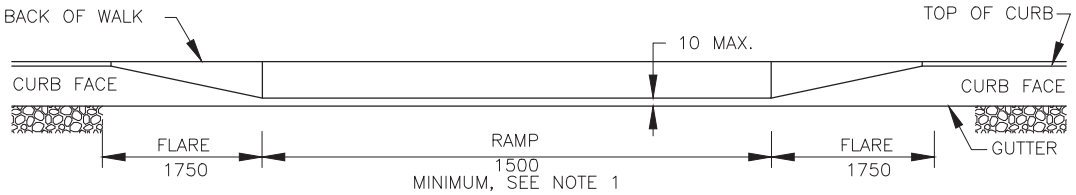
(3) MAXIMUM CUL–DE–SAC LENGTH IS 300m.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

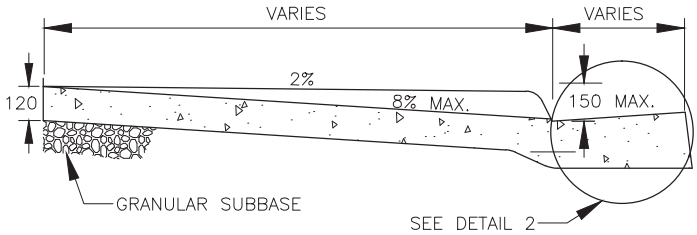
CUL-DE-SAC SIDEWALK REQUIREMENTS

STANDARD DETAIL:	4- 500
DATE: OCT 2016	REV: 5

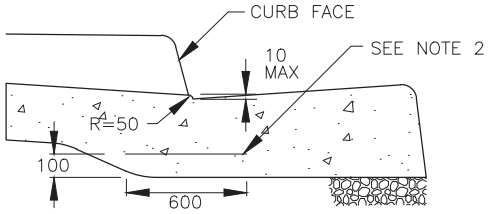




ELEVATION



SECTION A–A



DETAIL 2

NOTES:

(1) MAXIMUM ALLOWABLE:
RESIDENTIAL = 6.7m
COMMERCIAL = 10.6m
INDUSTRIAL = 10.6m
APT. BLDG. = 10.6m
LANEWAYS = 6.1m

(2) 150x150 P18/P18 GUAGE WIRE MESH TO BE PLACED IN SIDEWALK ACROSS ALL COMMERCIAL, INDUSTRIAL LANES AND APARTMENT BUILDING ENTRANCES. CURB AND GUTTER SECTION REQUIRES 3–10mm. REFER TO STANDARD DRAWING NO. 4–400 AND 4–401.

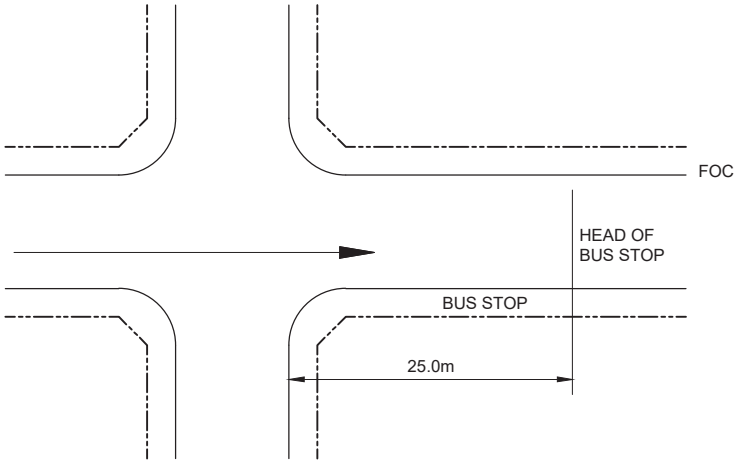
(3) SIDEWALK THICKNESS = 120mm AT RESIDENTIAL CROSSINGS. SIDEWALK THICKNESS = 150mm AT COMMERCIAL, INDUSTRIAL, LANES, AND APARTMENT BUILDING CROSSINGS.

(4) CONCRETE TO BE TYPE HS, 32MPa C OMPRESSIVE STRENGTH AT 28 DAYS WITH 5% TO 8% AIR ENTRAINMENT. (5) SIMILAR FOR SEPARATE WALKS.

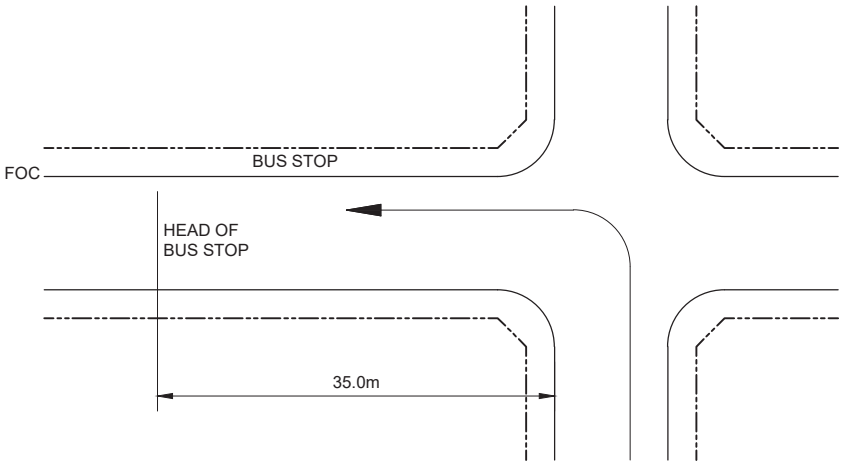
REGIONAL MUNICIPALITY OF WOOD BUFFALO

STANDARD DRIVEWAY APPROACH (MONO, CURB, GUTTER, SIDEWALK)

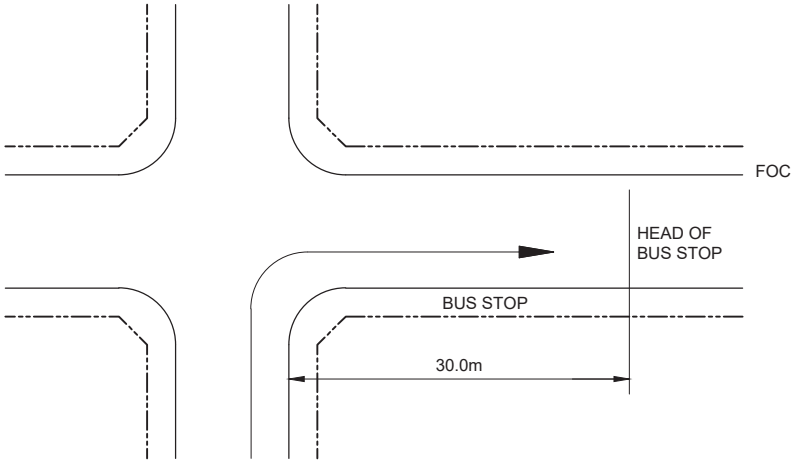
STANDARD DETAIL:	4-600
DATE: OCT 2016	REV: 10



BUS HEADING STRAIGHT



BUS MAKING LEFT HAND TURN



BUS MAKING RIGHT HAND TURN

NOTES:

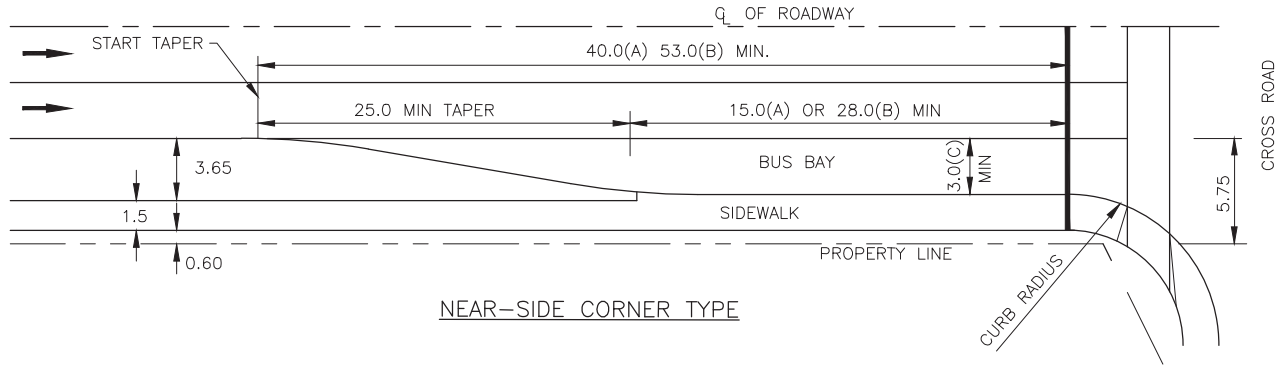
(1) FOC - FACE OF CURB.

(2) STRAIGHT FACE CURB REQUIRED AT ALL BUS STOPS.

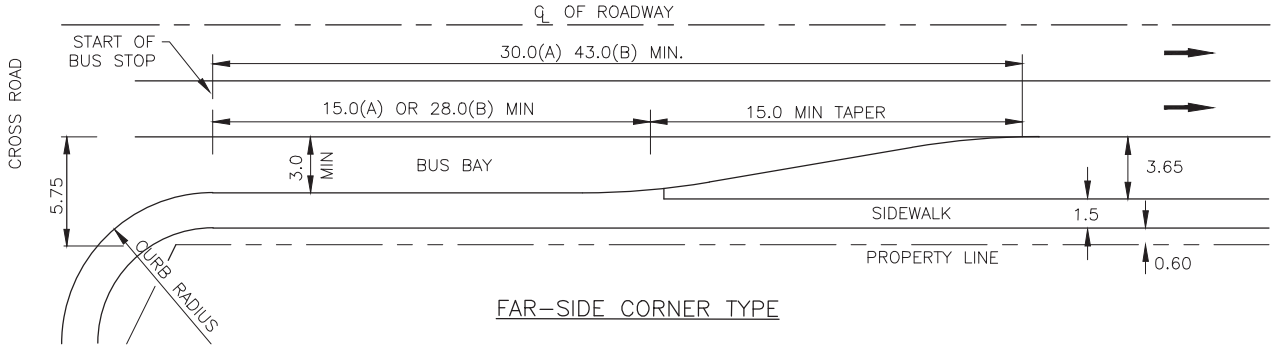
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRANSIT DETAILS
LOCATION OF BUS STOP
(UNCHANNELIZED INTERSECTION)

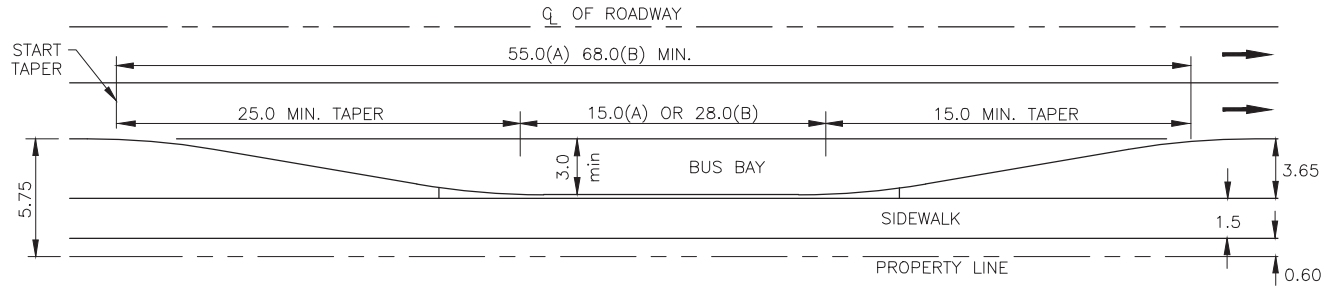
STANDARD DETAIL:	4- 601
DATE: OCT 2016	REV: 4



NEAR–SIDE CORNER TYPE



FAR–SIDE CORNER TYPE



MIDBLOCK TYPE

NOTES:

(1) (A) DIMENSIONS TO ACCOMMODATE A SINGLE CITY BUS.

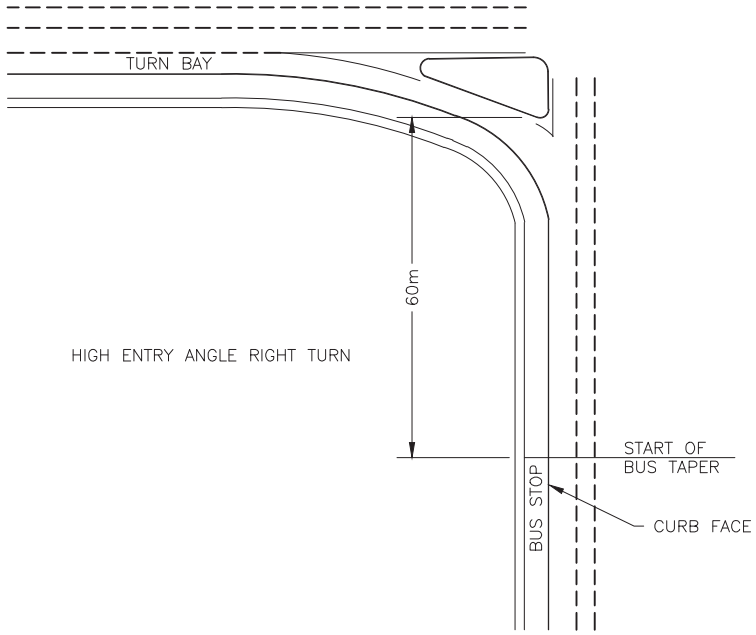
(2) (B) DIMENSIONS TO ACCOMMODATE TWO CITY BUSES.

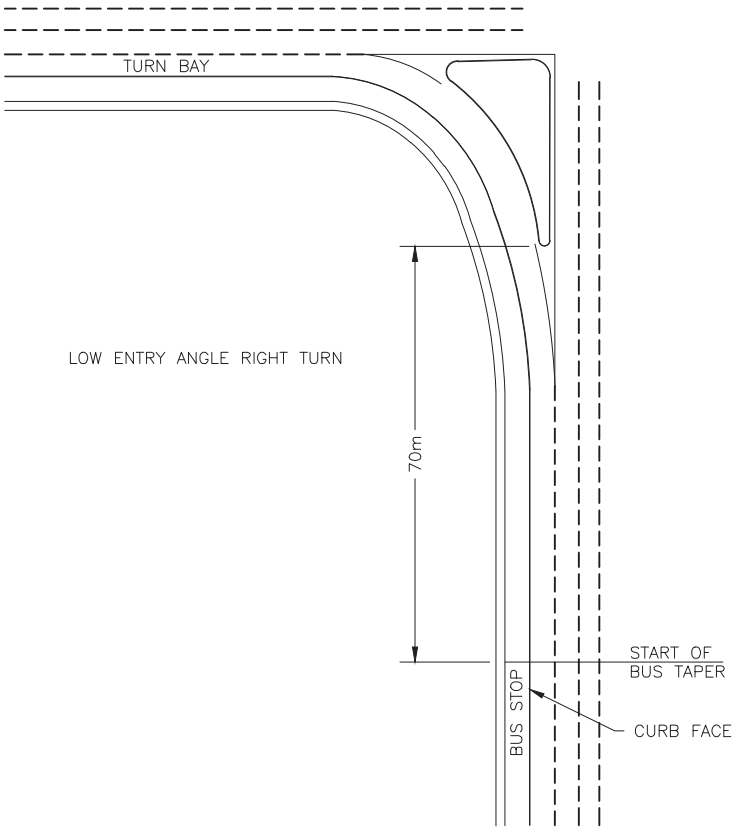
(3) (C) DIMENSIONS INCREASED TO 3.5m IF USED AS A COMBINATION BUS BAY/RIGHT–TURN BAY.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUS BAY PULLOUT
ARTERIAL ROADWAY

STANDARD DETAIL:	4-602
DATE: OCT 2016	REV: 10

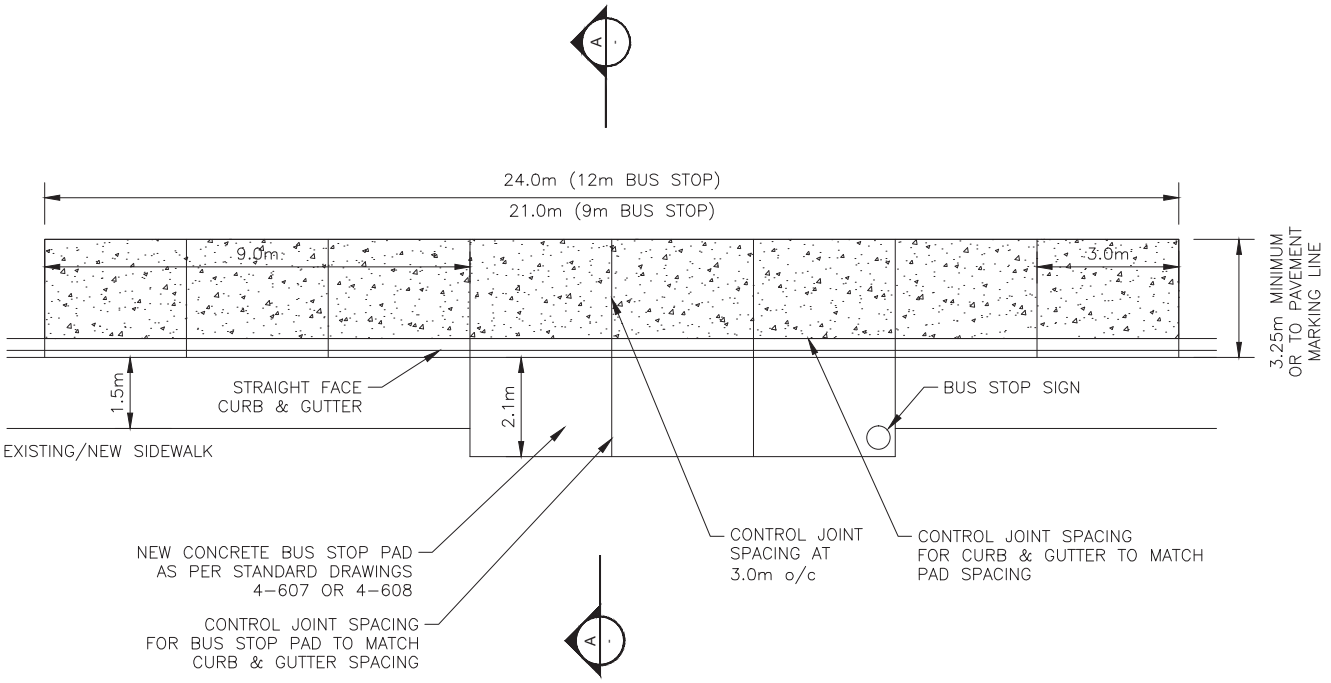




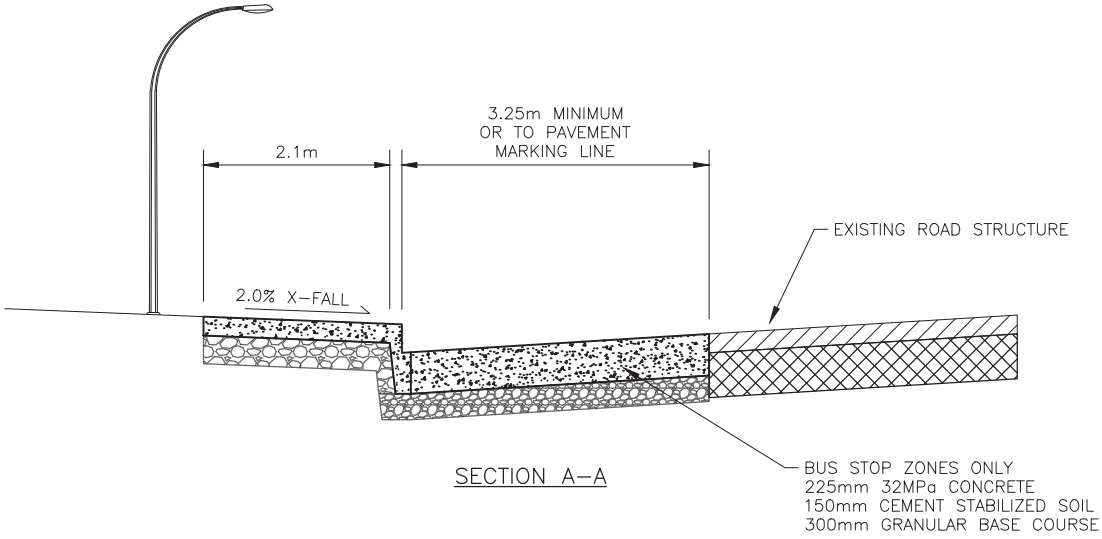
REGIONAL MUNICIPALITY OF WOOD BUFFALO

LOCATION OF BUS STOP (CHANNELIZED INTERSECTION)

STANDARD DETAIL:	4-603
DATE: OCT 2016	REV: 10



PLAN VIEW

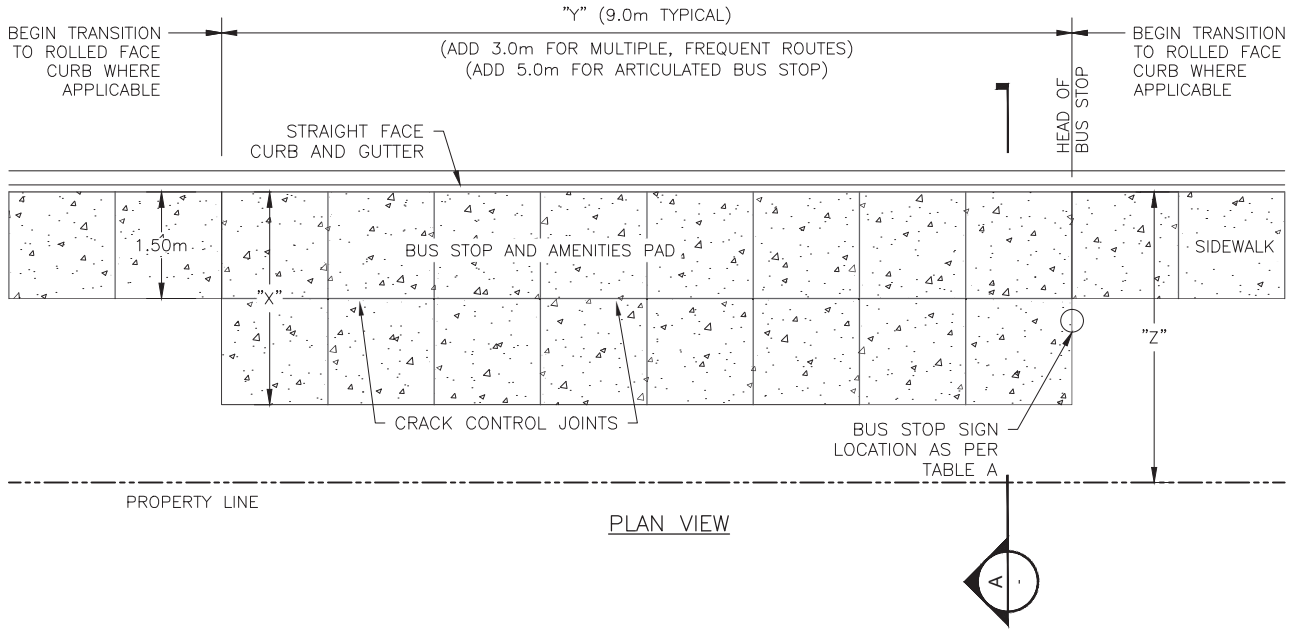


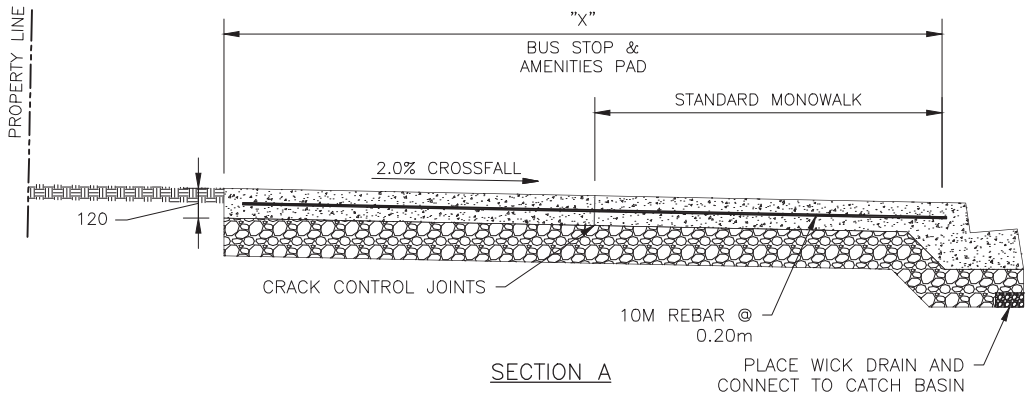
SECTION A-A

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CONCRETE BUS STOP PAD (RETROFIT)

STANDARD DETAIL:	4-607
DATE: OCT 2016	REV: 10





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 APPROPRIATE CRACK CONTROL JOINTS THROUGHOUT.

(2) MAINTAIN MIN. 0.3m CLEARANCE BETWEEN PROPERTY LINE AND AMENITIES PAD.

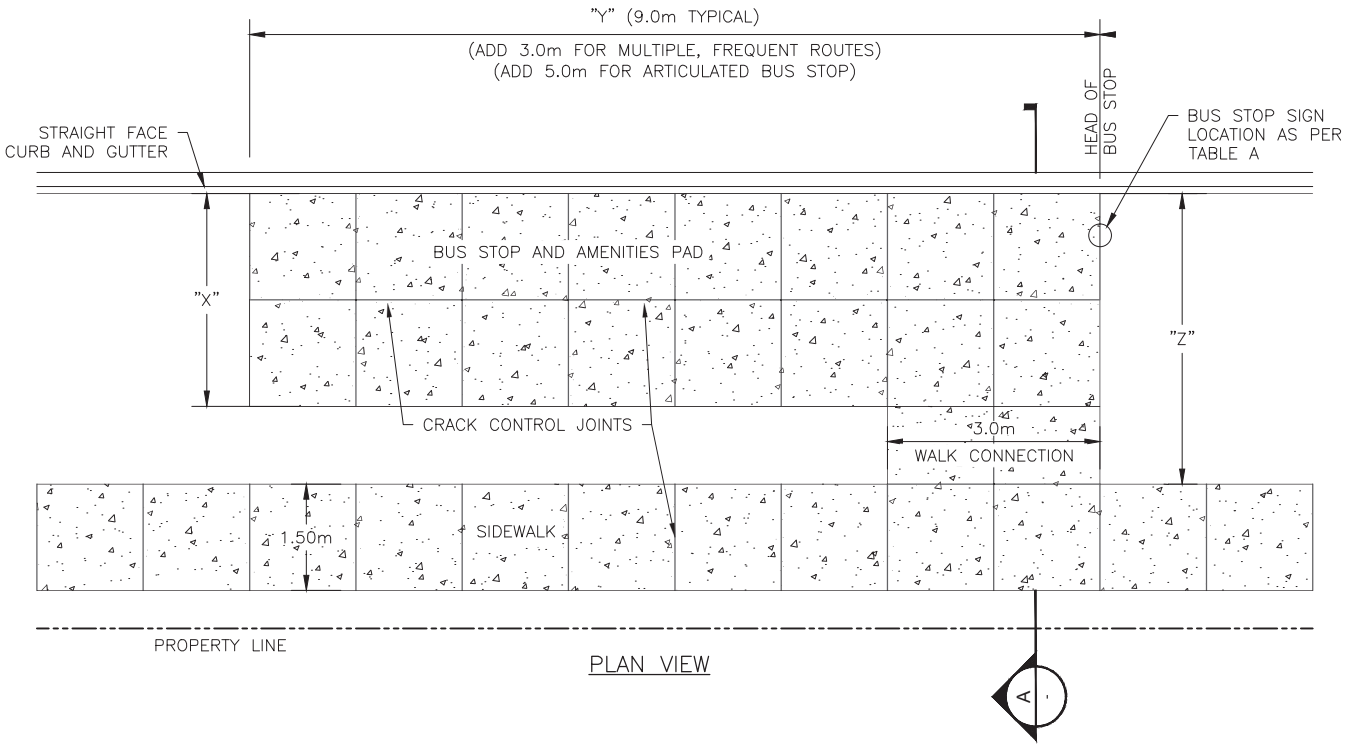
TABLE A

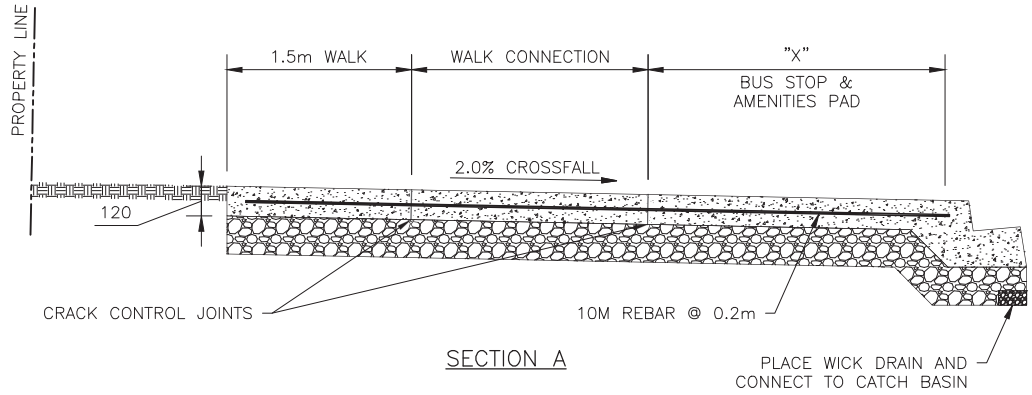
CONDITION	DISTANCE "Z" TO PROPERTY LINE	REQUIRED PAD WIDTH "X"	REQUIRED PAD LENGTH "Y"	BUS STOP SIGN LOCATION BEHIND SIDEWALK
OVER-CONSTRAINED	"Z" < 2.8m	2.1m	9.0m	HEAD OF PAD
CONSTRAINED	2.8m <= "Z" < 3.9m	"Z"-0.3m (MAX. 3.0m)	12.0m	3m BACK FROM HEAD
NOT CONSTRAINED	"Z" >= 3.9m	"Z"-0.3m (MAX 4.1m)	9.0m	HEAD OF PAD

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUS STOP AND AMENITIES PAD MONO WALK

STANDARD DETAIL:	4-608
DATE: OCT 2016	REV: 10





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 APPROPRIATE CRACK CONTROL JOINTS THROUGHOUT.

(2) IF REQUIRED PAD WIDTH "X" IS LESS THAN 1.0m FROM SIDEWALK, POUR THE CONCRETE PAD TO THE SIDEWALK, OTHERWISE, PROVIDE A 3.0m WIDE WALK CONNECTION AT THE HEAD OF THE PAD.

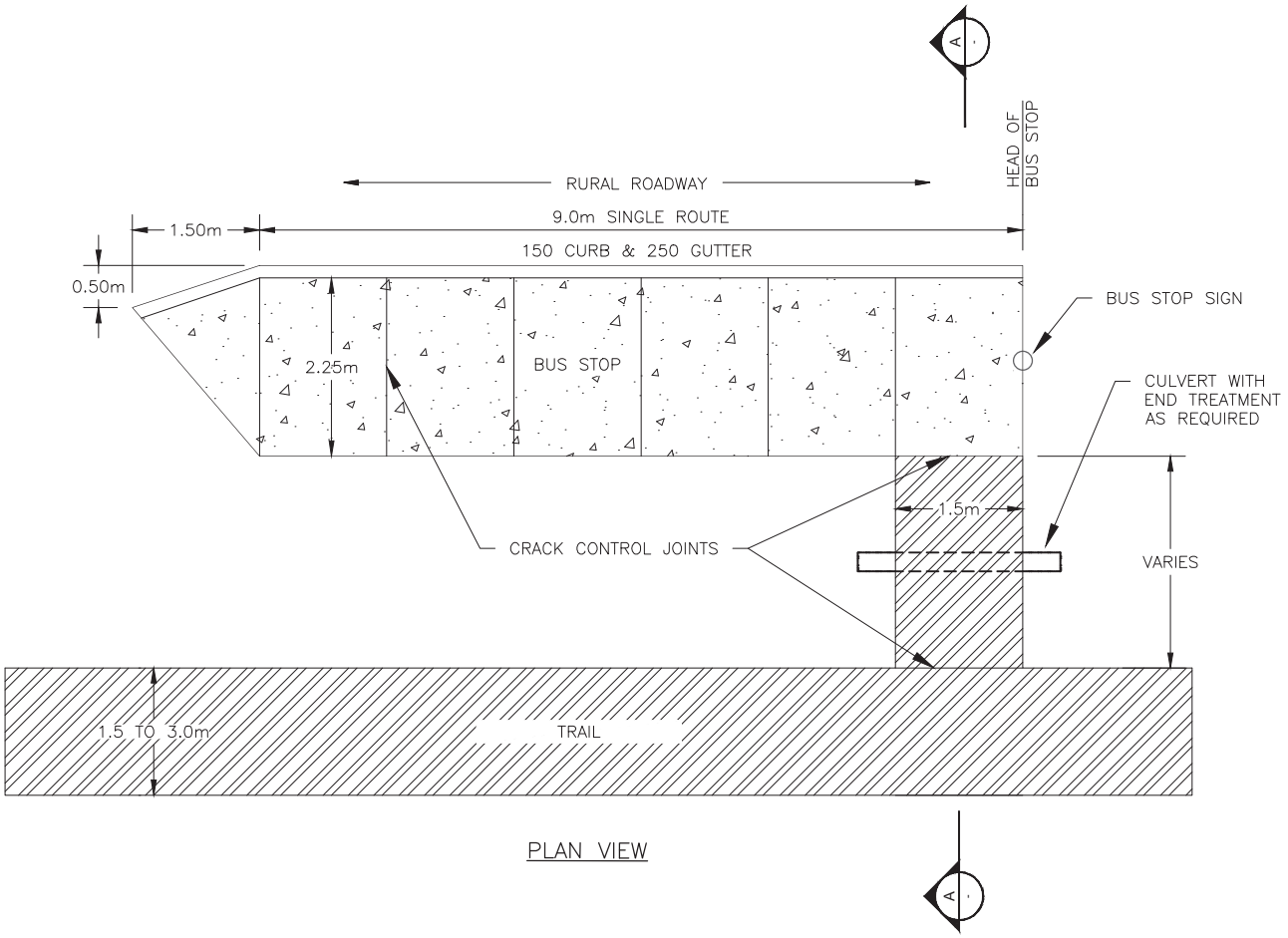
TABLE A

CONDITION	DISTANCE "Z" TO PROPERTY LINE	REQUIRED PAD WIDTH "X"	REQUIRED PAD LENGTH "Y"	BUS STOP SIGN LOCATION BEHIND SIDEWALK
OVER-CONSTRAINED	"Z" < 2.25m	NOT PERMISSIBLE	NOT PERMISSIBLE	NOT PERMISSIBLE
CONSTRAINED	2.25m <="Z"< 3.6m	"X" = "Z"	12.0m	3m BACK FROM HEAD
NOT CONSTRAINED	"Z" >= 3.6m	"X" = "Z" (MAX 4.1m)	9.0m	HEAD OF PAD

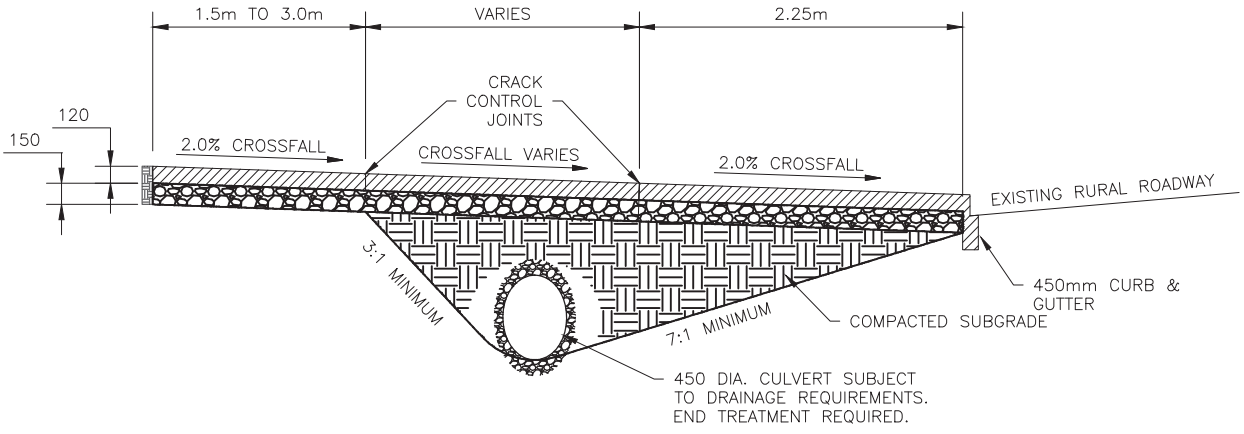
REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUS STOP AND AMENITIES PAD SEPARATE WALK

STANDARD DETAIL:	4-609
DATE: OCT 2016	REV: 10



PLAN VIEW



SECTION A–A

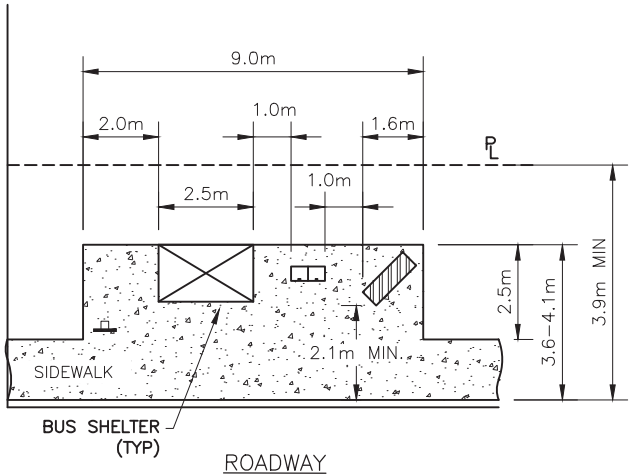
NOTES:

(1) ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

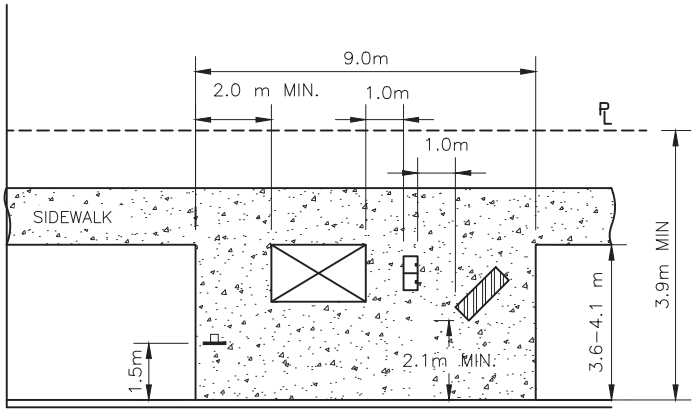
REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUS STOP PAD
RURAL ROADWAY

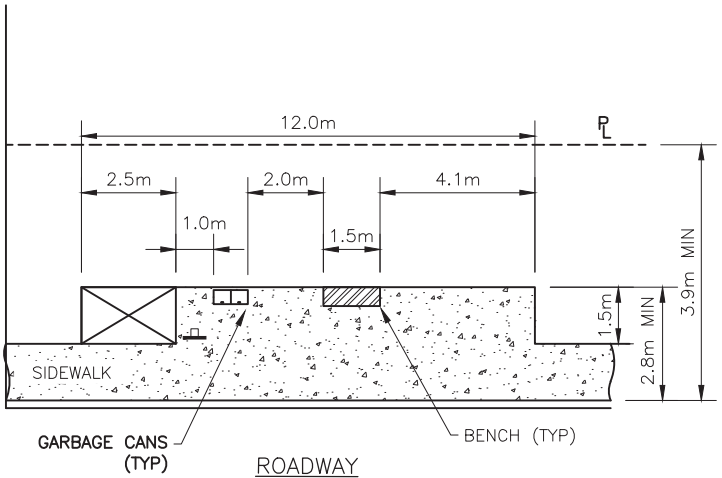
STANDARD DETAIL:	4-610
DATE: OCT 2016	REV: 10



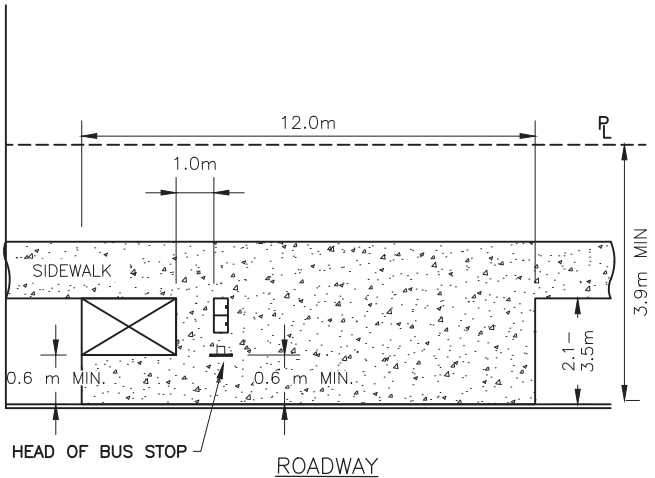
ROADWAY
NOT CONSTRAINED
MONOLITHIC SIDEWALK



ROADWAY
NOT CONSTRAINED
SEPERATE SIDEWALK



ROADWAY
OVER–CONSTRAINED
MONOLITHIC SIDEWALK



ROADWAY
OVER–CONSTRAINED
SEPERATE SIDEWALK

NOTES:

(1) BENCH ANGLE MAXIMUM OF 45° W.R.T. ROAD WAY.

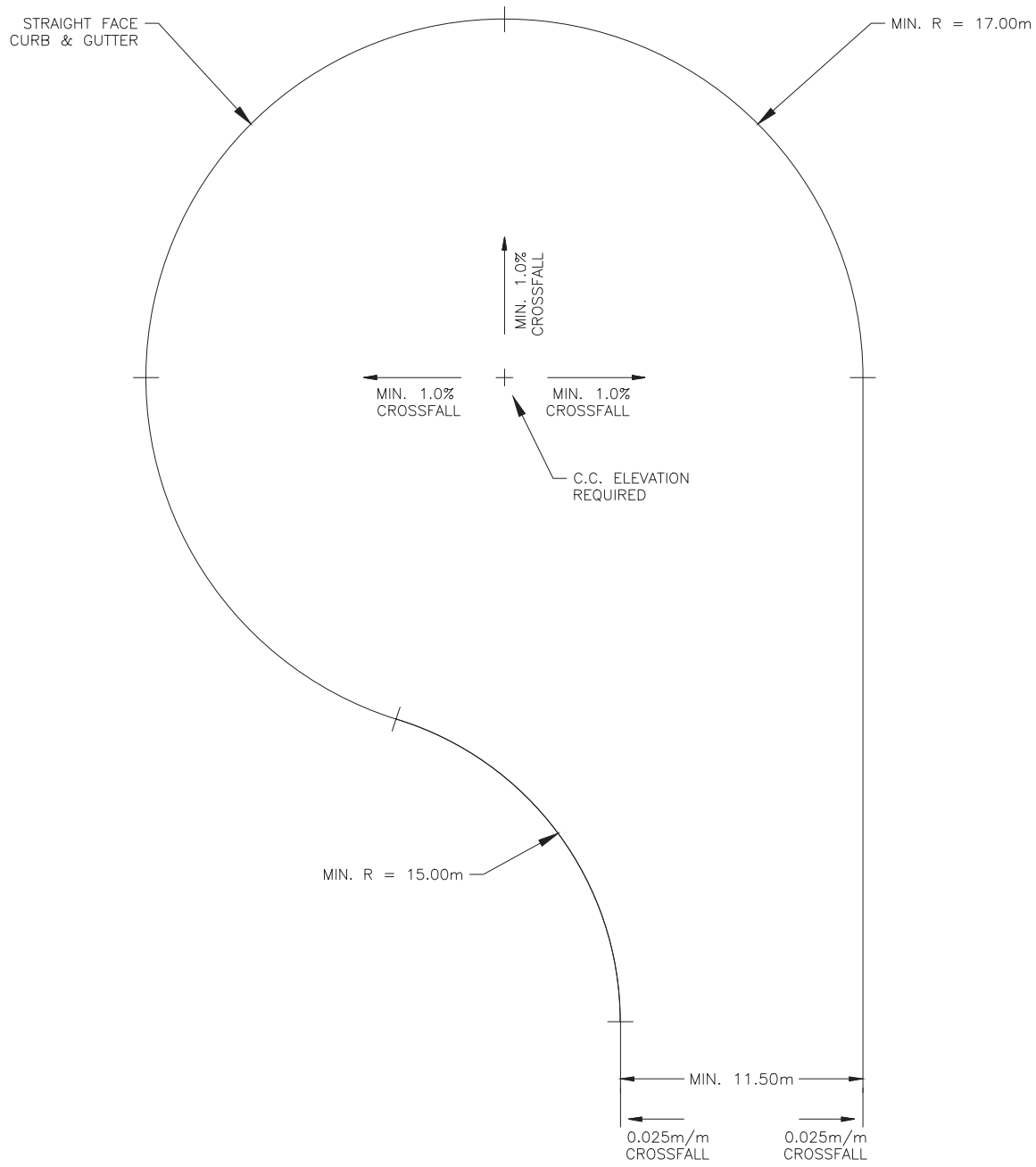
(2) BENCH CANNOT BLOCK VIEW OF BUS SHELTER.

(3) BUS PAD MINIMUM 2.1m WIDE TO BE CONSIDERED FOR A SHELTER.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRANSIT GUIDELINES
BUS STOP FURNITURE LAYOUT

STANDARD DETAIL:	4-611
DATE: OCT 2016	REV: 10



NOTES:

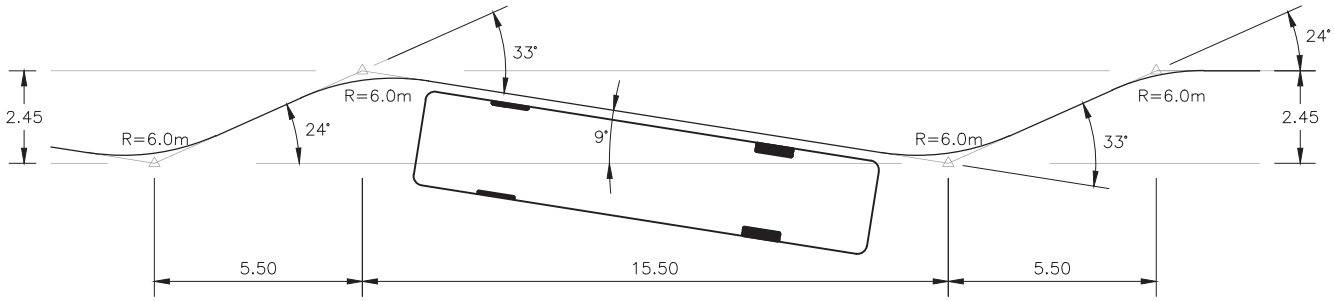
(1) PROVIDE ELEVATION FOR ALL TICK MARKS SHOWN.

(2) FOR TEMPORARY TURNAROUND WITH NO CURB AND GUTTER, PLACE MINI BARRIERS OR INSTALL BARRIER POSTS @ 1.5m ON CENTRE ALONG EDGE OF TURNAROUND.

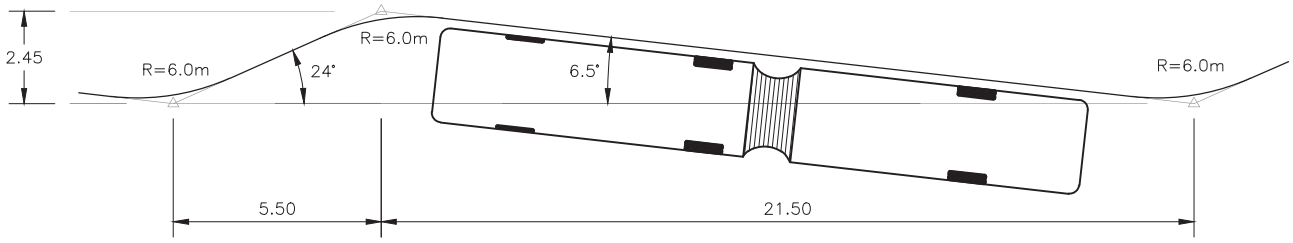
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRANSIT TURNAROUND (OFFSET)

STANDARD DETAIL:	4-612
DATE: OCT 2016	REV: 10



STANDARD (12m) BUS SAWTOOTH TRANSIT BAY



ARTICULATED (18m) BUS SAWTOOTH TRANSIT BAY

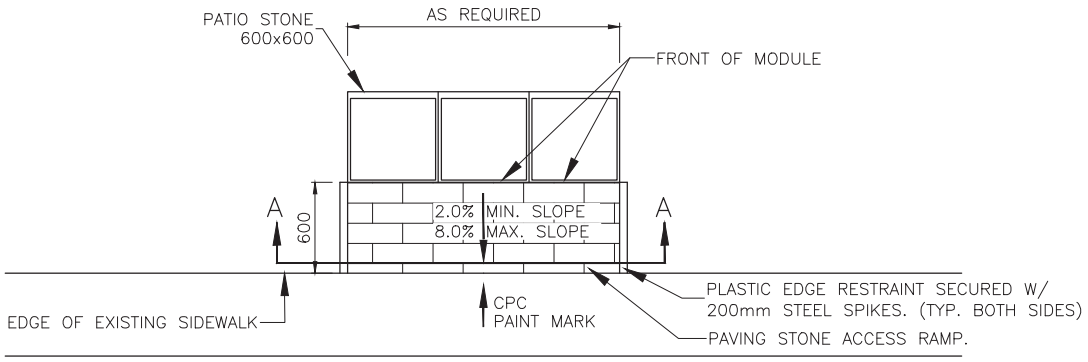
NOTES:

(1) CROSSWALK WILL BE ACCOMMODATED BY PROVIDING A 4.0m LENGTH OF STRAIGHT CURB BETWEEN CONSECUTIVE BUS BAYS.

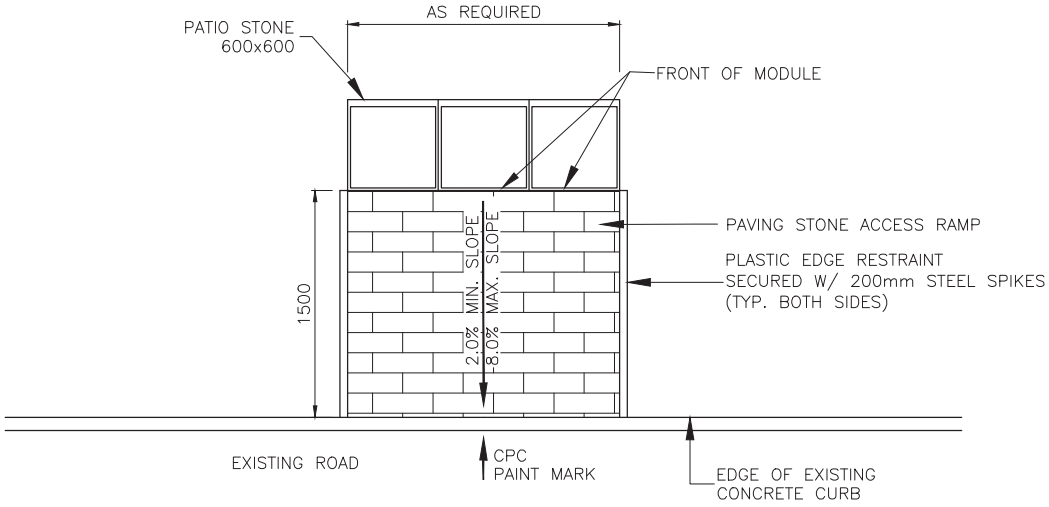
REGIONAL MUNICIPALITY OF WOOD BUFFALO

SAWTOOTH TRANSIT BAY
TRANSIT TERMINAL SITE

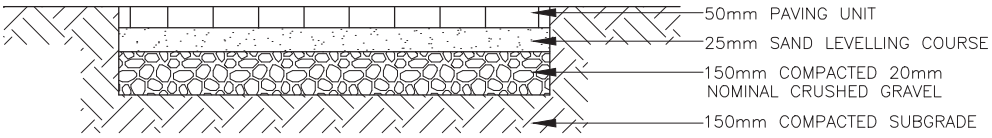
STANDARD DETAIL:	4-620
DATE: OCT 2016	REV: 5



SIDEWALK LAYOUT



NO SIDEWALK LAYOUT



SECTION A–A

NOTES:

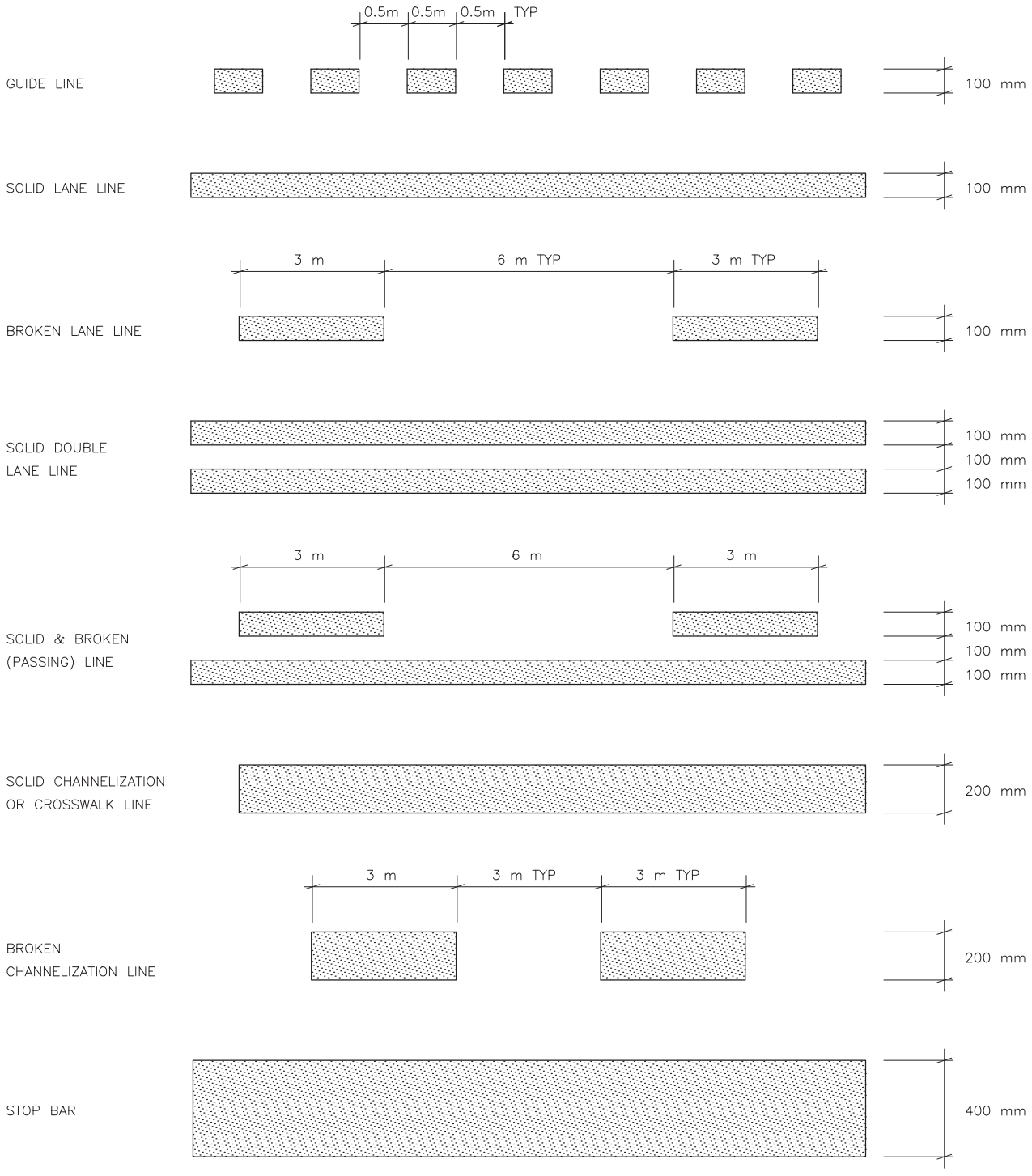
(1) COORDINATE WITH CANADA POST CORPORATION (CPC) FOR LOCATION AND INSTALLATION REQUIREMENTS.

(2) MAILBOX LOCATIONS WILL GENERALLY NOT BE ACCEPTED AT LOCATIONS WITHOUT SIDEWALKS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL URBAN COMMUNITY MAIL BOX LAYOUTS

STANDARD DETAIL:	4- 700
DATE: OCT 2016	REV: 6



NOTES:

(1) SEE STANDARD DRAWING 4–701 FOR APPLICATION

(2) ARROWS PER TAC STANDARDS

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PAVEMENT MARKING DIMENSIONS

LINE TYPE	WIDTH	WHITE	YELLOW
GUIDE LINE (0.5m LINE:0.5m GAP)	100 mm	(1) GUIDE TURNING TRAFFIC THROUGH INTERSECTION, POSITIONED BETWEEN TWO OR MORE TURNING LANES	(1) GUIDE TURNING TRAFFIC THROUGH INTERSECTION, POSITIONED ON THE LEFT SIDE, FOR ONE TURNING LANE
SOLID LANE LINE	100 mm	(1) DELINEATE LANES OF TRAFFIC IN SAME DIRECTION WHERE LANE CHANGE IS PROHIBITED (2) RIGHT EDGE LINE (NO CURB)	(1) DELINEATE LANES OF OPPOSING TRAFFIC, NO PASSING (2) LEFT EDGE LINE (DIVIDED ROADWAY, NO CURB)
BROKEN LANE LINE (3m LINE : 6m GAP)	100 mm	(1) DELINEATE LANES OF TRAFFIC IN SAME DIRECTION WHERE LANE CHANGE IS PERMITTED	(1) DELINEATE LANES OF OPPOSING TRAFFIC WHERE PASSSING IS PERMITTED
SOLID DOUBLE LANE LINE (SEPARATION 100mm)	100 mm 100 mm	(1) DELINEATE LANES OF TRAFFIC IN SAME DIRECTION WHERE LANE CHANGE IS PROHIBITTED	(1) DELINEATE LANES OF OPPOSING TRAFFIC WHERE PASSING IS PROHIBITTED
SOLID & BROKEN CENTERLINE (3m LINE: 6m GAP) (SEPARATION 100mm)	100 mm 100 mm	NOT USED	(1) DELINEATE LANES OF OPPOSING TRAFFIC WHERE PASSING IS PERMITTED FROM BROKEN LINE SIDE ONLY (2) TWO LANES, IN PAIRS
SOLID CHANNELIZATION OR CROSSWALK LINE	200 mm	(1) DELINEATE LANES OF TRAFFIC IN SAME DIRECTION WHERE LANE CHANGE IS PROHIBITTED BETWEEN THROUGH AND TURN LANES (2) USED IN PARALLEL PAIRS TO GUIDE PEDESTRIANS (SEE STD DWG 4–702) (3) USED DIAGONALLY TO INDICATE WHERE TRAFFIC SHOULD NOT CROSS (SEE STD DWG 4–704)	NOT USED
BROKEN CHANNELIZATION LINE (3m LINE: 3m GAP)	200 mm	(1) DELINEATE LANES OF TRAFFIC IN SAME DIRECTION WHERE LANE CHANGE IS PERMITTED BETWEEN MERGING OR DIVERGING LANES	NOT USED
STOP BAR	400 mm	(1) DELINEATE WHERE VEHICLES ARE TO STOP	NOT USED

NOTES:

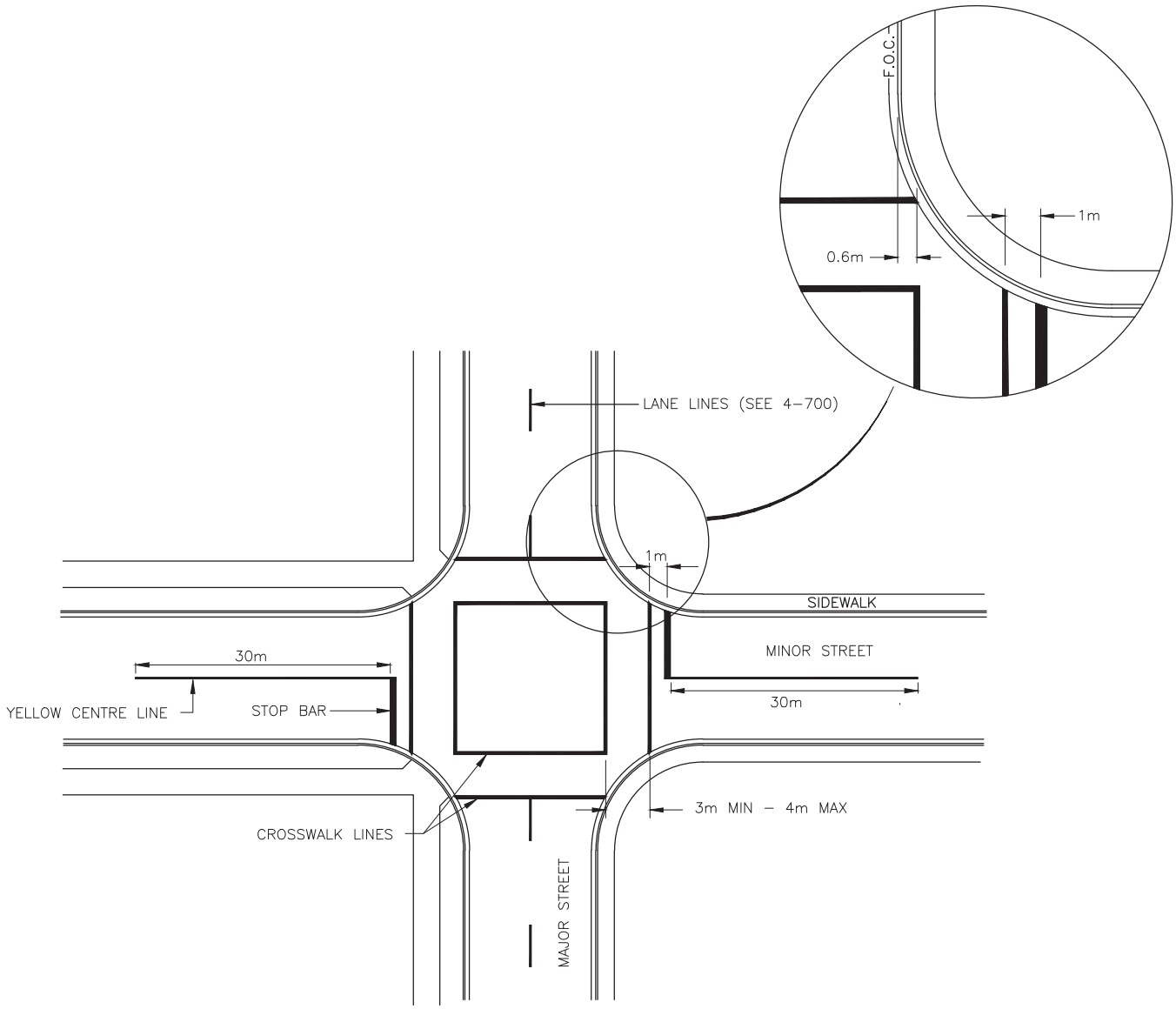
(1) SEE STANDARD DRAWING 4–700 FOR LAYOUT

(2) PARKING STALLS TO BE IN ACCORDANCE WITH LAND USE BYLAW

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PAVEMENT MARKING APPLICATIONS

STANDARD DETAIL:	4- 702
DATE: OCT 2016	REV: 4



NOTES:

(1) SEE STANDARD DETAIL 4–700 FOR LINE WIDTHS AND SPACING.

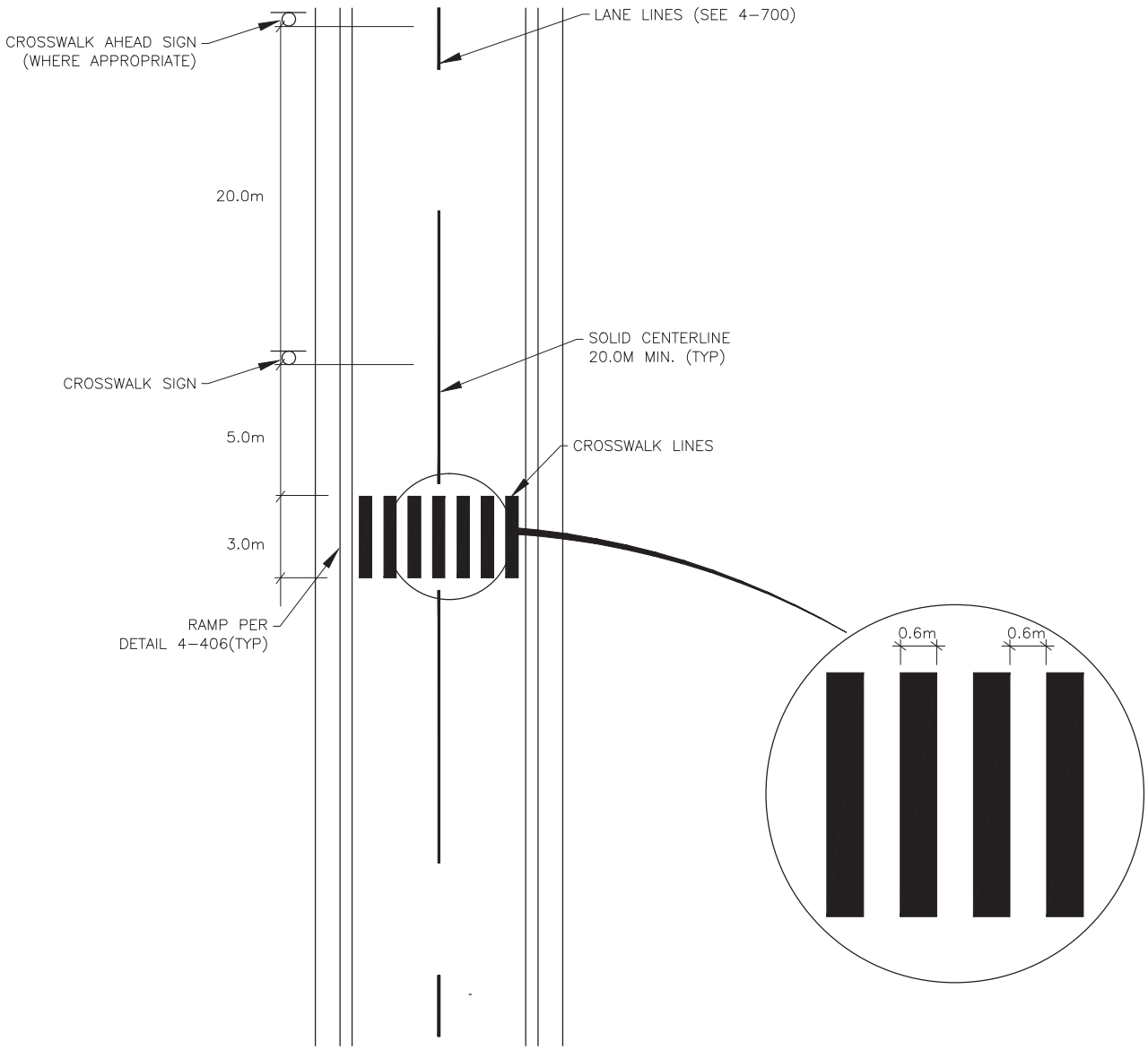
(2) ALL LINES AS PER STANDARD DETAIL 4–701.

(3) SEE STANDARD DEATIL 4–405 FOR PARA RAMP DETAILS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

STANDARD INTERSECTION CROSSWALK PAVEMENT MARKINGS

STANDARD DETAIL:	4- 703
DATE: OCT 2016	REV: 5



NOTES:

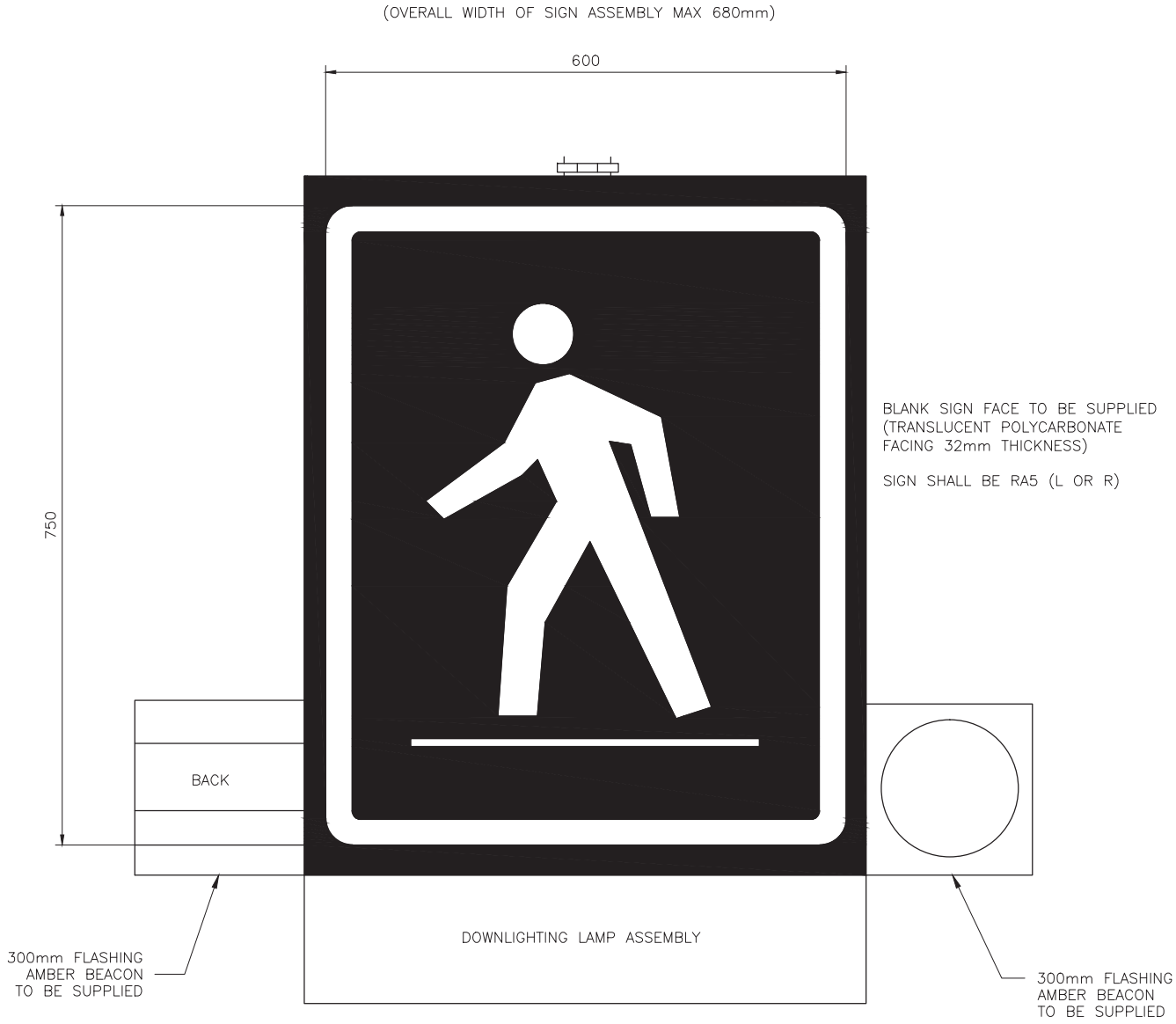
(1) CROSSWALK LINES TO BE PER STANDARD DETAIL 4–701.

(2) FOR USE AT:
- (A) MIDBLOCK CROSSWALKS
- (B) PRIMARY SCHOOL CROSSINGS
- (C) COLLECTOR ROAD CROSSING IN SCHOOL ZONE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

STANDARD MID-BLOCK CROSSWALK PAVEMENT MARKINGS

STANDARD DETAIL:	4-704
DATE: OCT 2016	REV: 0



NOTES:

(1) ALL WIRING FOR THE ILLUMINATED SIGN SHALL BE IN FLEX–ARMOUR SHEATHING AND COMPLETE WITH 9.5cm CONNECTORS.

(2) THE BALLASTS REQUIRED FOR THE FLUORESCENT AND SODIUM LAMPS SHALL BE MOUNTED TO THE TOP OF BOTTOM PANEL OF THE SIGN CASE FOR HEAT TRANSFER REQUIREMENTS.

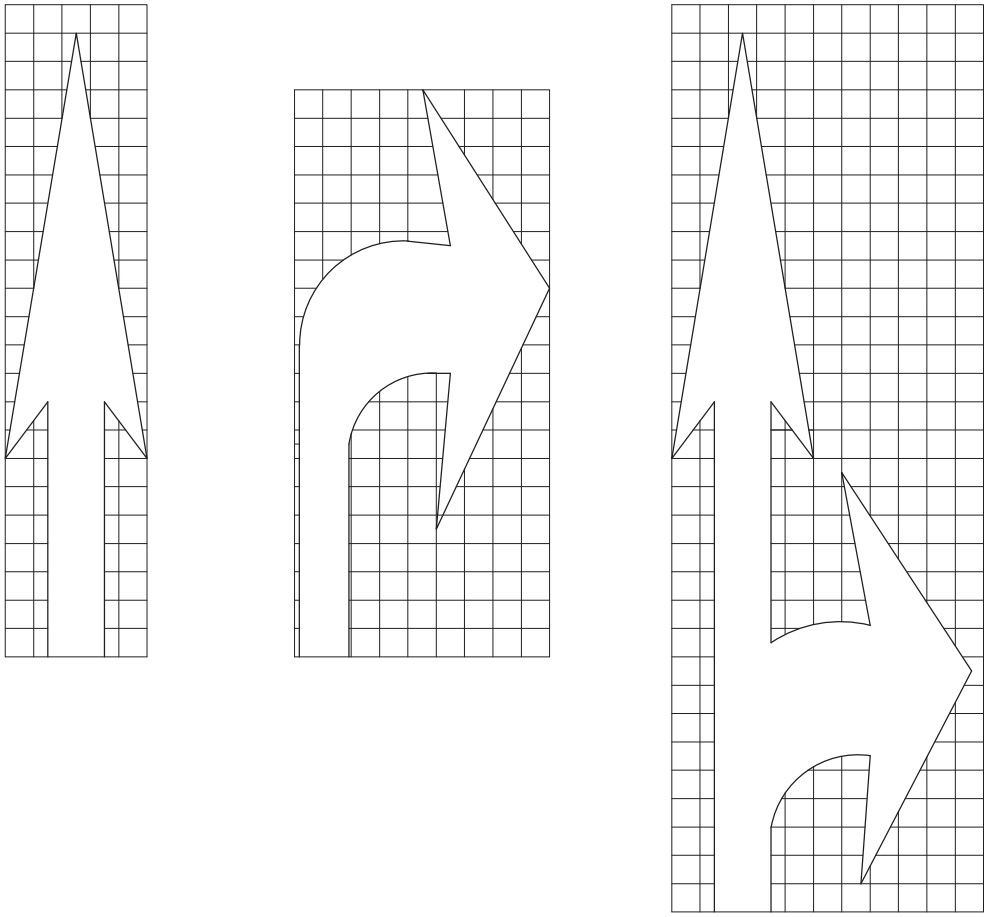
(3) HEIGHT OF SIGNS AND LOCATION AS PER M.U.T.C.D.

(4) ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SPECIAL CROSSWALK OVERHEAD SIGN BASIC CASE DESIGN (RA-5)

STANDARD DETAIL:	4- 705
DATE: OCT 2016	REV: 5



NOTES:

(1) PER FIGURE C1–3 MUTCD SEPT 98

(2) GRID SHOWN IS 150mm x 150mm

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PAVEMENT ARROWS

STANDARD DETAIL:	4- 760
DATE: OCT 2016	REV: 3

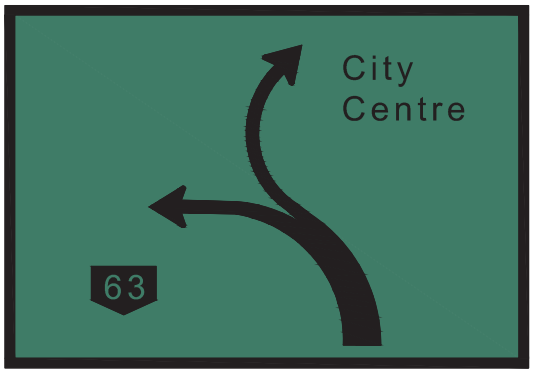


FIG A: DIAGRAMMATIC ADVANCED STREET NAME SIGN



FIG B: URBAN ARTERIAL STREET NAME SIGN



FIG C: URBAN ADVANCED ARTERIAL STREET IDENTIFICATION SIGN



FIG. D: URBAN STREET NAME SIGN

NOTES:

(1) THIS DETAIL IS FOR ILLUSTRATION PURPOSES ONLY.

(2) REFER SECTION 4 AND THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA (MUTCDC)" FOR SPECIFIC DETAILS.

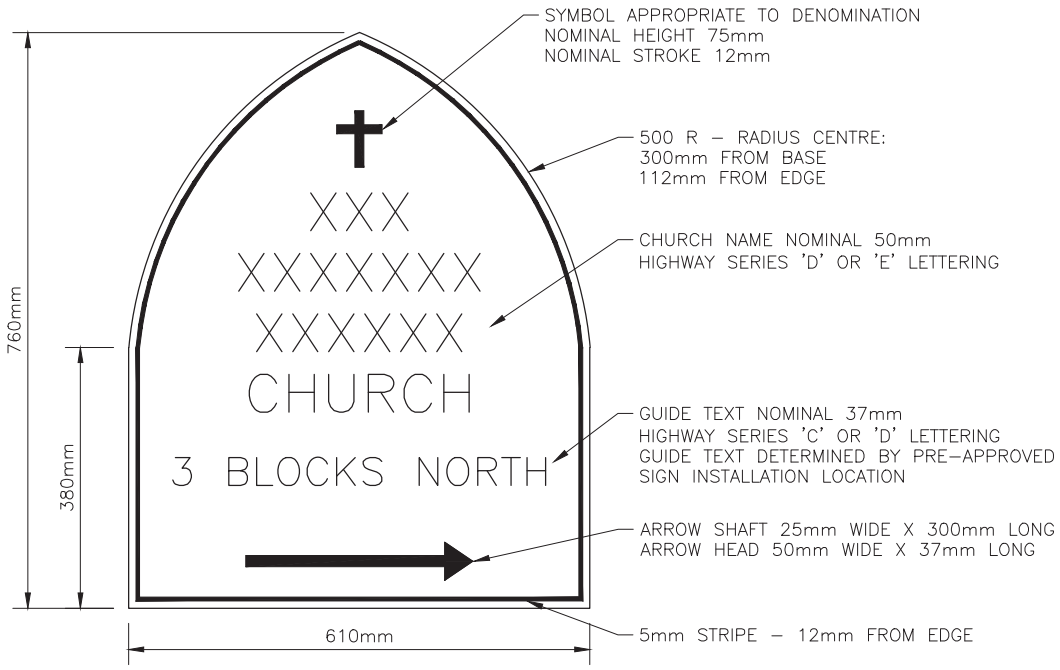
(3) COLORS SHOULD MATCH TAC AND/OR ALBERTA TRANSPORTATION REQUIREMENTS.

(4) COLORS FOR MUNICIPAL SIGNS SHOULD BE APPROVED BY THE RMWB. MUNICIPAL LOGOS SHOULD BE ATTAINED FROM THE RMWB COMMUNICATIONS DEPARTMENT

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL STREET SIGNS

STANDARD DETAIL:	4- 761
DATE: OCT 2016	REV: 4



NOTES:

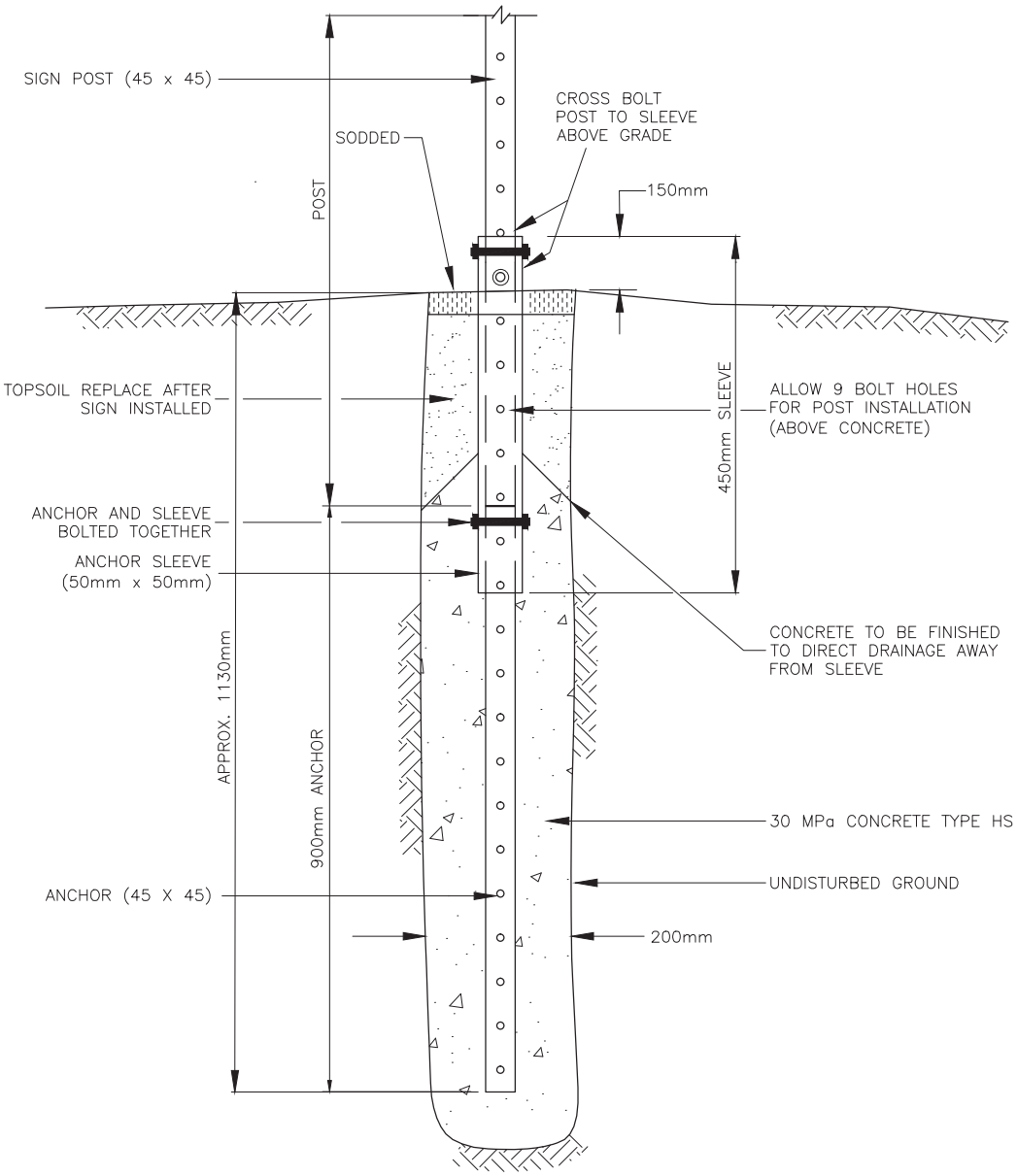
(1) WHITE LEGEND ON GREEN ENGINEER GRADE REFLECTIVE SHEETING.

(2) PROVIDE TWO 10mm MOUNTING HOLES ON CENTRELINE AT 25mm O/C.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

STANDARD CHURCH GUIDE SIGN

STANDARD DETAIL:	4- 800
DATE: OCT 2016	REV: 6



NOTES:

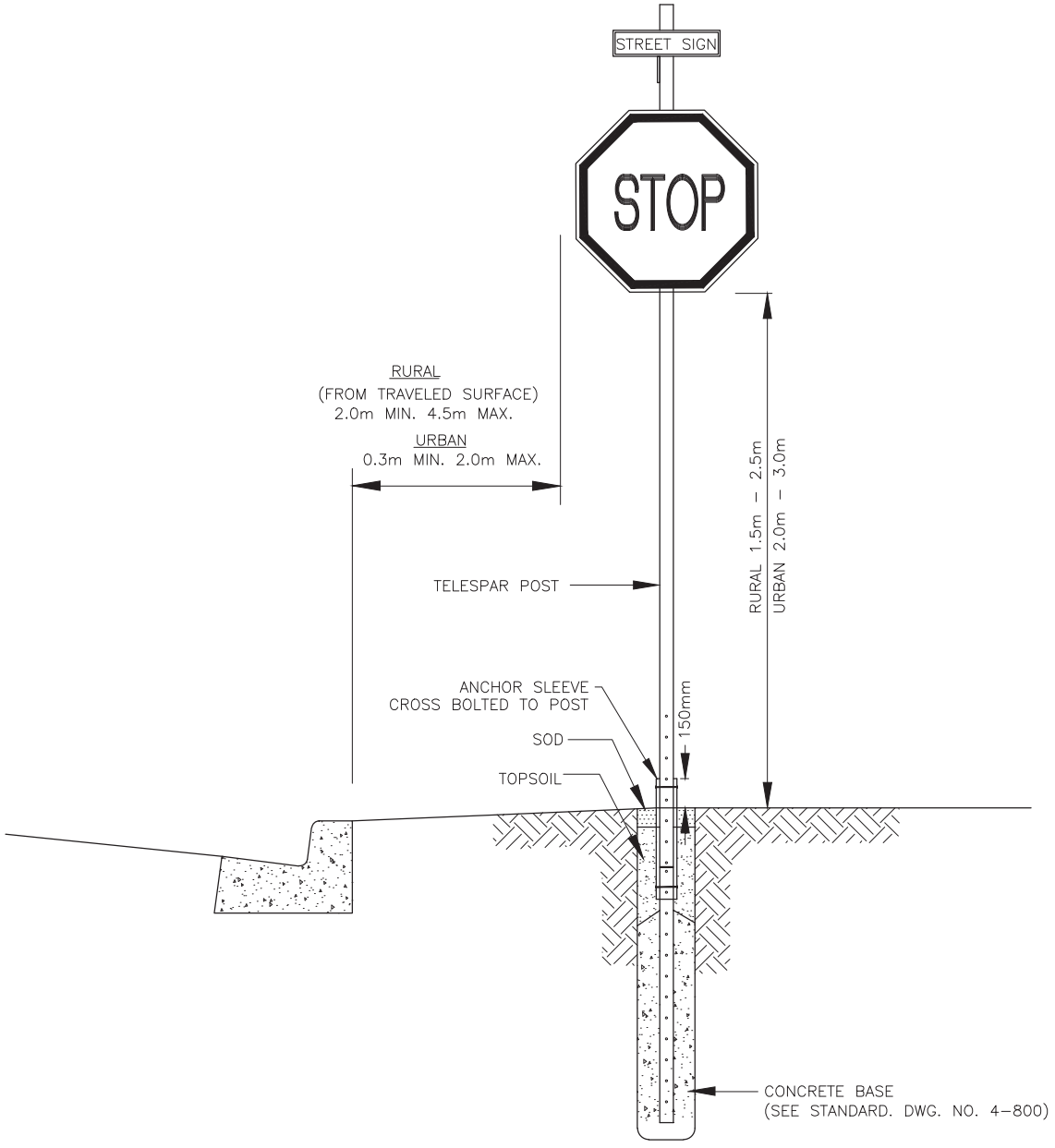
(1) USE 45mm SQUARE TELESPAR POSTS AND ANCHORS, AND 50mm SQUARE TELESPAR SLEEVES OR APPROVED ALTERNATE.

(2) FOR SIGNS LARGER THAN 750mm, PROVIDE ENGINEERED DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SIGN SUPPORT DETAIL

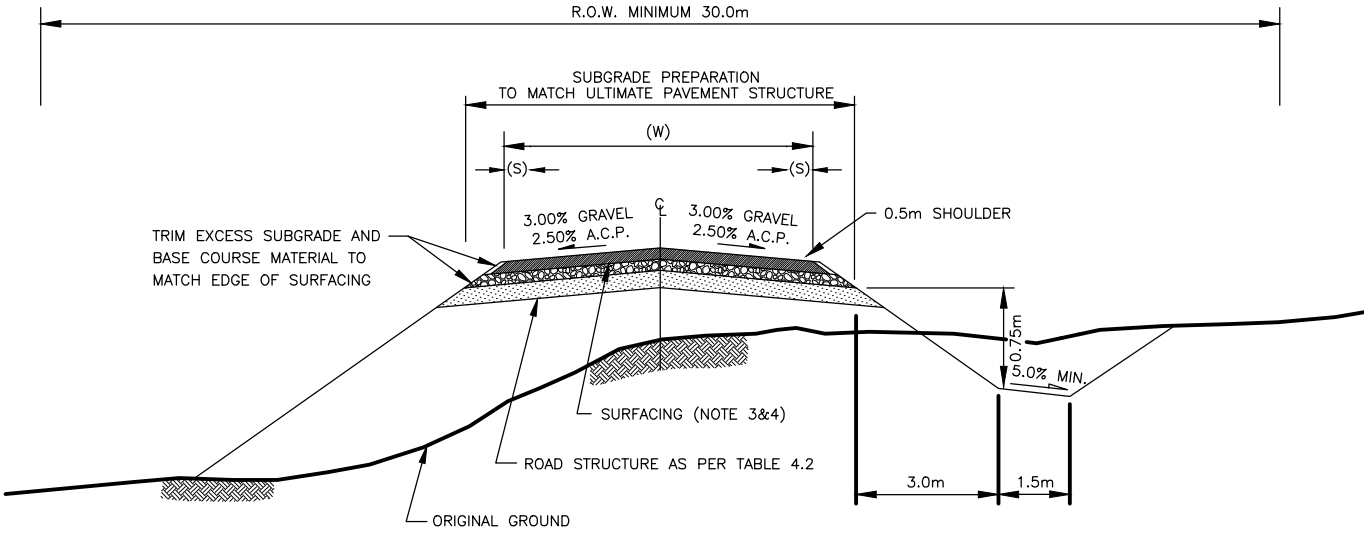
STANDARD DETAIL:	4- 801
DATE: OCT 2016	REV: 6



REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL SIGN INSTALLATION

STANDARD DETAIL:	4-1300
DATE.: JAN. 2021	REV: 0



FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 – 1.5m	4:1
1.5 – 3.5m	3:1
3.5 – 4.5m	2.5:1
> 4.5m	2:1

ROAD CLASSIFICATION	ROADWAY	SHOULDER (S)	TOTAL STRUCTURE WIDTH (W)
RESIDENTIAL LOCAL	7.0m	0.5m	8.0m
RESIDENTIAL COLLECTOR	8.0m	0.5m	9.0m
COMMERCIAL / INDUSTRIAL LOCAL	8.0m	0.5m	9.0m
COMMERCIAL / INDUSTRIAL COLLECTOR	9.0m	0.5m	10.0m

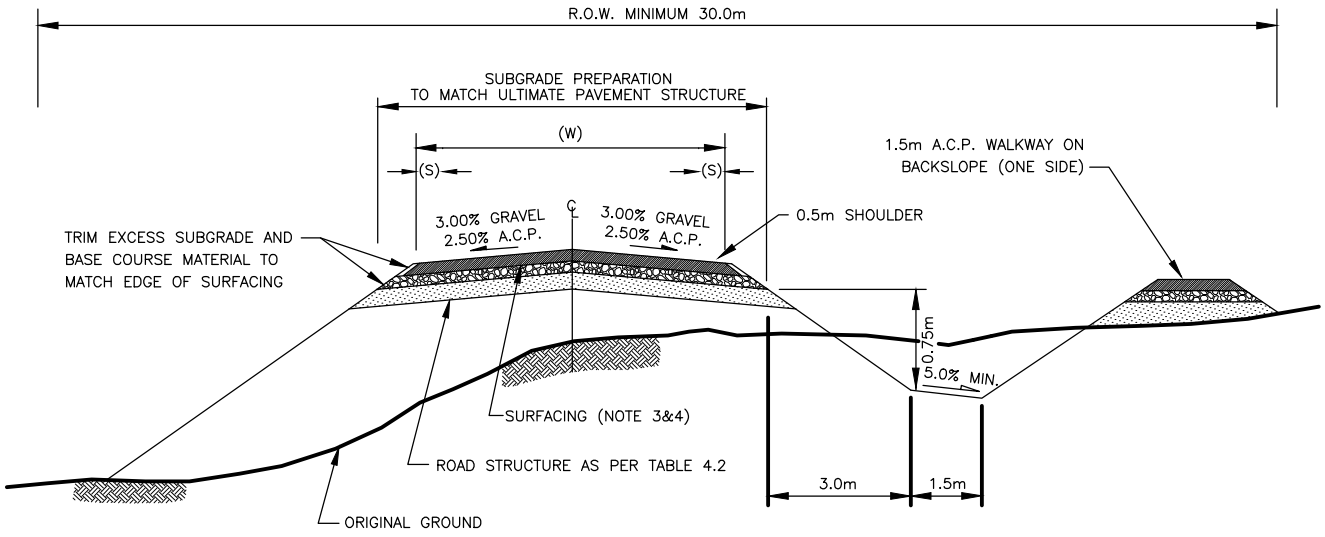
NOTES:

1. ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE
2. SLOPES STEEPER THAN 3:1 REQUIRES 1m SHOULDER WIDENING & GUARD RAIL INSTALLATION
3. PAVEMENT STRUCTURE AS PER SECTION 4 TABLE 4.2
4. RURAL GRAVEL ROAD STRUCTURE (AS APPROVED BY THE MUNICIPALITY)
   - 4.a. BASE, SUB–BASE AND SUBGRADE AS PER SECTION 4 TABLE 4.2
   - 4.b. REPLACE ASPHALT WITH 50mm OF DES. 4 CL. 25 GRAVEL SURFACE
5. FILL SLOPES GREATER THAN 3.5M AND/OR STEEPER THAT 3:1 REQUIRE GEOTECHNICAL DESIGN.
6. EROSION PROTECTION REQUIRED ON ALL EXPOSED CUT AND FILL SLOPES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL CROSS SECTION RURAL ROADS

STANDARD DETAIL:	4-1301
DATE.: JAN. 2021	REV: 8



FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 – 1.5m	4:1
1.5 – 3.5m	3:1
3.5 – 4.5m	2.5:1
> 4.5m	2:1

ROAD CLASSIFICATION	ROADWAY	SHOULDER (S)	TOTAL STRUCTURE WIDTH (W)
RESIDENTIAL LOCAL	7.0m	0.5m	8.0m
RESIDENTIAL COLLECTOR	8.0m	0.5m	9.0m
COMMERCIAL / INDUSTRIAL LOCAL	8.0m	0.5m	9.0m
COMMERCIAL / INDUSTRIAL COLLECTOR	9.0m	0.5m	10.0m

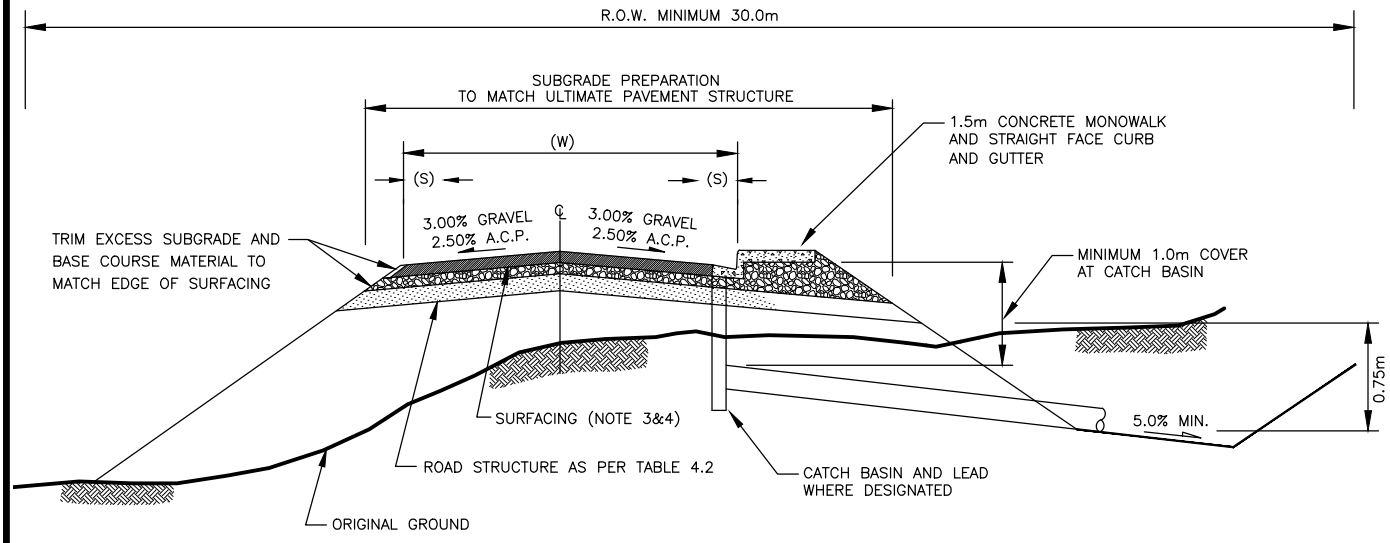
NOTES:

1. ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE
2. SLOPES STEEPER THAN 3:1 REQUIRES 1m SHOULDER WIDENING & GUARD RAIL INSTALLATION
3. PAVEMENT STRUCTURE AS PER SECTION 4 TABLE 4.2
4. RURAL GRAVEL ROAD STRUCTURE (AS APPROVED BY THE MUNICIPALITY)
   - 4.a. BASE, SUB–BASE AND SUBGRADE AS PER SECTION 4 TABLE 4.2
   - 4.b. REPLACE ASPHALT WITH 50mm OF DES. 4 CL. 25 GRAVEL SURFACE
5. FILL SLOPES GREATER THAN 3.5M AND/OR STEEPER THAT 3:1 REQUIRE GEOTECHNICAL DESIGN.
6. EROSION PROTECTION REQUIRED ON ALL EXPOSED CUT AND FILL SLOPES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL CROSS SECTION RURAL ROADS WITH WALKWAY ON BACKSLOPE

STANDARD DETAIL:	4-1302
DATE.: JAN. 2021	REV: 7



FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 – 1.5m	4:1
1.5 – 3.5m	3:1
3.5 – 4.5m	2.5:1
> 4.5m	2:1

ROAD CLASSIFICATION	ROADWAY	SHOULDER (S)	CARRIAGE WIDTH (W)
RESIDENTIAL LOCAL	7.0m	1.0m	9.0m
RESIDENTIAL COLLECTOR	8.0m	1.0m	10.0m
COMMERCIAL / INDUSTRIAL LOCAL	8.0m	1.5m	11.0m
COMMERCIAL / INDUSTRIAL COLLECTOR	9.0m	1.5m	12.0m

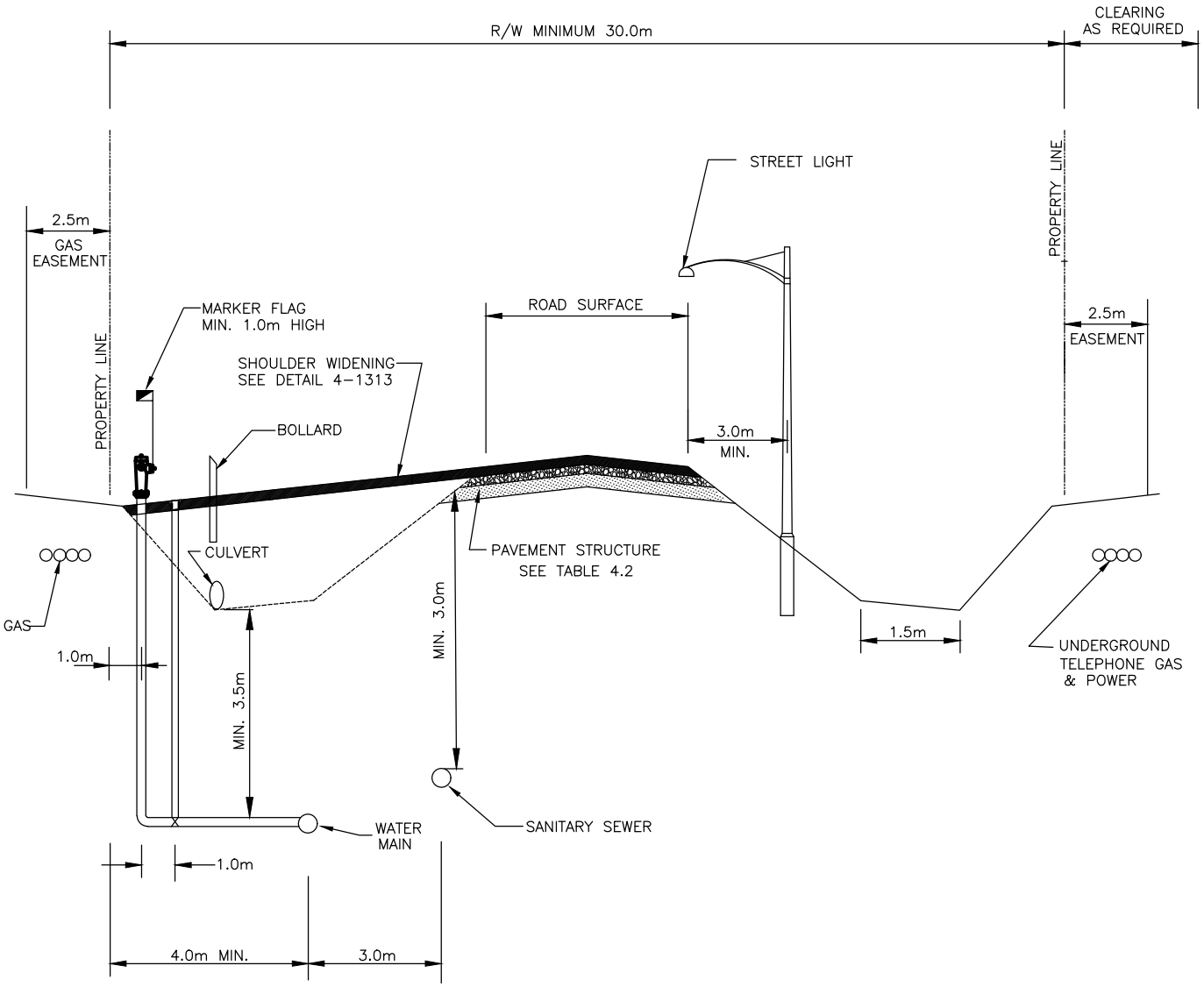
NOTES:

1. ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE
2. SLOPES STEEPER THAN 3:1 REQUIRES 1m SHOULDER WIDENING & GUARD RAIL INSTALLATION
3. PAVEMENT STRUCTURE AS PER SECTION 4 TABLE 4.2
4. RURAL GRAVEL ROAD STRUCTURE (AS APPROVED BY THE MUNICIPALITY)
   - 4.a. BASE, SUB–BASE AND SUBGRADE AS PER SECTION 4 TABLE 4.2
   - 4.b. REPLACE ASPHALT WITH 50mm OF DES. 4 CL. 25 GRAVEL SURFACE
5. FILL SLOPES GREATER THAN 3.5M AND/OR STEEPER THAT 3:1 REQUIRE GEOTECHNICAL DESIGN.
6. EROSION PROTECTION REQUIRED ON ALL EXPOSED CUT AND FILL SLOPES.
7. INSTALL 900mm CATCH BASIN AS REQUIRED PER ROAD DRAINAGE DESIGN, AND DISCHARGE TO DITCH SYSTEM. IF NO DITCH SYSTEM IS AVAILABLE, LOCAL STORM SEWER COLLECTION SYSTEM MAY BE REQUIRED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL CROSS SECTION RURAL ROADS WITH CONCRETE CURB AND SIDEWALK

STANDARD DETAIL:	4-1303
DATE.: JAN. 2021	REV: 5



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) LUMINARIES SUPPORTS TO BE OF THE FRANGIBLE BASE, SLIP BASE OR FRANGIBLE COUPLING TYPE.

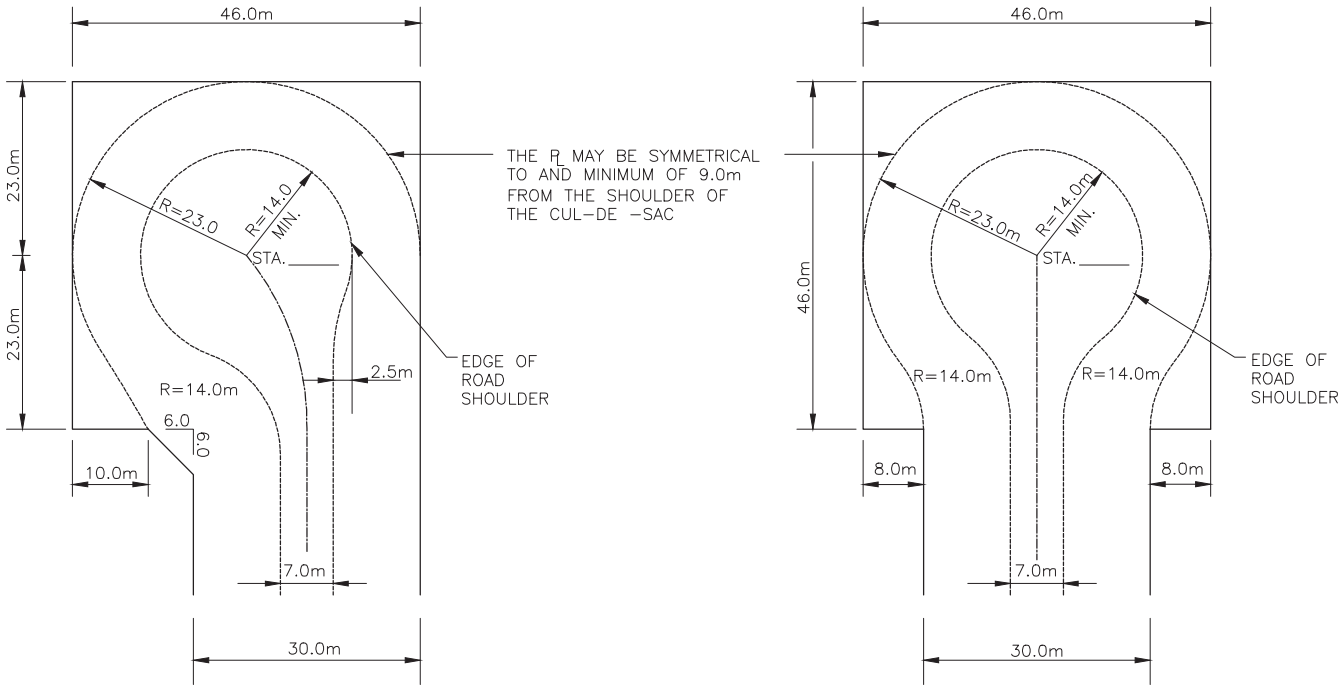
(4) AVOID PLACEMENT OF SANITARY MANHOLES IN DITCH INVERT.

(5) FOR NEW CONSTRUCTION PLACE WATER AND SANITARY MAINS BENEATH THE ROAD STRUCTURE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL UTILITY LAYOUT

STANDARD DETAIL:	4-1306
DATE: OCT 2016	REV: 4



NOTES:

(1) THE MINIMUM CROWN SLOPE WITHIN THE CUL-DE-SAC SHALL BE 4.0%.

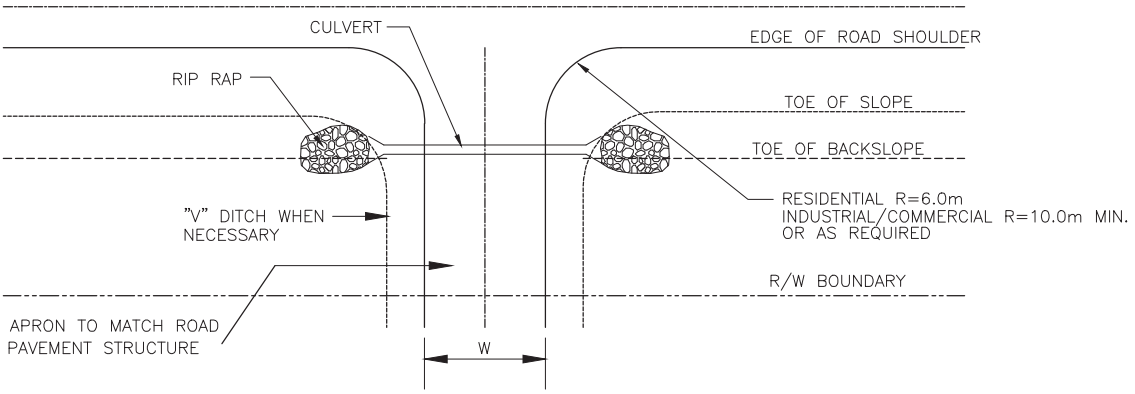
(2) PROPERTY LINE MAY INCREASE, DEPENDING ON FILL OR BACKSLOPE REQUIREMENTS.

(3) FOR TYPICAL URBAN CUL-DE-SAC SEE DETAIL 4-409.

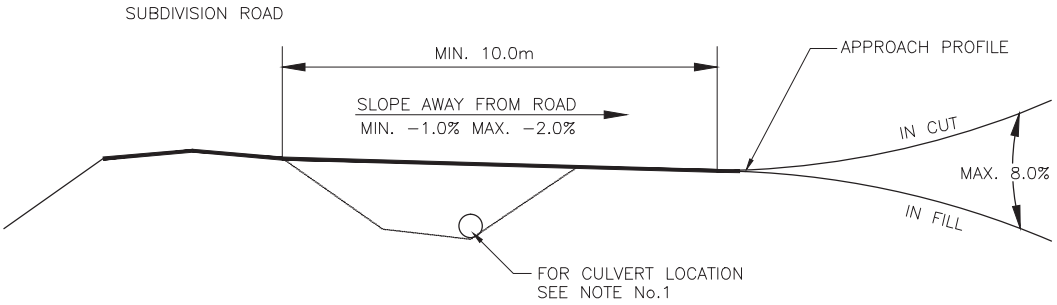
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL RESIDENTIAL CUL-DE-SAC

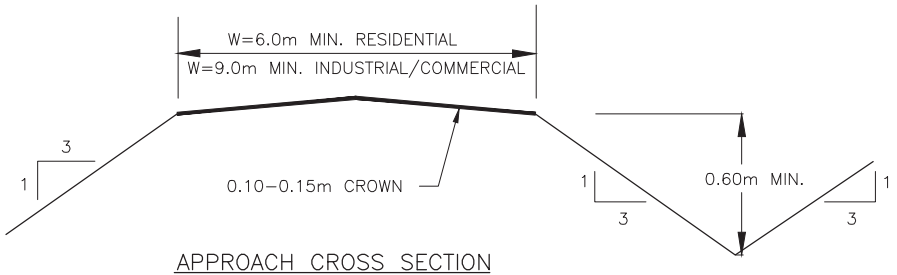
STANDARD DETAIL:	4-1310
DATE: OCT 2016	REV: 5



APPROACH PLAN



DITCH AND CULVERT LOCATION



APPROACH CROSS SECTION

NOTES:

(1) WHEN CULVERTS ARE REQUIRED THEY MUST BE C.S.P. CULVERTS AND BE THE FOLLOWING MIN. DIAMETERS.

RESIDENTIAL – 0.40m

INDUSTRIAL – 0.50m

– LENGTH WILL VARY WITH DEPTH OF FILL (MIN. 10.0m)

– CULVERT TO BE PLACED AT TOE OF BACKSLOPE

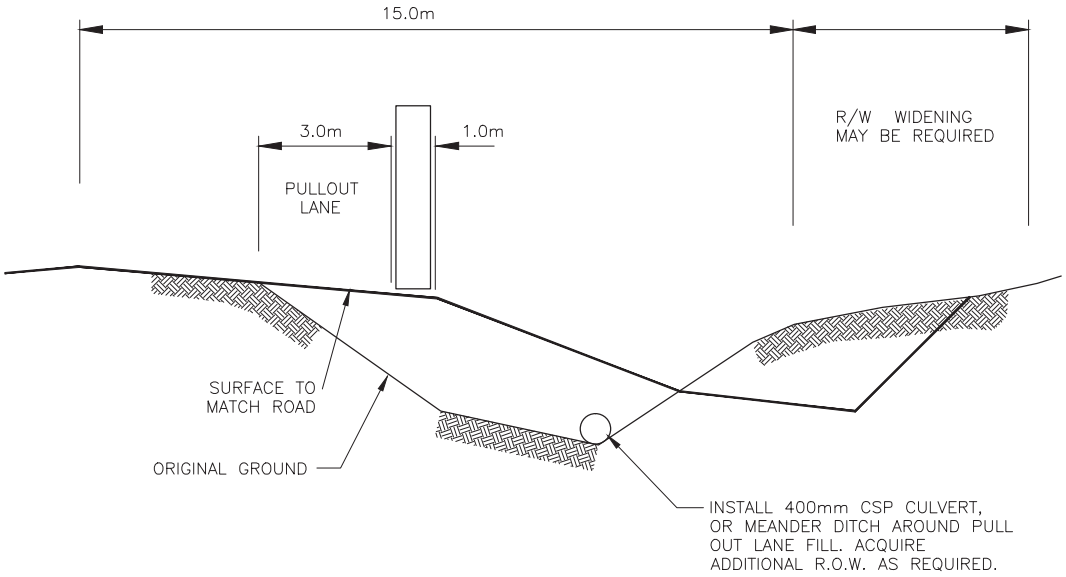
(2) ALL DIMENSIONS SHOWN ARE IN METERS.

(3) MIN. APPROACH LENGTH – FROM EDGE OF ROAD SHOULDER TO R/W BOUNDARY.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL RESIDENTIAL AND INDUSTRIAL/COMMERCIAL APPROACHES

STANDARD DETAIL:	4-1311
DATE: OCT 2016	REV: 5



FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 – 1.5m	4:1
1.5 – 3.5m	3:1
3.5 – 4.5m	2.5:1
> – 4.5m	2:1

NOTES:

(1) ALL BACK SLOPES 3:1 UNLESS NOTED OTHERWISE.

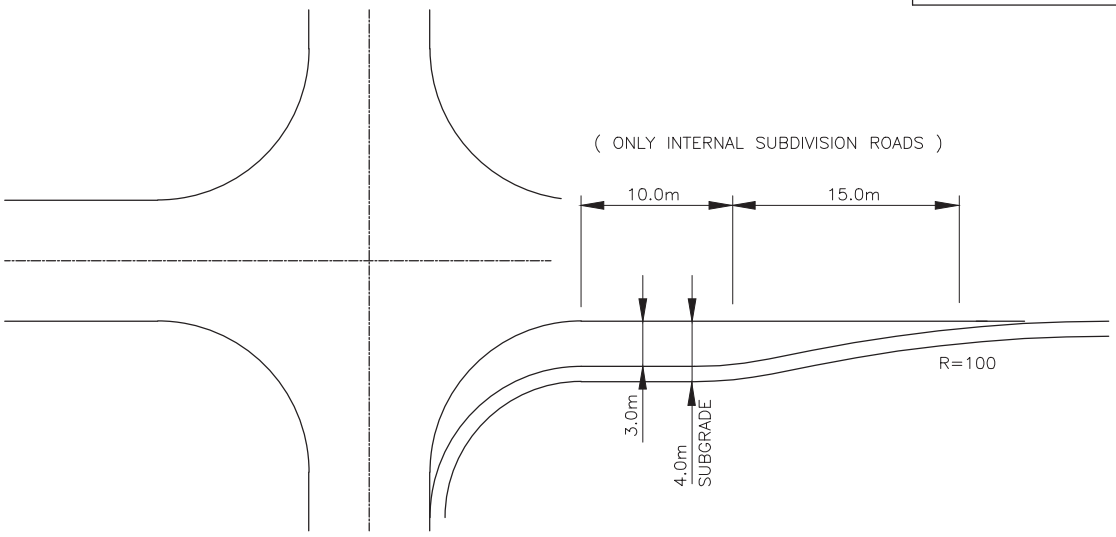
(2) SLOPE STEEPER THAN 3:1 REQUIRES 1m SHOULDER WIDENING & GUARD RAIL INSTALLATION.

(3) FOR LOCATION DETAILS, REFER TO DRAWING 4–1312.

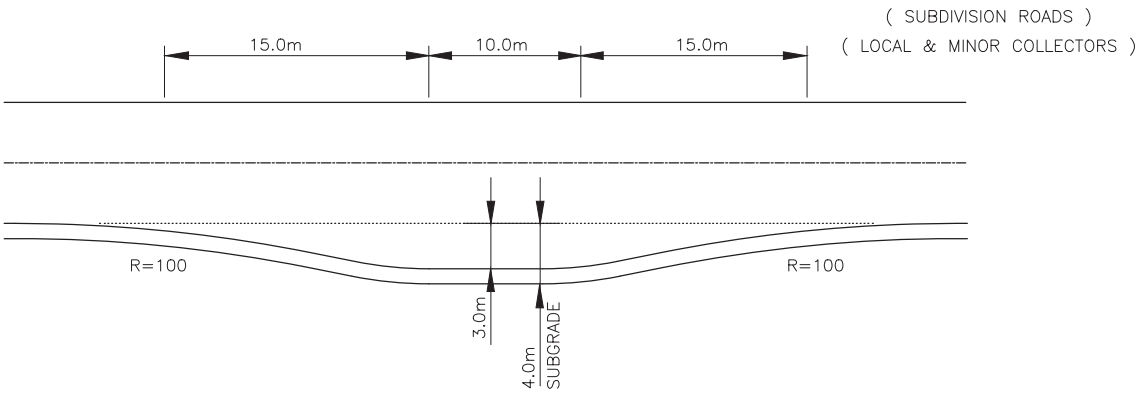
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL COMMUNITY MAILBOX PULLOUT CROSS SECTION

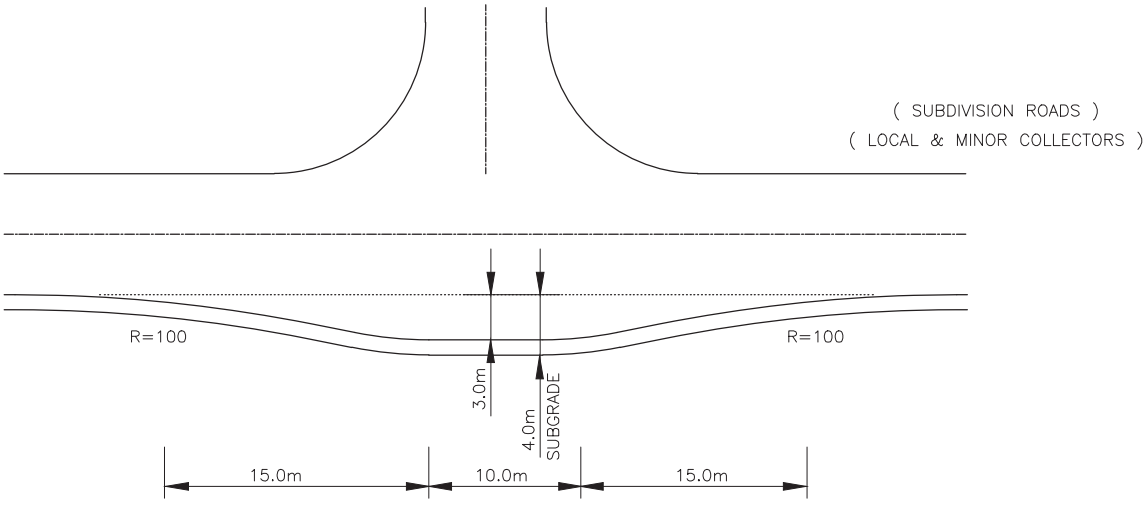
STANDARD DETAIL:	4-1312
DATE: OCT 2016	REV: 5



CORNER LOCATION



MID BLOCK LOCATION

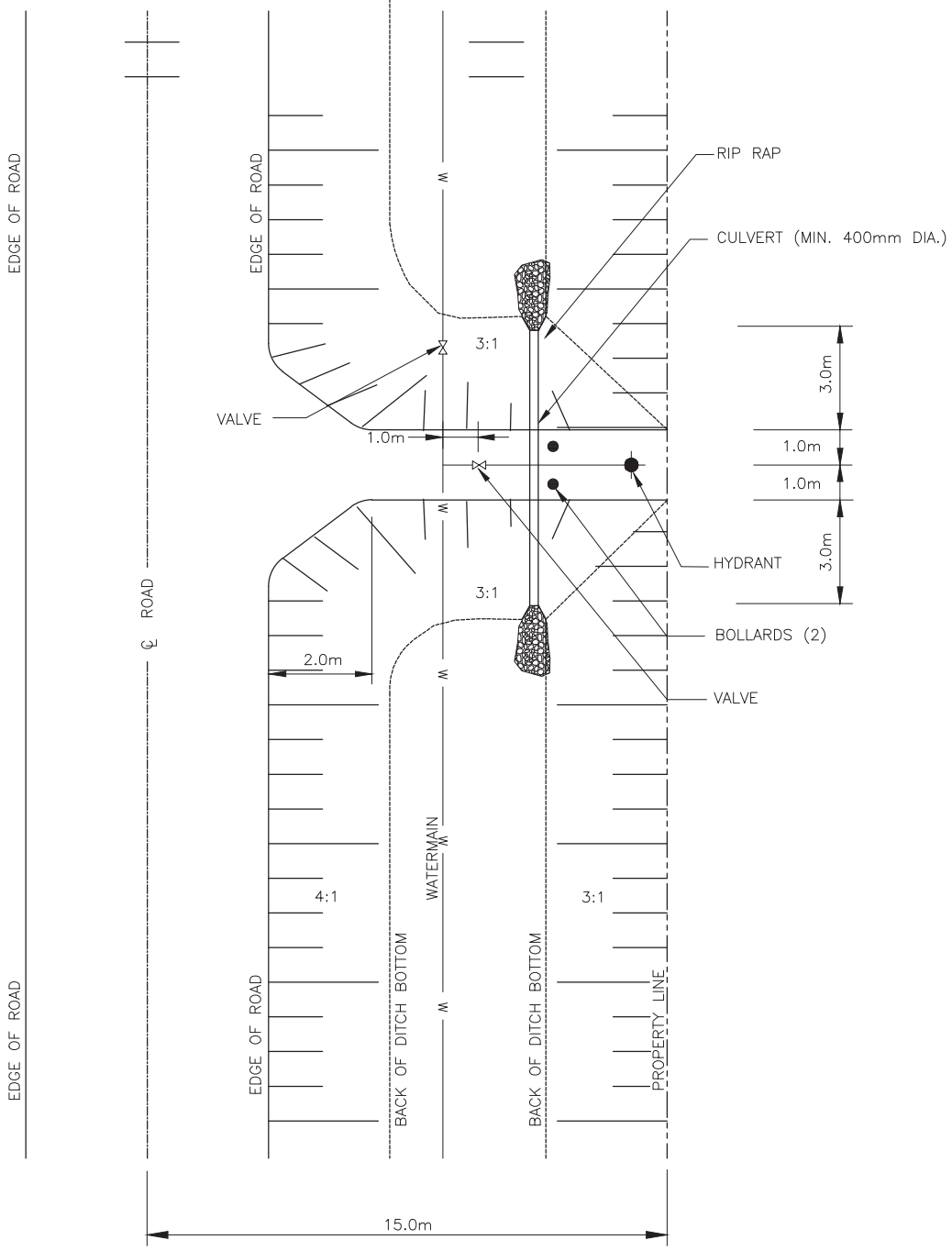


TEE LOCATION

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL COMMUNITY MAILBOX PULLOUT LOCATIONS

STANDARD DETAIL:	4-1313
DATE: OCT 2016	REV: 5



NOTES:

(1) WATER MAIN AND HYDRANTS MAY BE LOCATED EITHER SIDE OF ROAD.

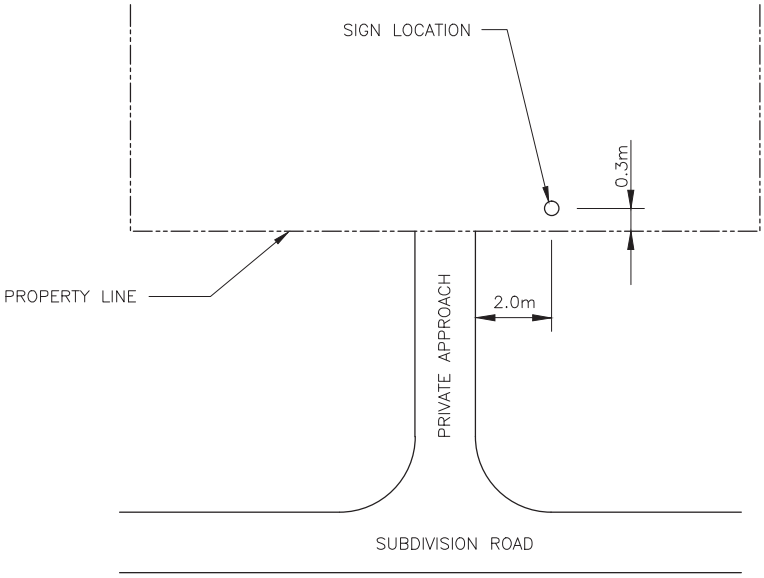
(2) STREET LIGHTS OR UNDERGROUND POWER TO BE OPPOSITE SIDE TO WATER MAIN.

(3) SEE STANDARD DWG. NO. 4–1302 FOR FURTHER DETAILS.

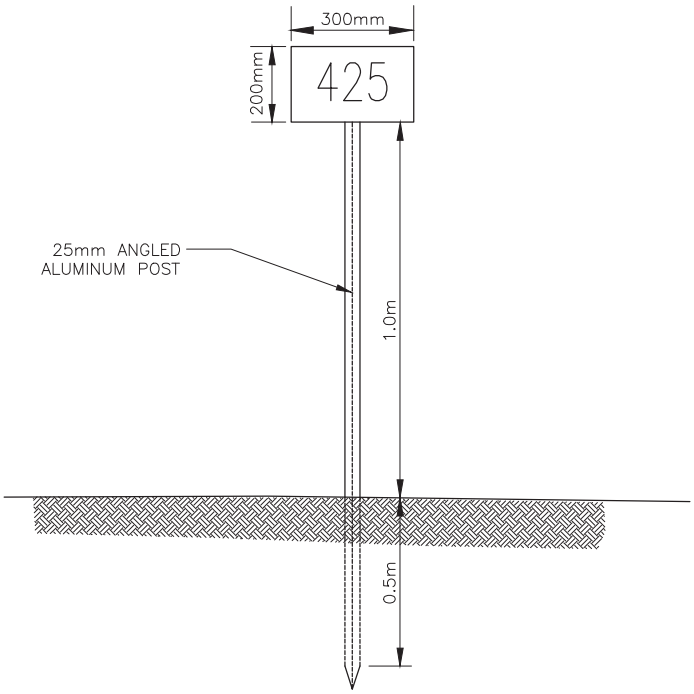
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL HYDRANT SHOULDER WIDENING LAYOUT

STANDARD DETAIL:	4-1314
DATE: OCT 2016	REV: 5



PLAN

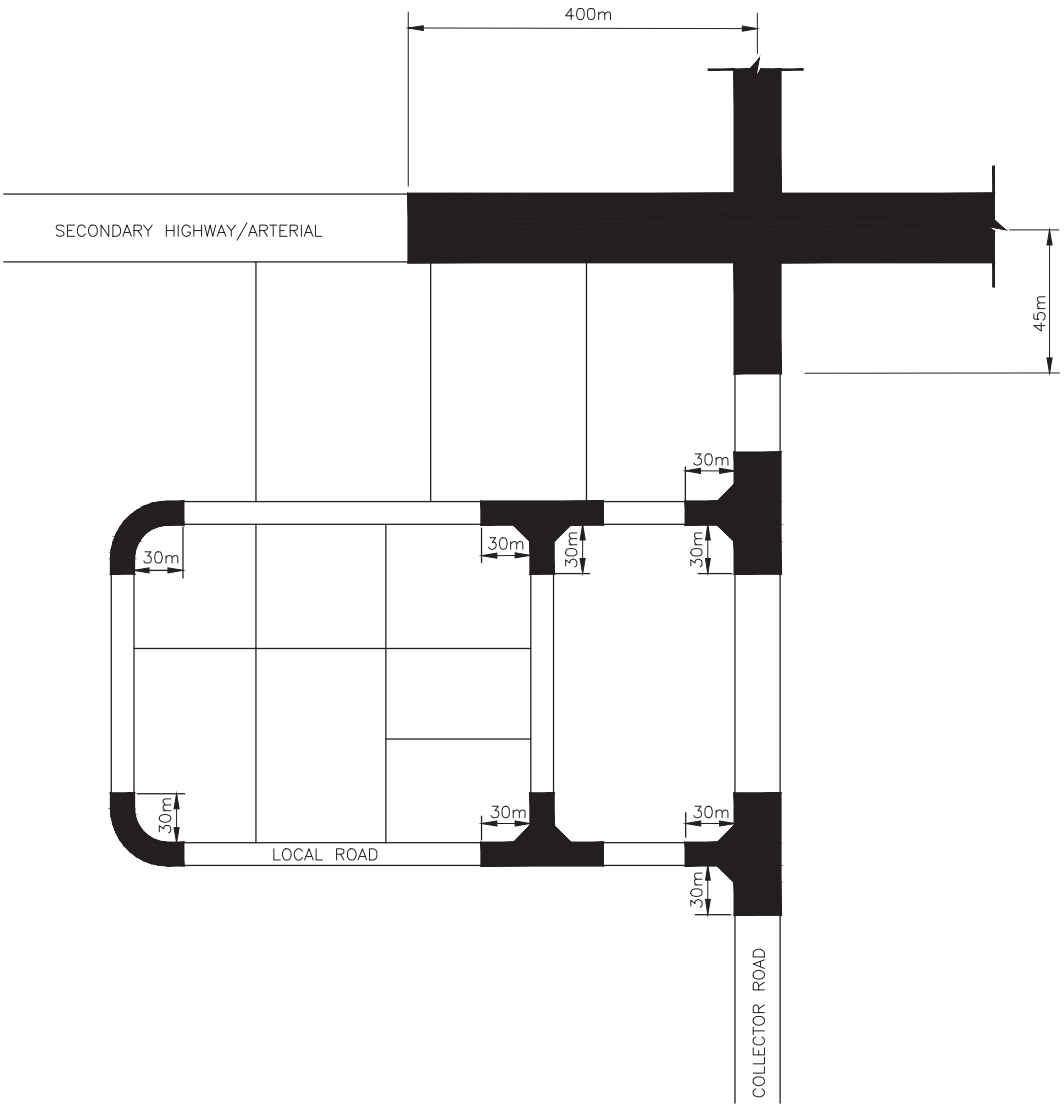


SIGN ELEVATION

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL MUNICIPAL ADDRESSING SIGN (MINIMUM REQUIREMENTS)

STANDARD DETAIL:	4-1316
DATE: OCT 2016	REV: 5



NOTES:

(1) DIMENSIONS AND HIGHLIGHTING INDICATE WHERE ROAD APPROACHES SHALL NOT BE CONSTRUCTED UNLESS NO REASONABLE ALTERNATIVE EXISTS.

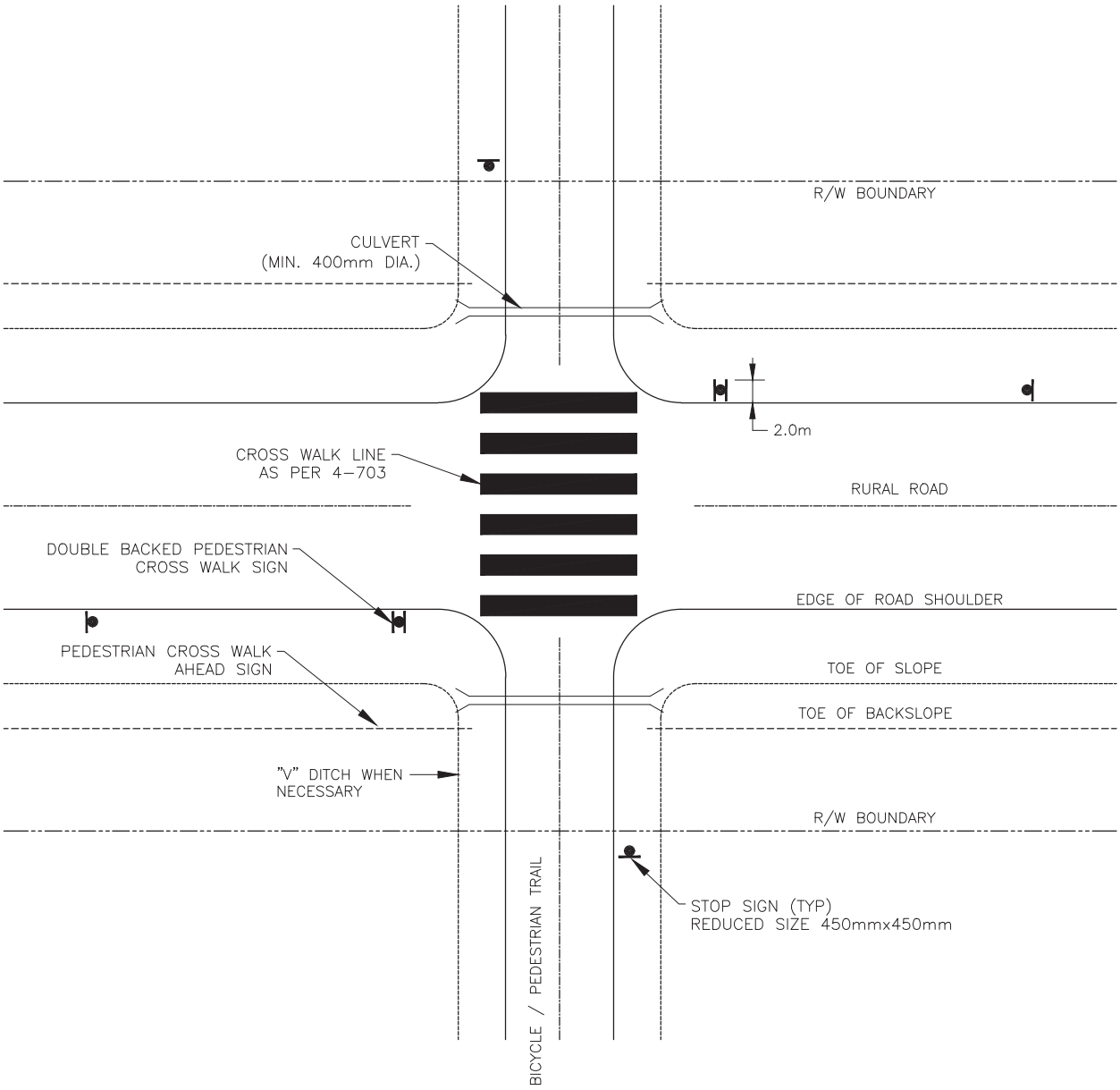
(2) ALL LOT ACCESS WITHIN SUBDIVISIONS SHALL BE OFF OF INTERNAL SUBDIVISION ROADS.

(3) MINIMUM SIGHT DISTANCES AS PER TAC.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL APPROACH DRIVEWAY LOCATIONS

STANDARD DETAIL:	4-1318
DATE: OCT 2016	REV: 6



NOTES:

(1) ALL SIGNAGE TO BE IN ACCORDANCE WITH THE TAC MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL MID BLOCK RURAL TRAIL/ PATH CROSSING DETAIL

5 Sanitary Sewer Systems

5.1 GENERAL

These standards cover the design and construction of sewer mains and accessories to be constructed or re-constructed in the Regional Municipality of Wood Buffalo (Municipality). Standard Drawings relating to sanitary sewer system construction are provided at the end of this section.

These standards provide the minimum design criteria and general construction requirements and construction materials for Consulting Engineer to use in their preparation of specifications and drawings. These standards may be exceeded if warranted by the design consultant. Good engineering practices and designs must prevail on all projects.

The design of the sanitary sewer system should confirm to the Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems, as published by Alberta Environment and Parks.

5.2 DESIGN FLOW

Sanitary sewage systems shall be designed, using a minimum of a spreadsheet model, on the population density basis of either the ultimate subdivision design population in the Area Structure Plan or the Land Use Bylaw as follows:

Land Use	Design Density	Minimum Design Population
Single Family	18 units/net ha @ 3.5 people/unit	63 people / net ha
Low Density Multifamily	44 units/net ha @ 3.5 people/unit	154 people / net ha
Medium Density Multifamily	148 units/net ha @ 2.5 people/unit	370 people / net ha
High Density Multifamily	296 units/net ha @ 2.5 people/unit	740 people / net ha

If design populations are unknown and outside the current Area Structure Plan, use 50 persons per gross developable hectare utilizing 3.5 people/residence for conceptual design.

The sewer main capacity shall be designed to convey the peak hourly sewage contribution and infiltration, without the use of holding tanks, and based on the following standards:

5.2.1 Residential Contribution

Residential dry weather flows are to be calculated as follows:

- QPDW = (G x P x Pf) / 86.4
- QPDW = the peak dry weather design flow rate (litres/sec)
- G = 360 litres/day/person
- P = the design contributing population in thousands
- (Population per hectare x contributing area / 1000)
- Pf = Harmon's Peaking Factor = 1 + 14 / (4 + P0.5)

5.2.2 Non-Residential Contribution

1. Industrial flows shall be minimum average contribution of 0.20 L/s per gross hectare or as supported by the Design Brief.
2. Commercial and Institutional (churches, schools, etc.) flows shall be minimum average contribution of 0.20 L/s per gross hectare or as supported by the Design Brief.
3. For more specific Industrial, Commercial and Institutional applications, Table: Commercial/Institutional and Industrial Sanitary Flow Generation Factors on the Basis of Land Use may be utilized unless the development has higher or specialized flow generation.
4. Peak dry weather flows are to be determined as follows:
    - Peaking Factor, Pf = 10 (Q_{AVE} $^{-0.45}$), but not less than 3.0 or greater than 25
    - Peak Dry Weather Flow, Q_{PDW} = Pf x Q_{AVE}

Commercial/Institutional and Industrial Sanitary Flow Generation Factors based on Land Use	
Type of Establishment	Average Flow Generation L/day/m^2 of Floor Area
Office Buildings	8
Restaurants	20
Bars and Lounges	12
Hotels and Motels	14
Neighbourhood Stores	8

Commercial/Institutional and Industrial Sanitary Flow Generation Factors based on Land Use	
Type of Establishment	Average Flow Generation L/day/m^2 of Floor Area
Department Stores	8
Shopping Centres	4
Laundries and Dry Cleaning	41
Banks and Financial Buildings	12
Medical Buildings and Clinics	12
Warehouses	4
Meat and Food Processing Plants	115
Car Washes	77
Service Stations	8
Auto Dealers, Repair and Service	6
Super Market	8
Trade Businesses - Plumbers, Exterminators, etc.	8
Mobile Home Dealer, Lumber Co., Drive-In Movies, Flea Market	7
Places of Assembly - Churches, Schools, Libraries, Theatres	24
Factories - Manufacturing raw products into finished products	33
Hospitals	1700 L/bed/day

5.2.3 Inflow/Infiltration Contribution

1. The sanitary sewer and manhole system shall be watertight. However, a general infiltration allowance of 0.28 L/s per gross hectare shall be added to the wastewater flows for residential and non-residential development.
2. In addition, any manholes located in "sags" (low areas subject to inundation during major rainfall events) are subject to an additional allowance of 0.4 L/s per manhole.
3. Roof leaders and weeping tiles shall not be connected to the sanitary sewer system. In existing areas where roof leaders and/or weeping tile are connected to the sanitary system, a minimum allowance for inflow of 0.6 L/s per gross hectare shall be provided, subject to site-specific flow monitoring. Every effort shall be made to disconnect any identified roof leaders from the sanitary sewer system.

5.2.4 Total Design Peak Rates for Sanitary Sewers

The total design peak flow rates for sanitary sewers shall be the sum of the peak dry weather flow rates plus all the inflow/infiltration contribution.

5.3 PIPE FLOW DESIGN

The following formulas are to be used for pipe flow design of gravity sewer and sewage force mains.

5.3.1 Gravity Sewers

Using Manning's formula:

The required minimum pipe diameter can be determined with the following equation, rounding up to the next full pipe size:

Where Q = Rate of flow in m^3/s
D = Internal pipe diameter (m)
n = Roughness Coefficient
= 0.011 for PVC pipe
= 0.013 for all other pipe materials
A = Flow area (m^2)
Rh = Hydraulic Radius (m) = Flow Area / Wetted Perimeter = D/4 for full flow
S = Pipe Slope (m/m)

5.3.2 Sewage Force Mains

Use Hazen-Williams formula:

Where Q = Rate of flow in L/s

C = Roughness coefficient = 130 for all mains

D = internal pipe diameter (m)

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

5.4 VELOCITY REQUIREMENTS

5.4.1 Minimum Velocity

Sanitary sewers to be designed to achieve the following minimum velocities for the peak dry weather flow for self-cleaning purposes.

Gravity sewers	V = 0.61 m/s
Force Mains	V = 0.9 m/s

5.4.2 Maximum Velocity

The maximum flow velocity shall be as follows to prevent undue turbulence, minimize odour and limit the erosive momentum effects of the flow.

Gravity sewers	V = 2.50 m/s
Force Mains	V = 2.50 m/s

The force main design shall account for the pump operation, sudden changes in velocity, pressure surges, and the method of restraining the pipe.

5.5 MINIMUM PIPE DIAMETER (GRAVITY SEWERS)

Gravity sewers shall be sized according to the design flow, subject to the following minimum sizing criteria:

Residential Areas	D = 200 mm
Commercial/Industrial Areas	D = 250 mm
Service Connections	D = 150 mm (single family dwelling)
	D = 150 mm (multi family, commercial and industrial areas)

5.6 MINIMUM PIPE GRADE

The following table lists the minimum pipe grades. Steeper grades are desirable.

Minimum Pipe Grades	
Internal Pipe Diameter mm	All Pipe Types % Grade
200	0.40*
250	0.28
300	0.22
375	0.15
450	0.12
525	0.10
600	0.08

***The percentage grade shall be increased on the pie servicing terminal manhole (manhole at the ed of the system) to 1.0%.

For curved sewers, the minimum grade shall be 50% greater than the above values.

5.7 MINIMUM DEPTH OF COVER

Minimum cover to be 3m to obvert and shall be of sufficient depth to satisfy the following criteria:

1. Permit service connections to basements.
2. Prevent freezing.
3. Clear other underground utilities.
4. Prevent damage from surface loading.

The alternate use of insulation in areas of predominantly rock may be approved on submission of an engineered design.

5.8 MANHOLE SPACING

1. Manholes shall be provided at the end of each line and at all changes in pipe sizes, grade and alignment.
2. The maximum allowable distances between manholes is to be 150m.
3. For curved sewers, manholes spacing shall be 90 m maximum for sewers 1200mm and smaller and 120 m for sewers larger than 1200 mm.
4. Sanitary manholes should not be located in or around trap lows. Sanitary manholes in trap lows areas must be sealed to reduce infiltration. Sanitary manholes within storm ponds are not permitted.

5.9 CURVED SEWERS

Maximum joint deflection shall be 50% or as recommended by pipe manufacturer. All sewers including curved sewers shall be aligned parallel to the road centreline. Minimum grade on curved sewers shall typically be 50% greater than aforementioned grades. This may be reduced if proper analysis has been completed and will be considered on a case-by-case basis.

5.10 HYDRAULIC LOSSES ACROSS MANHOLES

The following criteria shall be used:

1. Generally, for increasing pipe diameters, the crown of the downstream pipe shall match crown of the upstream pipe.
2. Minimum drop in invert levels across manholes
    a. Straight run - 0mm drop minimum
    b. Deflections up to 45°- 30mm drop minimum
    c. Deflections 45°to 90° - 60mm drop minimum
    d. Deflection greater than 90° shall be accommodated using two (2) or more manholes.
3. An external or internal drop pipe shall be installed when the drop between inverts exceeds 0.6 metres. Internal drop structures are preferred by the Municipality.
4. Internal drop manholes to have a cross connection in lieu of the tee connection or core a hole in the top of the tee with a 100mm diameter hole saw to facilitate flushing and maintenance from above.
5. Benching is to be provided in all manholes to provide a smooth transition from the inlet to the outlet, minimize hydraulic losses, and prevent debris from getting caught in the manhole. Refer to Standard Drawings.

5.11 SANITARY SEWER ALIGNMENT

1. Except in inverse-crowned roads and lanes, sanitary sewers should align with the center of the road crown to minimize infiltration through manhole lids. On divided arterial roadways, sanitary sewer should align with the center of one of the median lanes.
2. Separation of sewer main from watermains, storm sewers, and power/telephone/cable:
    a. Minimum 3.0m horizontally unless sewer depth requires increased spacing or in separate trench if 3m horizontal separation is not possible. The pipe separation can be reduced in a laneway with three (3) utilities, with Municipality approval.
    b. Minimum 0.5m vertical clearance above or below at crossings.
3. Service connections shall be in common trench with water service.

5.12 SERVICE CONNECTIONS

1. For service connection details, see Standard Drawings.
2. The minimum size of sanitary sewer service connections to a single-family dwelling shall be 150mm diameter.
3. Sanitary sewer service connections for commercial, industrial, institutional or multi-family areas, unless otherwise approved by the Municipality, will only be made after the service requirements have been determined and a permit, approving the installation, is issued by the Municipality.
    a. Notwithstanding the aforementioned, minimum size sanitary sewer service connection for these land uses shall not be less than 150mm.
4. All service connections are to connect to the mains in the front street or rear lane. Services connecting from the side yard PUL or MRs are not permitted.
5. Sanitary sewer service connections are to be designed as a single connection from the main to the property line in common trench with the water service.
6. If there is an easement for shallow utilities adjacent to the road right-of-way, the service connection shall be 1m beyond the limits of the shallow utility easement.
7. All 150mm sanitary sewer service connections should be designed with a 2.0% slope and with a minimum cover of 3.0 m at the property line. Where this cannot be achieved, the slope may be reduced to 1.0% if an inspection manhole is provided 0.5 m outside of the property line.
8. Sanitary sewer service connection materials shall be polyvinyl chloride (PVC) DR28 building service pipe conforming to CSA specification B182.2, latest revision thereof.

9. Sanitary service connections shall be made by the use of in-line tee and shall not be connected to manholes, except in the case of cul-de-sacs or major developments, where a manhole is required. Major developments include residential facilities with more than 40 units, and large commercial, institutional and industrial facilities. Manholes are required at the sewer main for all services larger than 150mm.
10. Pipe saddles or inserta tees shall be used to connect sanitary sewer services to mains in instances where retrofit work is undertaken.
11. Risers shall be employed where the service connection at the main is 4.0m or deeper.
12. An inspection manhole is required on all rural/urban commercial and industrial developments unless an exemption is granted by the Municipality. The inspection manhole to be installed on the private service line, not on a public main to allow for an uncontaminated test. The inspection manhole is to be located outside the property line on public property (ideally 0.5m off the property line and not situated in a driveway or public roadway) and must be accessible to Municipal staff. If the access point cannot be located on public property an easement is required to grant the Municipality access. Refer to Standard Drawings.
13. Residential Developments with an intensity equivalent of more than 40 residential units shall have an inspection manhole at the property line.
14. The end of the sewer service connection shall be adequately capped or plugged to prevent the entry of earth, water or other deleterious material into the pipe and shall be painted red. Furthermore, the end of the pipe shall be marked by a vertical, nominal size 2" x 4" timber set at the service invert and extending 1m above the top surface of the surrounding ground. The top 300mm of the exposed portion of this marker shall be painted red.
15. Always orient sanitary sewer service lateral between water and storm service laterals, as per Standard Drawings.
16. Residential lots zoned as single family and low-density multi-family (i.e. duplex / semi-detached) to be provided with one sanitary service connection per self-contained building.
17. Roof leaders and building foundation drains shall not be connected to the sanitary sewer system.
18. Hydrocarbon, grease and sediment traps shall be provided at all food processing establishments, shopping centres, service stations, car washes, hotels/motels, manufacturing, equipment servicing and cleaning facilities, institutions (churches, schools, etc.) and any other facility that is expected to discharge sediment and/or grease.
19. At the discretion of the Municipality, developments within Business Industrial land use zoning may require a form of pre-treatment upstream of the service connection prior to discharge into the sanitary collection system. Specific requirements will be determined at the Development Permit stage.

5.13 SERVICE ABANDONING

Where services are to be abandoned, they shall be abandoned with a manufactured compression type plug at the main. The service pipe shall be completely removed within the Municipality right-or-way unless approval from the Municipality is received to abandoned in place. If the service pipe is going to remain on private property, then install a manufactured compression type plug at property line.

5.14 SERVICE CONNECTION RECORD DRAWINGS

The Engineering Consultant shall provide detailed record drawings for all installed service connections with such drawings providing information related to pipe dimension, invert elevations at the property line, location of services relative to property line(s), insulation, manholes or watermain valves and lot number. This record drawing is required prior to issuing the Construction Completion Certification.

This information is also to be provided to the Municipality whenever there is a modification to an existing service.

5.15 SPECIAL CONSIDERATIONS

5.15.1 General Considerations

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

5.15.2 Cold Weather Consideration

Based on past experience on utility rehabilitation projects there have been issues with the sanitary system freezing the first year after construction. To help alleviate this problem measures illustrated in standard details 5-905 and 5-906 should be considered for all terminal sanitary manholes (manholes at the end of the system) or sanitary systems to known to have low flows on utility rehabilitation projects in the Municipality.

Projects located in Fort Chipewyan typically encounters shallow bedrock and therefore minimum pipe depths specified above are unattainable. The Engineering Consultant shall take into consideration the following during design and specifications for approval during the detailed engineering design stage:

1. All sanitary mains are to be insulated.
    a. UV stable high-density polyethylene jacket that is factory applied by continuous extrusion and specially formulated for superior cold weather performance (to –45^{o}C) and below grade applications.
    b. Minimum thickness of insulation on any side of pipe at any location is to be 50mm.
    c. Remove insulation for connection to manholes. Any exposed pipe outside of the manhole is to be reinsulated.

5.16 PIPE MATERIALS AND SPECIFICATIONS

Pipe materials and specifications shall be selected with the following information as a guide:

5.16.1 Gravity Sewers

Acceptable Pipe Materials for Gravity Sewers		
Preferred Materials	General Size Range mm	Specification
Polyvinyl Chloride (PVC)	100 to 1500	ASTM D3034, DR 35 (CSA B182.2)
Reinforced Concrete	525 and larger	CAN/CSA A257.2-03, ASTM C76M Class III min.
Polyethylene (PE)*	100 and larger	CGSB-41-GP-25M
Casing Pipe-Steel	pipe runners + 40 mm	CAN3-2245.1, Grade 241**

* on a project specific basis only ** or higher as required by crossing owner

5.16.2 Force Mains

Acceptable Pipe Materials for Sewer Force Main		
Preferred Materials	General Size Range mm	Specification
Polyvinyl Chloride (PVC) (White in colour)	100 to 900	AWWA C900, DR18 or approved
High Density Polyethylene (HDPE)	100 and larger	AWWA C906, DR-11 or approved
*Steel (Yellow Jacket, epoxy lined)	100 and larger	ASTM A53, Grade B, standard wall or approved

* on a project specific basis only

Alternate materials will be evaluated based on individual presentations (justification for deviation) by the Engineering Consultant to the Municipality.

5.16.3 Manhole Details

1. For manhole details, see Standard Drawings.
2. For manhole abandonment, plug all pipes with non-shrink grout, remove and dispose of manhole to 1.0m below ground and fill with fillcrete.
3. Manholes shall be manufactured using sulphate resistant Type HS cement.
4. Manhole sections shall be precast reinforced concrete sections conforming to ASTM C478M and CSA A257.4-03.
5. Tee Riser manholes shall conform to CSA 257.2-03/ASTM C76M (pipe components) and CSA A257.4-03/ASTM C478M for the manhole riser component.
6. Manhole steps shall be standard safety type, aluminium forged of 6061-76 alloy having a minimum tensile strength of 200 MPA.
7. All joints shall be sealed with rubber gaskets conforming to ASTM C443M and grouted inside and outside with non-shrink grout.
8. The entire outer surface of all sanitary precast concrete manholes shall be coated with two (2) coats of an approved bitumastic coating. Coating shall be Koppers 300 M Epoxy or Pennsbury 32-B-4 Epoxy, Sealmastic 501, or approved equal.
9. In areas where high water table is above the bottom of the manhole or underground concrete vault structures, the structure is to have both a concrete waterproofing admixture added to the mix design and a fully sealed exterior waterproofing membrane covering the full exterior including under the base slab. Shop drawings are to be provided to the Municipality for review and approval prior to installation. To further reduce chance of infiltration, consideration shall be made to fastening the barrels of the structure together to reduce lift from frost action. Buoyancy proofing may also be required.
10. Manholes shall be fitted with the appropriate cast iron frame and cover conforming to AASHTO-M-306-10 as shown on the Standard Drawings.
11. In landscaped or undeveloped areas, a double-ratchet locking frame and cover (F-39) may be required at the direction of the Municipality during the detailed design stage. Also to prevent the manhole frame from sliding off the backfill is to be placed around the flange frame to match to the top of the rim elevation. Refer to Standard Drawing detail 5-300.
12. Where manholes are to be installed in paved areas, floating manhole covers (F-80) must be used. Refer to Standard Drawing detail 5-301.
13. All castings shall be true to form and dimensions, free from faults, sponginess, cracks, blowholes or other defects affecting their strength.
14. Pre-benched manhole bases shall be used wherever possible with pre-cored connection holes and watertight Duraseal or G-Loc joints or approved equal. Refer to Standard Drawing details for benching requirements.

15. Aluminium safety platforms shall be required in all manholes with a depth greater than 6m.
16. Sanitary manhole covers to be marked “SANITARY”. (Storm manhole covers to be marked “STORM”.)

5.16.4 Bedding Materials

For bedding material gradation and specification refer the Standard Drawings & the Standard Construction Specifications.

5.16.5 Trench Sections

For trenching and bedding details, refer to the Standard Drawings.

5.16.6 Corrosion Protection

All concrete used in a sanitary sewer system shall be made of sulphate resistant concrete.

A specialist’s evaluation of cathodic protection requirements shall be supplied to Municipality for all steel applications.

5.17 PRIVATE SEWAGE SYSTEMS

1. All installations of private sewage systems shall be in accordance with the Safety Codes Council, Alberta Private Sewage System, and 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:
    - Is maintained. Is operated within the design parameters of the system. Effectively treats and disposes of the sewage and effluent.
    - Where sewage holding tanks are utilized, the minimum tank size shall be 9,000 litres (2,000 gallons).
4. Access road/area to tank shall be designed to accommodate sewage collection truck wheel loads. Refer to Section 4.0 Transportation, Roads and Sidewalks.
5. All private sewage holding tanks shall be within 2-10m of the access road for vac truck access.
6. Where disposal fields are utilized, soil percolation or alternative tests shall be performed in accordance with Alberta Environment Protection Standards to demonstrate the suitability for on-site disposal.

5.18 LOW PRESSURE SEWER SYSTEM

5.18.1 General

These Standards cover the design and construction of low-pressure sewer force main and accessories to be built or re-built in the Regional Municipality of Wood Buffalo (Municipality). Standard Drawings relating to low pressure sewer force main construction are provided at the end of this section.

These Standards provide the minimum design criteria and general construction requirements and construction materials for consulting engineers to use in their preparation of specifications and drawings. These Standards may be exceeded if warranted by the design consultant. Good engineering practices and designs must prevail on all projects.

5.18.2 Requirements

The Regional Municipality of Wood Buffalo and/or their engineering representative must approve the use of a low-pressure sewer system, and this system must conform to the Sanitary Sewer Master Plan. A low-pressure sewer system will only be considered under the following conditions:

- Sanitary sewer connection of proposed lots by gravity into the existing system is not possible because the proposed lots are lower in elevation than the sewer tie-in point.
- Open cut excavation depths in excess of 4.5m would be required to connect proposed lots by gravity.
- Rural lots are too large and/or spread out to allow sanitary service connections by gravity.
- Rural lot soil conditions are not suitable for on-site ground sewage disposal system.

5.18.3 Design Flow

The system shall be designed 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 the following table. The design flow can then be determined as the product of the maximum number of pumps in operation simultaneously, and the capacity of the average pump within the system.

Low Pressure Sewer System Design Flow	
Total Number of Pumps Connected to System	Maximum Pumps Operating Simultaneously
1	1
2 -3	2
4 – 9	3
10 – 18	4
19 – 30	5
31 – 50	6
51 – 80	7
81 – 113	8
114 – 146	9

Low Pressure Sewer System Design Flow	
Total Number of Pumps Connected to System	Maximum Pumps Operating Simultaneously
147 – 179	10
180 – 212	11
213 – 245	12
246 – 278	13
279 - 311	14
312 – 344	15

Assume zero infiltration and inflow for a closed system.

5.18.4 Low Pressure Sewage Pipe Flow Formula

Use Hazen-Williams formula:
Where Q = Rate of Flow in L/s
C = Roughness coefficient = 130 for all mains
D = internal pipe diameter (m)
S = Slope of hydraulic grade line (m/m)

5.18.5 Design Velocity

Minimum Velocity: 0.9 m/s
Maximum Velocity: 1.5 m/s

5.18.6 Minimum Force Main Pipe Diameter

Service Connections	D = 38mm (single family dwelling)
Force Main	D = 100mm (Note: 50 mm and 75 mm may be allowed at upstream ends of systems, as required to meet the minimum velocity per above)
Commercial/Industrial Area	D = as required to maintain minimum velocity of 0.9m/s

5.18.7 Minimum Depth of Cover

Minimum cover to be 3 m to pipe obvert and shall be of sufficient depth to satisfy the following criteria:

- Permit service connections to basements
- Prevent freezing
- Clear other underground utilities
- Prevent damage from surface loading

The alternate use of insulation in areas of predominantly rock may be approved on submission of an engineered design. Further details are shown on the Standard Drawings.

5.18.8 Isolation Valves

Isolation valves are required along the pipeline as a means to isolate a section for servicing, repair or regular maintenance. The valve should be installed at intersections, where each branch can be isolated.

Valves are to be plug valve or ball valve, equipped with a gear actuator and non-rising stem to be operable from ground level. See the Standard Drawings for further details.

5.18.9 Flush Points

Flush points are recommended at the end of every branch and also at intermediate points on long stretches of pipe. Typical flush point details are provided in the Standard Drawings.

5.18.10 Combination Air/Vacuum Valves

Combination air/vacuum valves are required at the sewer high points or wherever needed to release entrapped air during normal operation of a vacuum when the pump stops or the sewer is drained. See the Standard Drawings for further details.

5.18.11 Low Pressure Sewer Location

Separation of low-pressure sewer from storm sewer, watermains, and power/telephone cable:

- Minimum 3.0m horizontally unless sewer depth requires increased spacing.
- Minimum 0.5m vertical clearance above or below at crossings.

Service connections: in common trench with water and storm services. Preferably service laterals will be located under landscape areas at property lines. For further details, see the Standard Drawings.

5.18.12 Servicing Connections

1. For service connection details, see Standard Drawings.
2. The minimum size of low-pressure sewer service connections to a single family dwelling shall be 38mm diameter.
3. Low pressure sewer service connections for commercial, industrial, multi-family, or institutional areas, unless otherwise approved by the Municipality, shall only be made after the service requirements have been determined and a permit, approving the installation, is issued by the Municipality.
4. Low pressure sewer service connections shall be designed as a single connection from the main to the property line in common trench with the water service and storm service (if necessary).
5. If there is an easement for shallow utilities adjacent to the road right-of-way, the low-pressure sewer service connection shall be 1m beyond the limits of the shallow utility easement.
6. All low-pressure sewer service connections shall provide a minimum of 3m cover at property line.

7. Low Pressure sewer service connection materials shall be high-density polyethylene (HDPE) DR-11 (160 psi) building service pipe conforming to CSA specifications B137.1, latest revision thereof, based on IPS outside diameter sizing.
8. Low pressure sewer service connections shall be made by the use of in-line service tee. Stainless steel pipe saddles shall be used to connect low pressure sewer services to force mains in instances where retrofit work is undertaken.
9. A curb stop and service box located 0.30m inside the road right-of-way is required on all low pressure sewer service connections. The Municipality will also provide a check valve on all low-pressure sewer service connections which is located on the property line of the road right-of-way.
10. The top cap of the curb stop shall have “SEWER” marked into the casting.
11. The end of the low-pressure sewer service connection shall be capped or plugged to prevent the entry of earth, water or other deleterious material into the pipe.
12. Furthermore, the end of the pipe shall be marked by a vertical, nominal size 2” x 4” timber set at the service invert and extending 1m above the top surface of the surrounding ground. The top 300mm of the exposed portion of this mark shall be painted red.
13. Roof leaders and building foundation drains shall not be connected to the low pressure sewer system.
14. Always orient low pressure sewer service lateral between the water and storm service laterals, as per the Standard Detail Drawings.

5.18.13 Gravity/Low Pressure Standards

All of the other standard gravity sewer requirements listed previously in Section 5 also apply to the rural low pressure sewer systems.

5.19 SEPTIC TANK EFFLUENT PUMPING (STEP) SEWER SERVICE

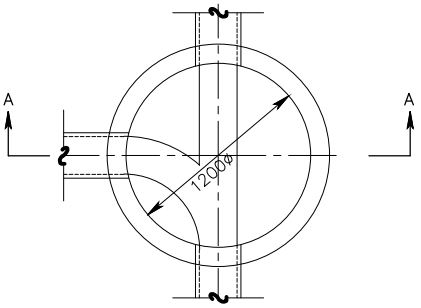
Refer to the Rural Water and Sanitary (RWSS) Servicing Guidelines at *Rural Water & Sewer Service - Regional Municipality of Wood Buffalo (rmwb.ca)* for service connection details of Septic Tank Effluent Pumping (STEP) system. These details are provided as a guideline for property owners to complete the on-property installation of a STEP system and service tie-in component for connection to the low-pressure sewer force main. Any work completed on private property by the owner is the sole responsibility of the property owner.

5.20 STANDARD DRAWINGS – SANITARY SEWER SYSTEM

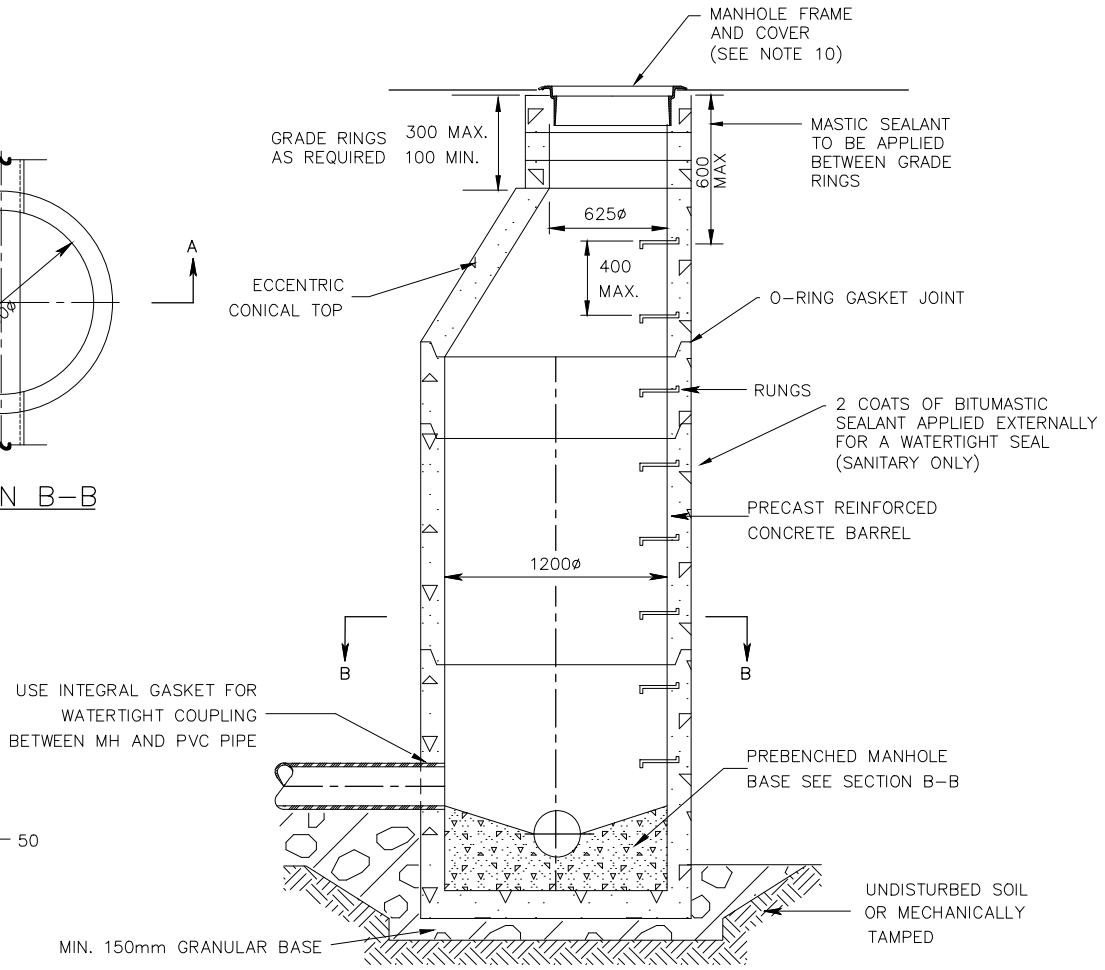
Dwg. No.	Title
5-100	Precast Manhole for Pipes up to 500mm Dia.
5-101	Precast Manhole for Pipes Larger than 500mm Dia. up to 1200mm Dia.
5-102	Manhole Tee for 1200mm or Larger Pipe
5-103	Typical Perched Manhole
5-104	Benching Standard for Sewer Manholes
5-200	External Drop Manhole
5-201	Internal Drop Manhole
5-300	Standard Manhole Frame and Cover
5-301	Floating Type Manhole Frame and Cover
5-400	Safety Platform
5-500	Non-Riser Type Sanitary Service Connection
5-501	Riser Type Sanitary Service Connection
5-502	PVC Sanitary Service Saddle Connection (For Retro Fit Only)
5-503	PVC Sanitary Service Tee Connection
5-504	Multi Serviced Lots
5-505	Service Connection Details for Sewer Manhole in Cul-De-Sac
5-506	Sanitary Sewer Service Inspection/Sampling Manhole
5-600	Pipe Zone Bedding Details (Class A, A-1, B)
5-601	Pipe Zone Bedding Details (Class C, C-1, D)
5-700	Class I Trench Backfill
5-701	Class II Trench Backfill
5-702	Class III Trench Backfill
5-703	Class IV Trench Backfill
5-704	Trench Backfill for Emergency Repairs in Paved Areas
5-705	Trench Backfill for Emergency Repairs in Grassed or Sodded Areas
5-800	Pipe Support - Type I
5-801	Pipe Support - Type II
5-802	Pipe Support - Type III
5-812	Warning Sewer Line

Dwg. No.	Title
5-905	Typical Insulated Precast Manhole
5-906	Enhanced Frost Cover Detail
5-907	Typical Frost Cover Detail
5-908	Insulated Pipe Zone Detail
5-910	Low Pressure Sewer Service Connection Detail
5-911	Septic Tank Effluent Pump Station for Low Pressure Sewer

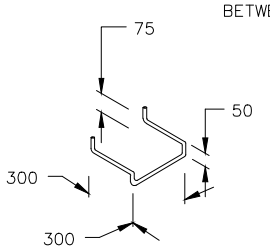
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DATE.: JAN. 2021	REV: 5



SECTION B–B



SECTION A–A



20mm ALUMINUM FORGED
MANHOLE STEPS
OR AS PER MANUFACTURER
SPECIFICATION

NOTES:

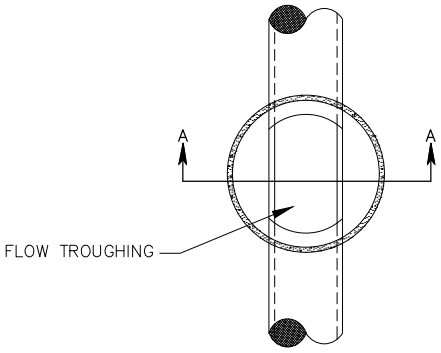
(1) PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT A.S.T.M. C478M STANDARDS.
(2) SPECIAL BASE DESIGN REQUIRED FOR DEPTHS OVER 9.0m.
(3) CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
CONTINUE MAIN PIPE WHERE POSSIBLE.
(4) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO MH COVER EXCEEDS 2m.
(5) VERTICAL SIDE OF CONICAL MH ON UPSTREAM SIDE.
(6) INSTALL SAFETY PLATFORMS FOR ALL MH OVER 6.0m DEEP, LOCATED 2m ABOVE PIPE OBVERT.
REFER TO DRAWING NO 5–400
(7) MANHOLE FRAME AND COVER TO BE AS PER STANDARD DWG. NO. 5–300, 5–301.
(8) BENCHING CONCRETE SHALL BE A MINIMUM OF 30MPa COMPRESSIVE STRENGTH, TYPE HS.
(9) RETROFIT RUNGS TO BE EPOXIED IN PLACE (NO PLASTIC SLEEVES)
(10) F–80 FRAME AND COVER FOR ASPHALT AREAS.
F–39 FRAME AND COVER FOR LANDSCAPED AREAS

REGIONAL MUNICIPALITY OF WOOD BUFFALO

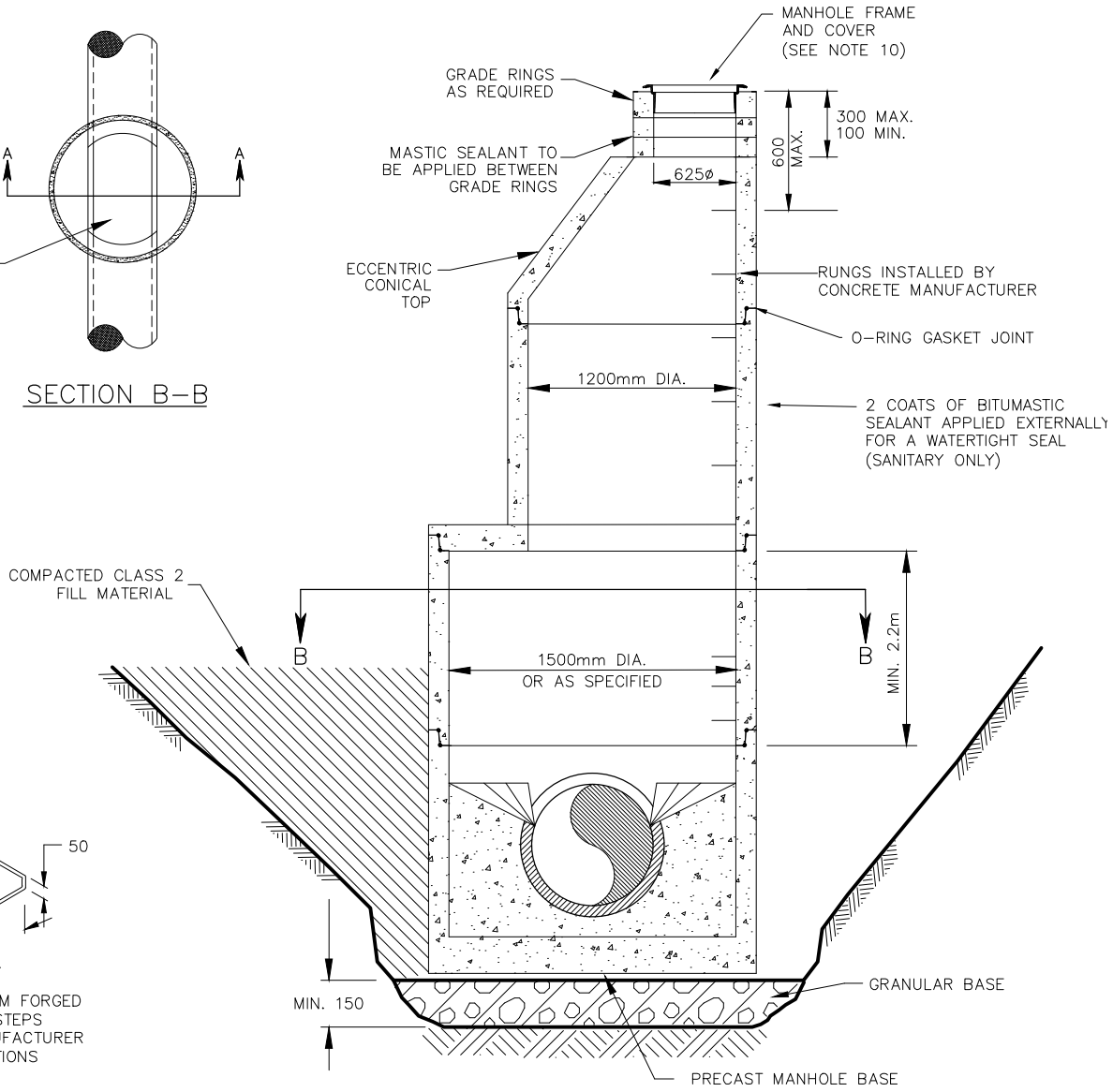
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Date: Jan 28, 2021
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Xrefs:

STANDARD DETAIL:	5-101
DATE.: JAN. 2021	REV: 4



SECTION B–B



SECTION A–A

NOTES:

(1) PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT A.S.T.M. C478M STANDARDS.

(2) SPECIAL BASE DESIGN REQUIRED FOR DEPTHS OVER 9.0m.

(3) CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
CONTINUE MAIN PIPE WHERE POSSIBLE.

(4) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO MH COVER EXCEEDS 2m.

(5) VERTICAL SIDE OF CONICAL MH ON UPSTREAM SIDE.

(6) INSTALL SAFETY PLATFORMS FOR ALL MH OVER 6.0m DEEP, LOCATED 2m ABOVE PIPE OBVERT.
REFER TO DRAWING NO 5–400

(7) MANHOLE FRAME AND COVER TO BE AS PER STANDARD DWG. NO. 5–300, 5–301.

(8) BENCHING CONCRETE SHALL BE A MINIMUM OF 30MPa COMPRESSIVE STRENGTH, TYPE HS.

(9) RETROFIT RUNGS TO BE EPOXIED IN PLACE (NO PLASTIC SLEEVES)

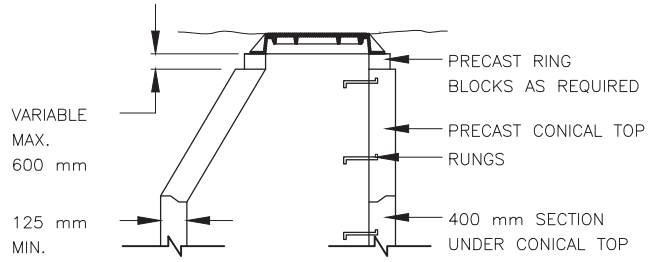
(10) F–80 FRAME AND COVER FOR ASPHALT AREAS.
F–39 FRAME AND COVER FOR LANDSCAPED AREAS

REGIONAL MUNICIPALITY OF WOOD BUFFALO

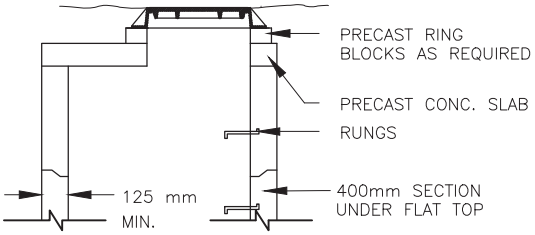
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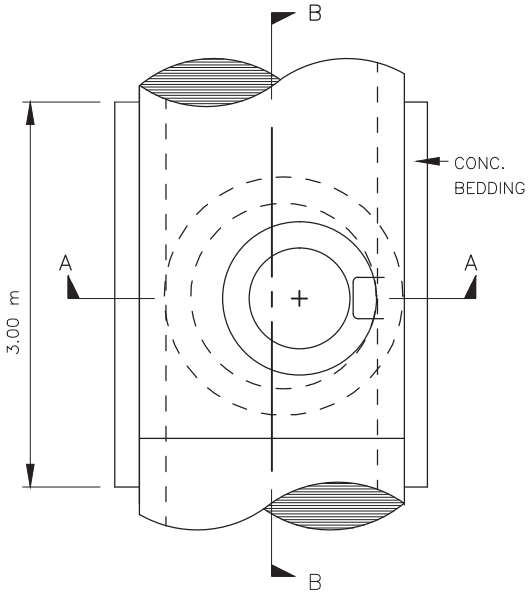
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DATE: OCT 2016	REV: 2



CONICAL TOP



FLAT TOP



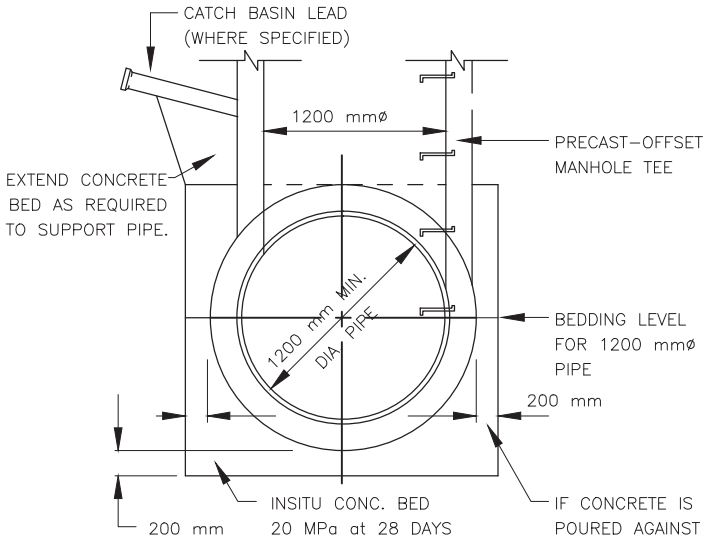
PLAN

NOTES:

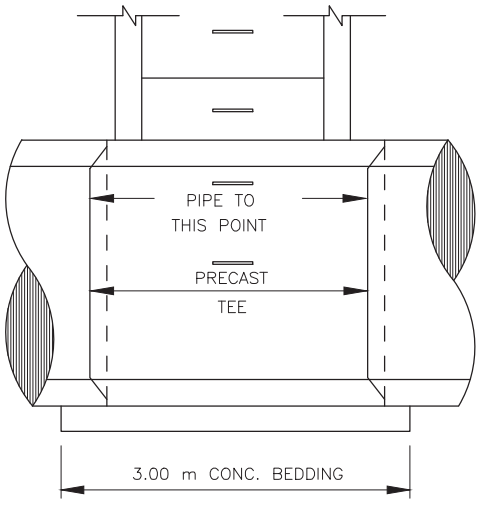
(1) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO M.H. COVER EXCEEDS 2.0 m.

(2) PRECAST CONICAL TOPS OR FLAT PRECAST SLABS SHALL BE 300 mm BELOW FUTURE ROAD GRADE. THE BALANCE OF THE DISTANCE SHALL BE MADE UP WITH PRECAST RINGS ALTERNATIVELY 400 mm REMOVABLE M.H. SECTION TO BE USED.

(3) CONTRACTOR TO PROVIDE SHOP DRAWINGS.



SECTION A–A

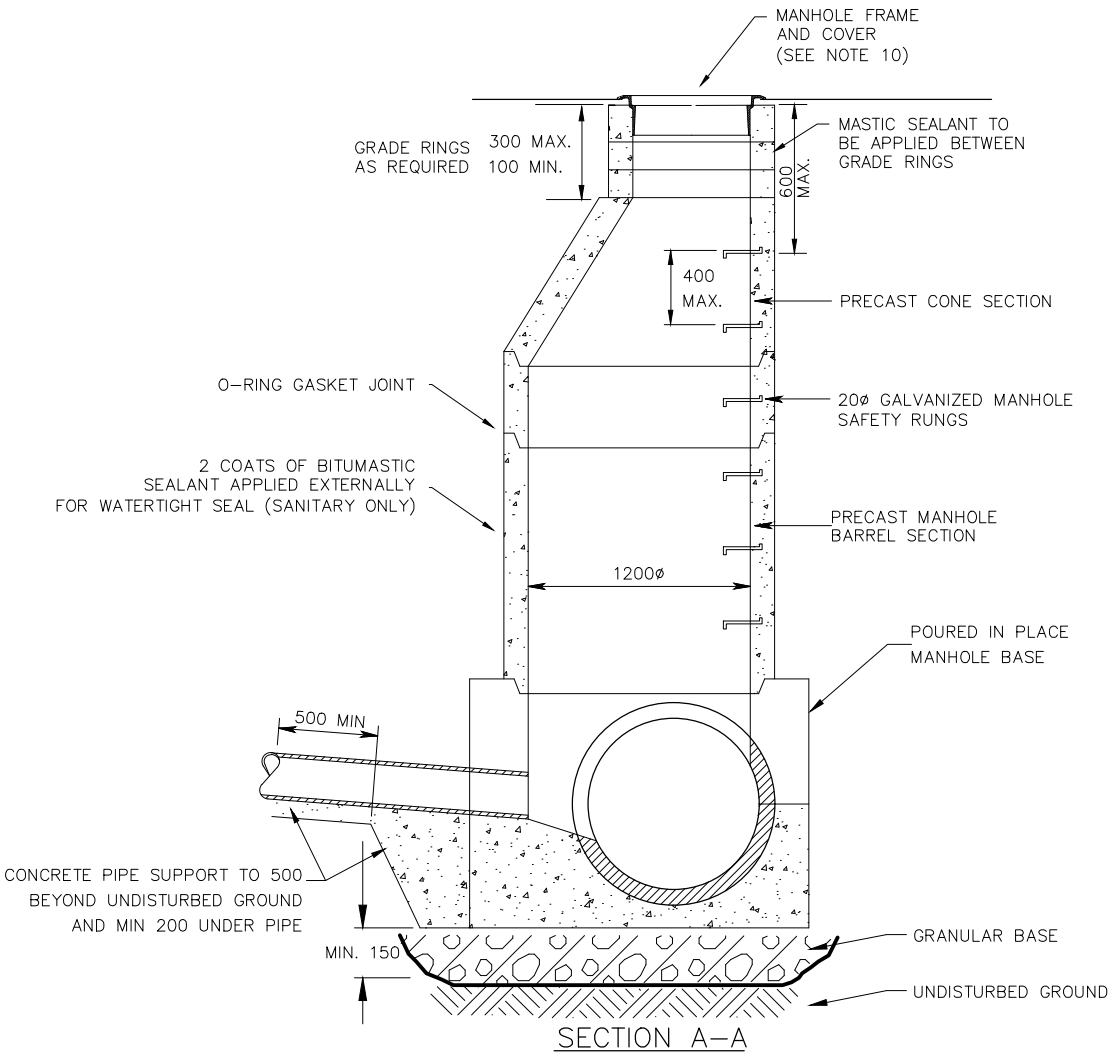


SECTION B–B

REGIONAL MUNICIPALITY OF WOOD BUFFALO

MANHOLE TEE FOR 1200mm OR LARGER PIPE

STANDARD DETAIL:	5-103
DATE.: JAN. 2021	REV: 1



SECTION A–A

NOTES:

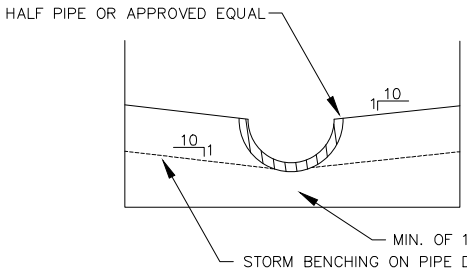
(1) PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT A.S.T.M. C478M STANDARDS.
(2) SPECIAL BASE DESIGN REQUIRED FOR DEPTHS OVER 9.0m.
(3) CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
CONTINUE MAIN PIPE WHERE POSSIBLE.
(4) CONICAL TOP TO BE USED WHERE DISTANCE FROM BENCH TO MH COVER EXCEEDS 2m.
(5) VERTICAL SIDE OF CONICAL MH ON UPSTREAM SIDE.
(6) INSTALL SAFETY PLATFORMS FOR ALL MH OVER 6.0m DEEP, LOCATED 2m ABOVE PIPE OBVERT.
REFER TO DRAWING NO 5–400
(7) MANHOLE FRAME AND COVER TO BE AS PER STANDARD DWG. NO. 5–300, 5–301.
(8) BENCHING CONCRETE SHALL BE A MINIMUM OF 30MPa COMPRESSIVE STRENGTH, TYPE HS.
(9) RETROFIT RUNGS TO BE EPOXIED IN PLACE (NO PLASTIC SLEEVES)
(10) F–80 FRAME AND COVER FOR ASPHALT AREAS.
F–39 FRAME AND COVER FOR LANDSCAPED AREAS
(11) PIPE DIAMETER 600 MIN AND 1200 MAX WHEN USING PERCHED MANHOLE BASE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL PERCHED MANHOLE

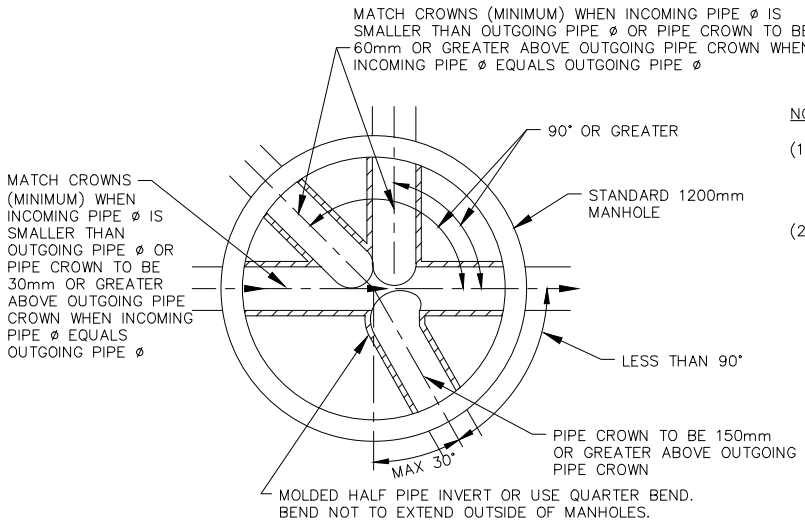
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STANDARD DETAIL:	5-104
DATE.: JAN. 2021	REV: 0



NOTES:

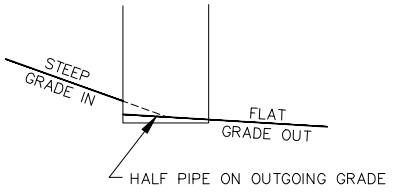
(1) STANDARD SIDE SLOPE OF BENCHING 10:1 FROM HALFWAY UP PIPE IN ALL CASES.
(2) ALL CONCRETE SHALL BE 30MPa IN 28 DAYS.
(3) SANITARY – HALF PIPE OR APPROVED EQUAL SHALL FORM THE INVERT.
(4) STORM – SAME BENCHING AS SANITARY FOR PIPE DIAMETER LESS THAN OR EQUAL TO 600mm.
(5) ALL CHANNELS ARE TO BE SIZE ON SIZE, 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 FILLED WITH CONCRETE.



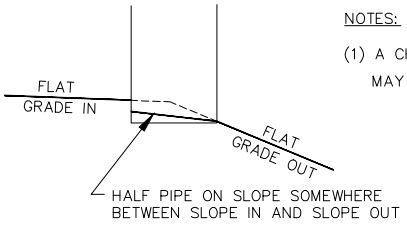
NOTES:

(1) LOWEST OUTGOING PIPE TO GO STRAIGHT THROUGH MANHOLE WITH HALF PIPE TO OPPOSITE WALL IN ALL CASES INCLUDING DEAD END MANHOLE.
(2) WHERE THE ANGLE BETWEEN THE DIRECTION OF FLOW IN THE INCOMING AND OUTGOING PIPES IS 90° OR GREATER, THEN THE INCOMING PIPE MUST COME STRAIGHT TO INTERSECT WITH THE OUTGOING PIPE WITH A HALF PIPE SET IN MAIN BENCHING; WHERE THIS ANGLE IS LESS THAT 90° THEN A MIN OF 150mm DROP IS REQUIRED BETWEEN INCOMING AND OUTGOING INVERTS AND MUST BE APPROVED BY THE MUNICIPALITY.

CASE I

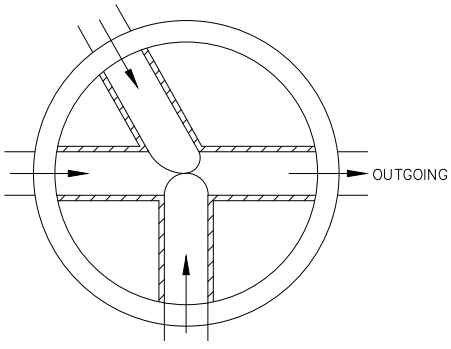


CASE II



NOTES:

(1) A CHANGE IN GRADE BETWEEN INCOMING AND OUTGOING PIPES MAY BE ACCOMPLISHED AS SHOWN IN CASE I AND II.



NOTES:

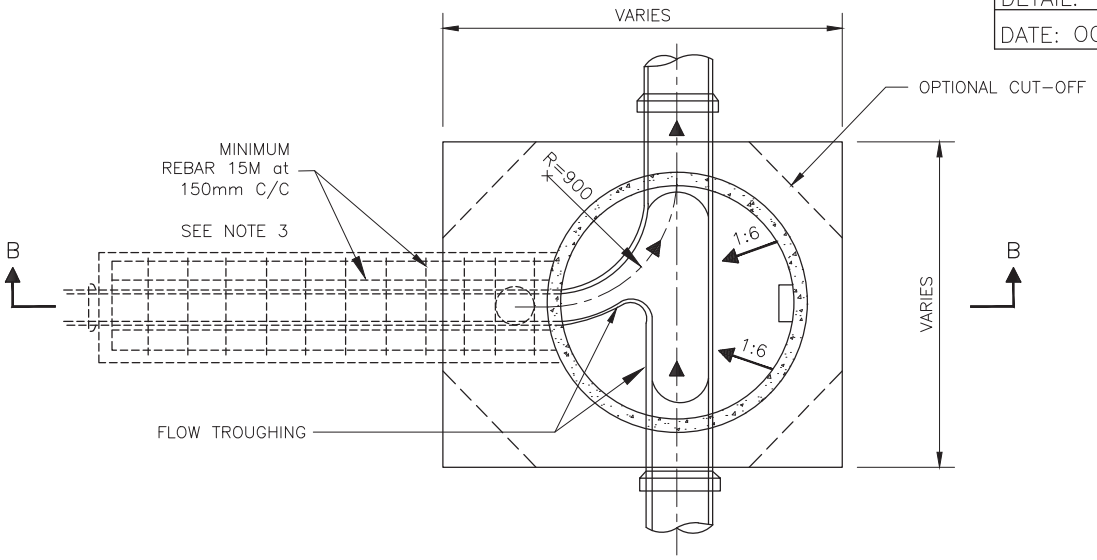
(1) USE SANITARY DROP MANHOLE WHEN INCOMING PIPE INVERT IS 600mm OR GREATER ABOVE OUTGOING PIPE CENTERLINE.
(2) HAVE INLET FLOW DROP INTO HALF PIPE SET IN MAIN BENCHING AND RUNNING STRAIGHT TO INTERSECTION WITH OUTGOING PIPE.
(3) HALF PIPE STRAIGHT THROUGH ON OUTGOING SLOPE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

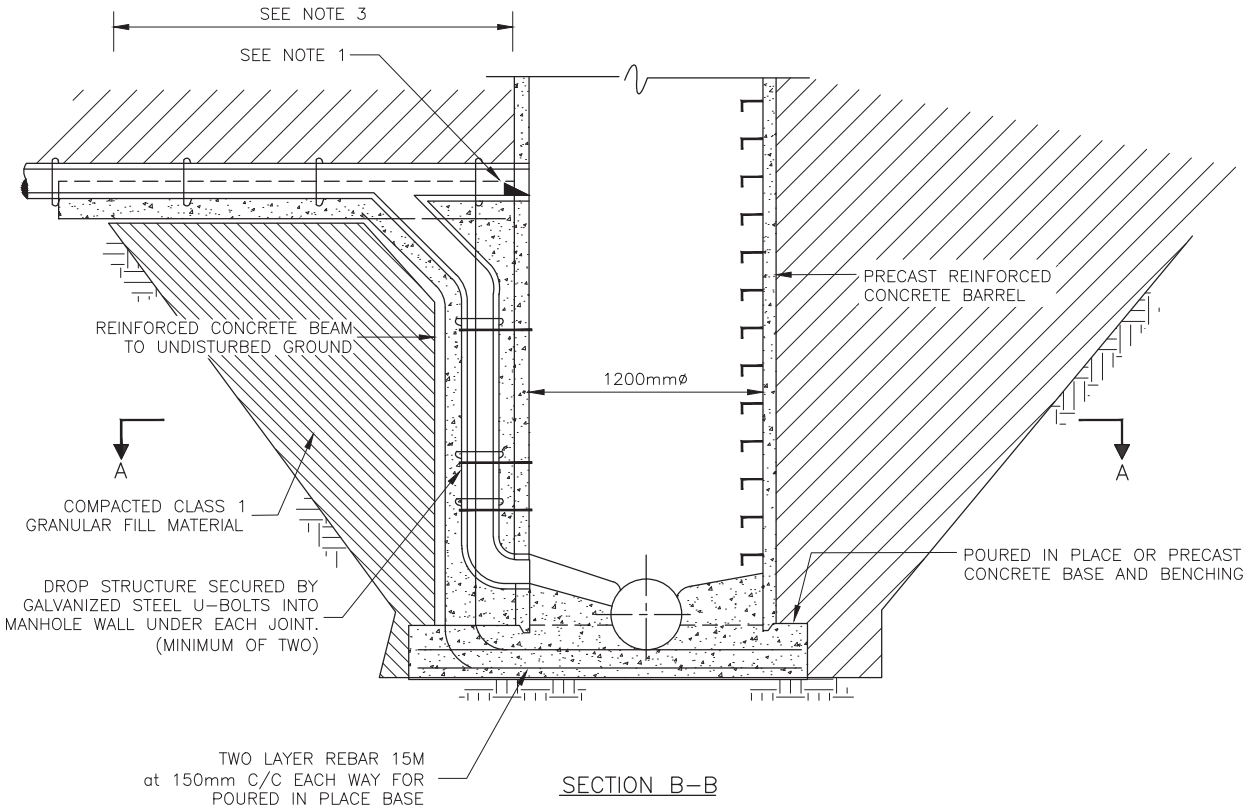
BENCHING STANDARD FOR SEWER MANHOLES

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Xrefs:

STANDARD DETAIL:	5-200
DATE: OCT 2016	REV: 4



PLAN A–A



SECTION B–B

NOTES:

(1) FOR SEWERS LARGER THAN 300mm, A 1/2 PIPE DIA. POURED CONCRETE STOPPER TO BE INSERTED IN THE INVERT OF THE MAIN LINE AS INDICATED.

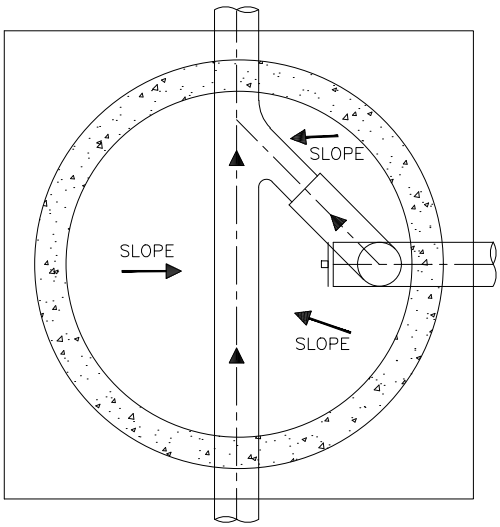
(2) CONCRETE SHALL BE A MINIMUM OF 30MPa COMPRESSIVE STRENGTH, TYPE HS.

(3) WHERE SPAN EXCEEDS 4.5m CONSTRUCT 300mm DIA. CONCRETE COLUMNS (SONOTUBES) SUPPORTS AT 3.5m O.C.

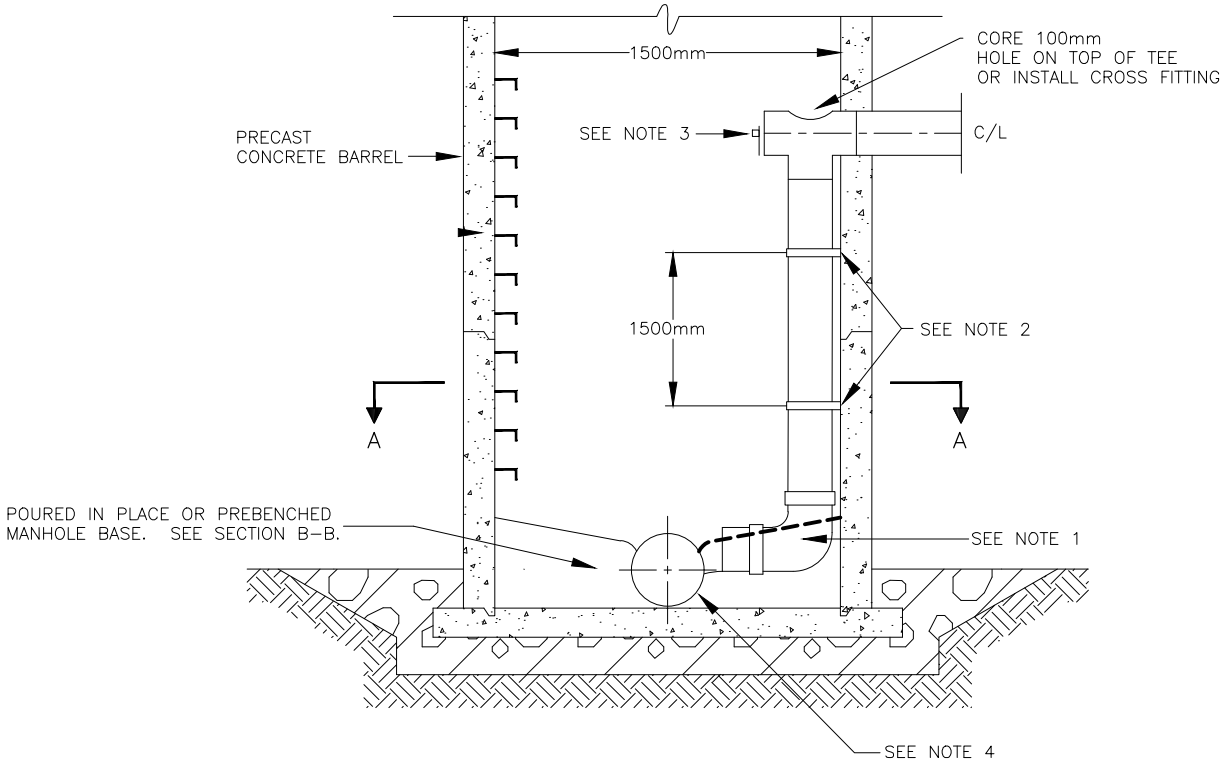
REGIONAL MUNICIPALITY OF WOOD BUFFALO

EXTERNAL DROP MANHOLE

STANDARD DETAIL:	5-201
DATE.: JAN. 2021	REV:5



SECTION A–A



NOTES:

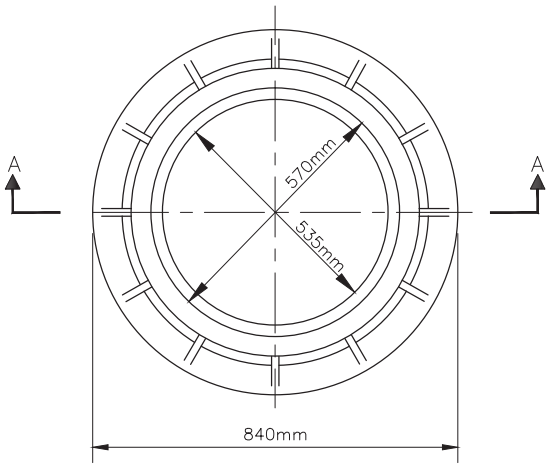
(1) ELBOW EMBEDDED IN CONCRETE AT 45° IN FLOW DIRECTION OF SEWER.
(2) CLAMPING BRACKETS (MIN 2) IS TO BE STAINLESS STEEL (TYPE 304 – 11 GAUGE) AND SECURED TO THE STRUCTURE WITH TWO STAINLESS STEEL BOLTS.
(3) 1/2 CAP, SECURED WITH SS 304 SCREWS AT 3,6 AND 9 O'CLOCK, IMPEDING WATER FROM FLOWING OUT END OF TEE BUT NOT OBSTRUCTING FLOW IN CASE A BLOCKAGE.
(4) DROP CONNECTION INVERT WILL MATCH THE SPRING LINE OF EXIT PIPE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

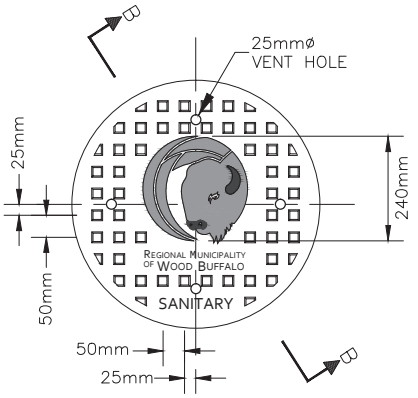
INTERNAL DROP MANHOLE

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Xrefs:

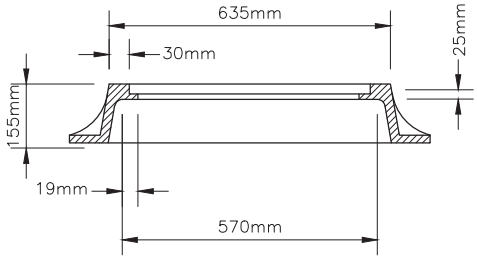
STANDARD DETAIL:	5-300
DATE: FEB 2017	REV: 6



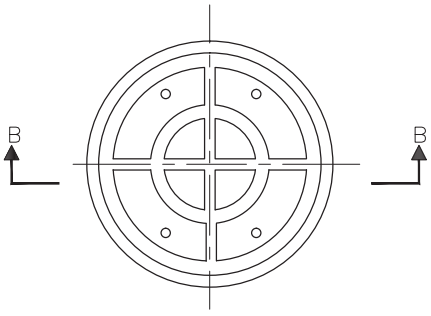
FRAME PLAN



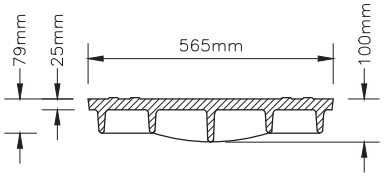
COVER SURFACE PLAN



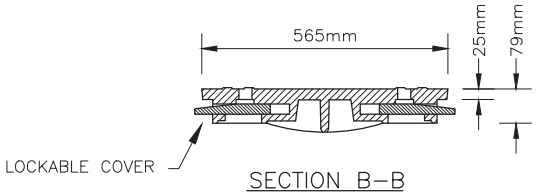
SECTION A–A



COVER STRUCTURE PLAN



SECTION B–B



SECTION B–B

NOTES:

(1) COVER LETTER HEIGHT – 25mm LETTER TYPE – CORBEL

(2) CASTING SHALL BE TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS AND EXCESSIVE SHRINKAGE.

(3) CASTING SURFACES SHALL BE FREE FROM BURNT ON SAND AND SHALL BE SMOOTH

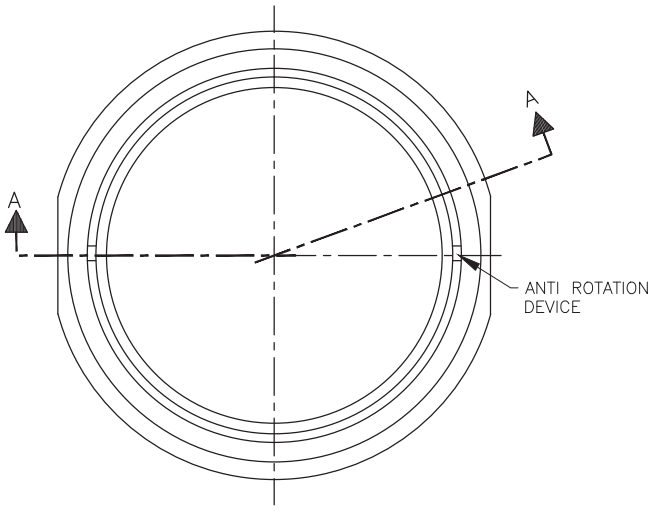
(4) CAST ON PIECES SUCH AS RUNNERS AND FINS SHALL BE REMOVED.

(5) TO BE USED IN OFF ROAD LANDSCAPED AREAS ONLY

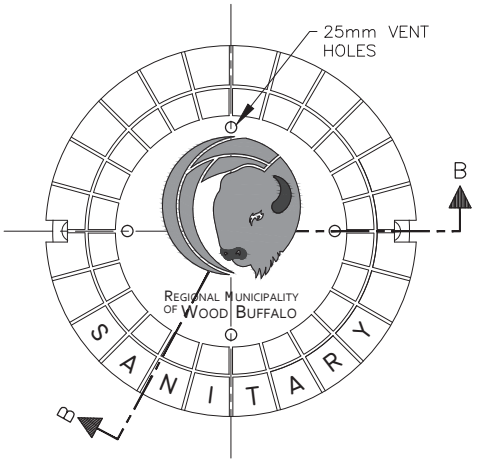
REGIONAL MUNICIPALITY OF WOOD BUFFALO

STANDARD MANHOLE FRAME AND COVER

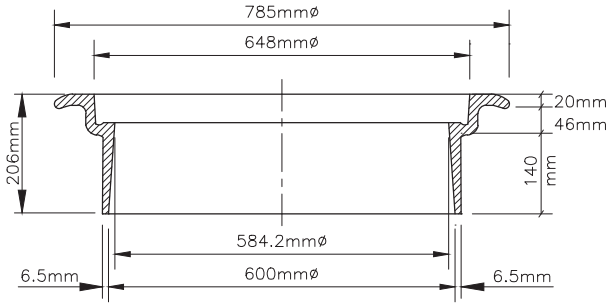
STANDARD DETAIL:	5-301
DATE: FEB 2017	REV: 5



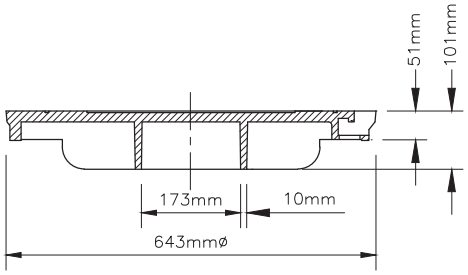
FRAME–PLAN



COVER–PLAN



SECTION A–A



SECTION B–B

NOTES:

(1) COVER LETTER HEIGHT – 30mm LETTER TYPE – CORBEL.

(2) CASTINGS SHALL BE TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS, SHRINKAGE AND BEARING SURFACE SHALL BE MACHINED TO PREVENT ROCKING.

(3) USE FOR ALL ROADWAY, GRAVEL AND SIDEWALK APPLICATIONS IN GRAVEL GROUT BETWEEN LIP OF FRAME AND GRADE RING.

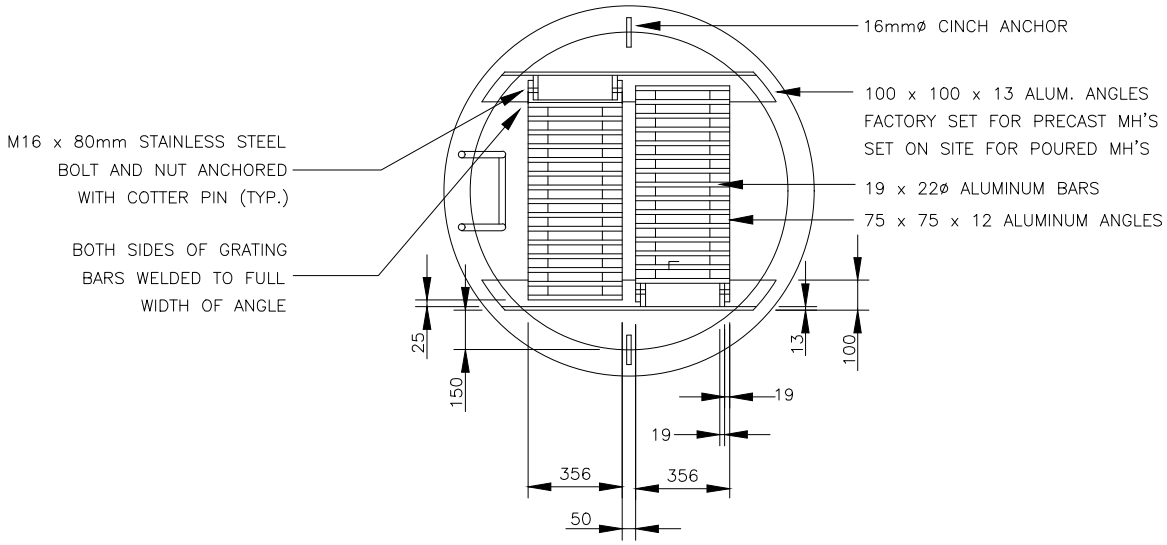
(4) NOT FOR USE IN LANDSCAPED AREAS.

(5) MANHOLE COVER TO BE LABELLED AS BELOW, AS APPROPRIATE
SANITARY SEWER
STORM SEWER
WATER UTILITY

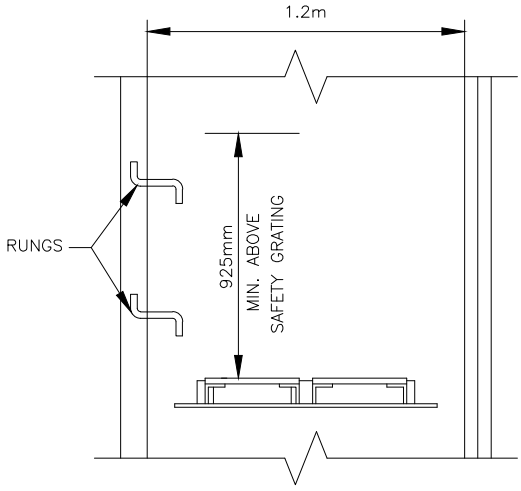
REGIONAL MUNICIPALITY OF WOOD BUFFALO

FLOATING TYPE MANHOLE FRAME AND COVER

STANDARD DETAIL:	5-400
DATE.: JAN. 2021	REV: 4



PLAN



ELEVATION

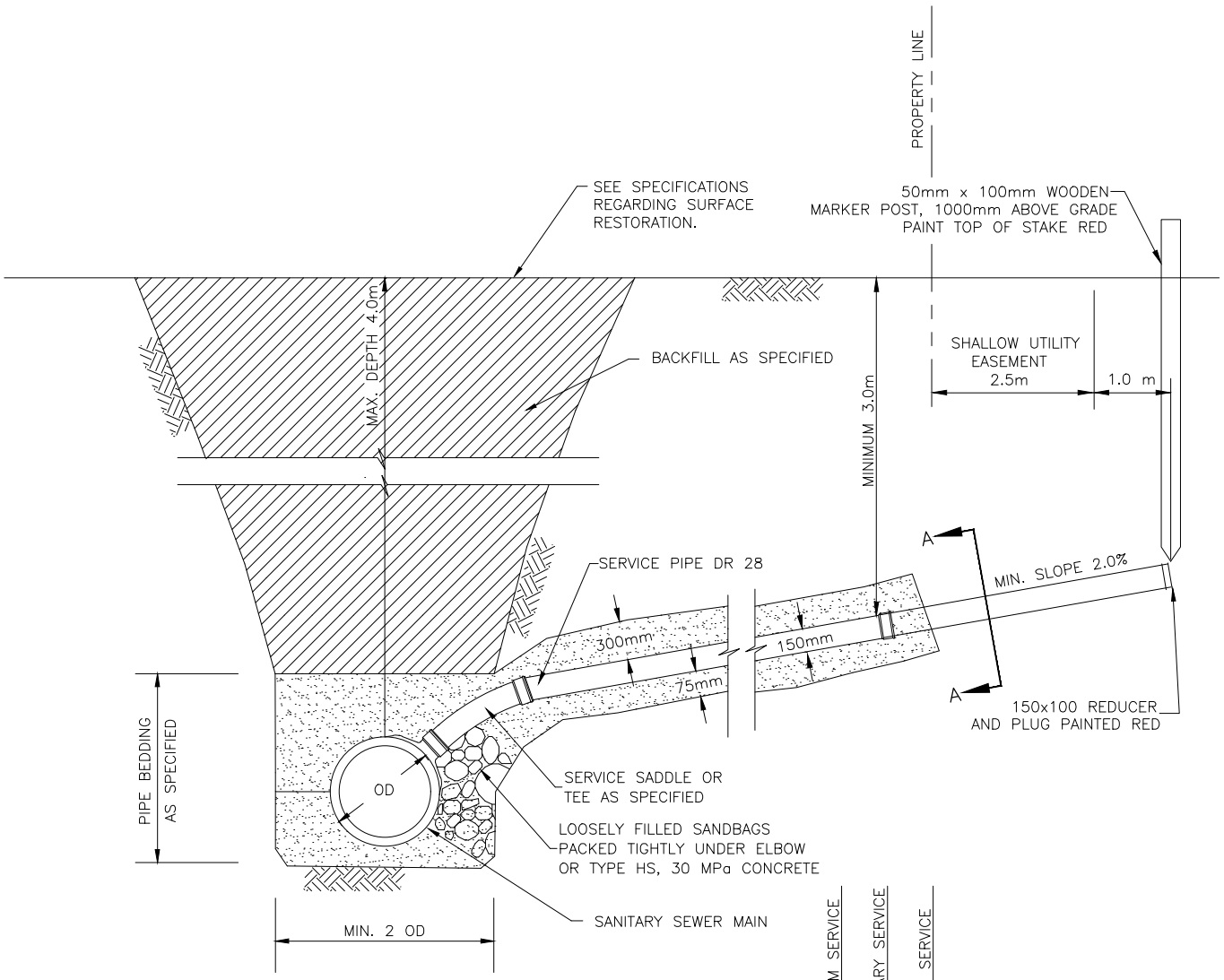
NOTES:
(1) PLATFORM TO BE INSTALLED IN ALL MANHOLES OVER 6.0m DEPTH (RIM TO LOWEST INVERT)
(2) PLATFORM TO BE INSTALLED AT MID MANHOLE DEPTH, FASTENED MIN 300mm FROM A BARREL JOINT
(3) SECOND PLATFORM MAY BE REQUIRED SHOULD THE REMAINING DISTANCE BE GREATER THAN 6.0m

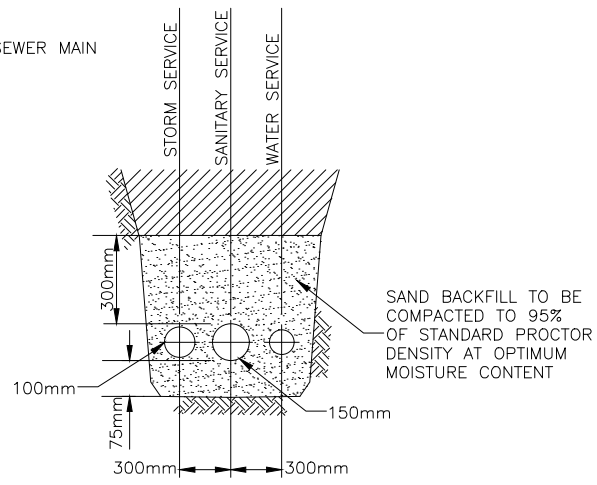
REGIONAL MUNICIPALITY OF WOOD BUFFALO

SAFETY PLATFORM

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Xrefs:

STANDARD DETAIL:	5-500
DATE.: JAN. 2021	REV: 4





SECTION A–A

NOTES:

(1) WHEN CUT BACK SLOPES ARE TO BE USED IN LIEU OF CAGES AND SHORING, THESE SLOPES ARE TO MEET REQUIREMENTS OF LOCAL CODES.

(2) OD = OUTSIDE PIPE DIAMETER.

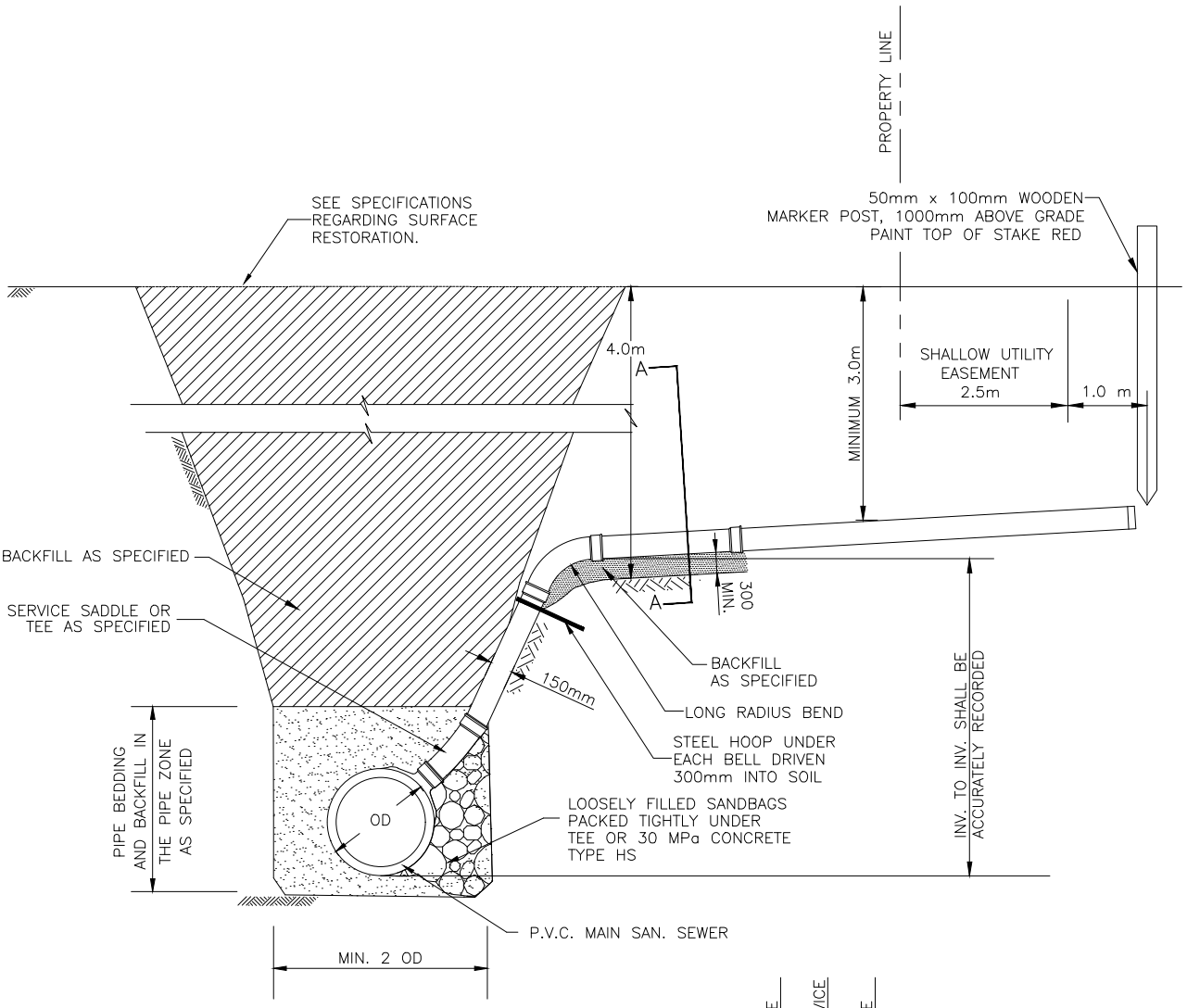
(3) EXTEND SANITARY SERVICE 1.0m BEYOND UTILITY EASEMENT, WHERE APPLICABLE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

NON - RISER TYPE SANITARY SERVICE CONNECTION

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Date: Feb 17, 2021
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STANDARD DETAIL:	5-501
DATE.: JAN. 2021	REV: 4

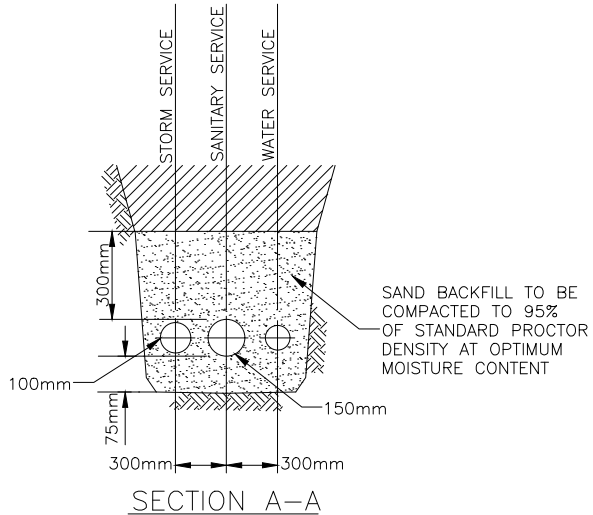


NOTES:

(1) WHEN CUT BACK SLOPES ARE TO BE USED IN LIEU OF CAGES AND SHORING, THESE SLOPES ARE TO MEET REQUIREMENTS OF LOCAL CODES.

(2) OD = OUTSIDE PIPE DIAMETER.

(3) EXTEND SANITARY SERVICE 1.0m BEYOND UTILITY EASEMENT, WHERE APPLICABLE.



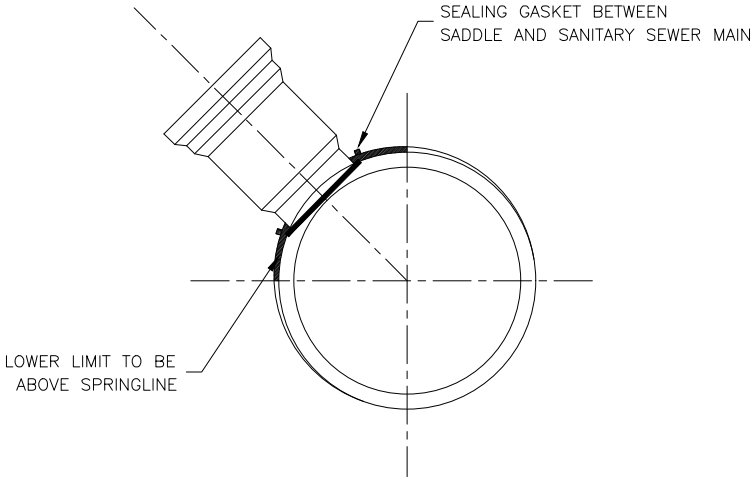
SECTION A–A

REGIONAL MUNICIPALITY OF WOOD BUFFALO

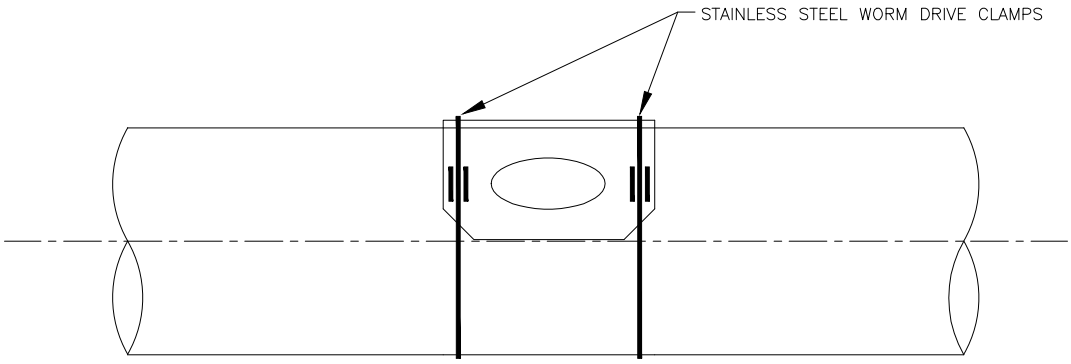
RISER TYPE SANITARY SERVICE CONNECTION

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Xrefs:

STANDARD DETAIL:	5-502
DATE.: JAN. 2021	REV: 3



END VIEW



PLAN – EXPOSED SADDLE

NOTES:

(1) FOR RETROFIT ONLY. TEES REQUIRED FOR ALL NEW SERVICE INSTALLATIONS.

(2) PVC SADDLE SHALL BE HELD IN PLACE BY TWO STAINLESS STEEL WORM DRIVE CLAMPS, COATED WITH DENSO–MASTIC OR APPROVED EQUAL COMPOUND.

(3) NO PROTRUSION OF SERVICE PIPE INTO MAIN LINE SHALL BE ALLOWED.

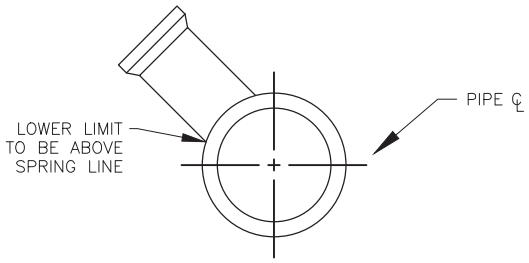
(4) INSERTA TEE IS AN APPROVED ALTERNATIVE FOR RETROFIT ONLY.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

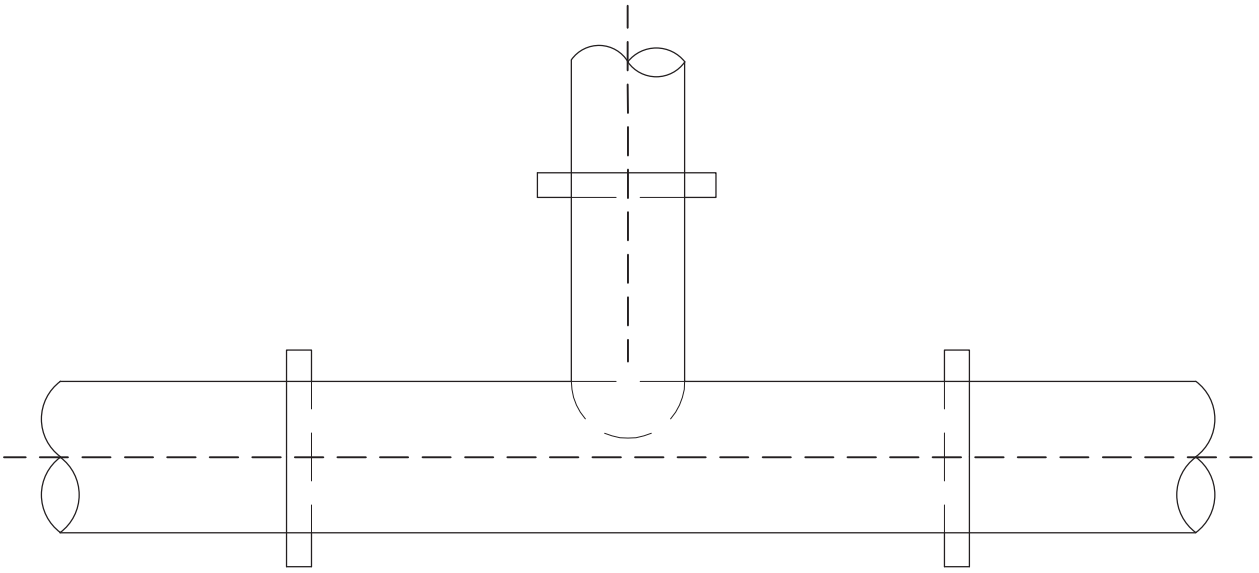
PVC SANITARY SERVICE SADDLE CONNECTION (FOR RETRO FIT ONLY)

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STANDARD DETAIL:	5-503
DATE: OCT 2016	REV: 3



END VIEW



PLAN

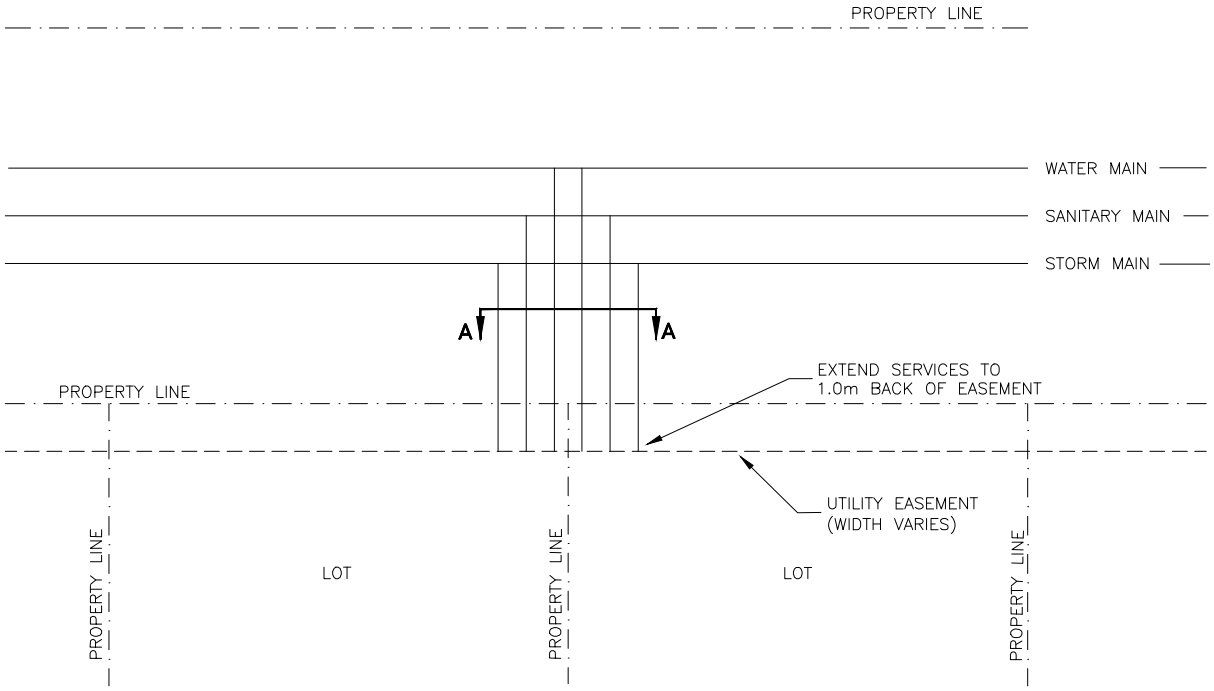
NOTES:

(1) TEES REQUIRED FOR ALL NEW SERVICE INSTALLATIONS.

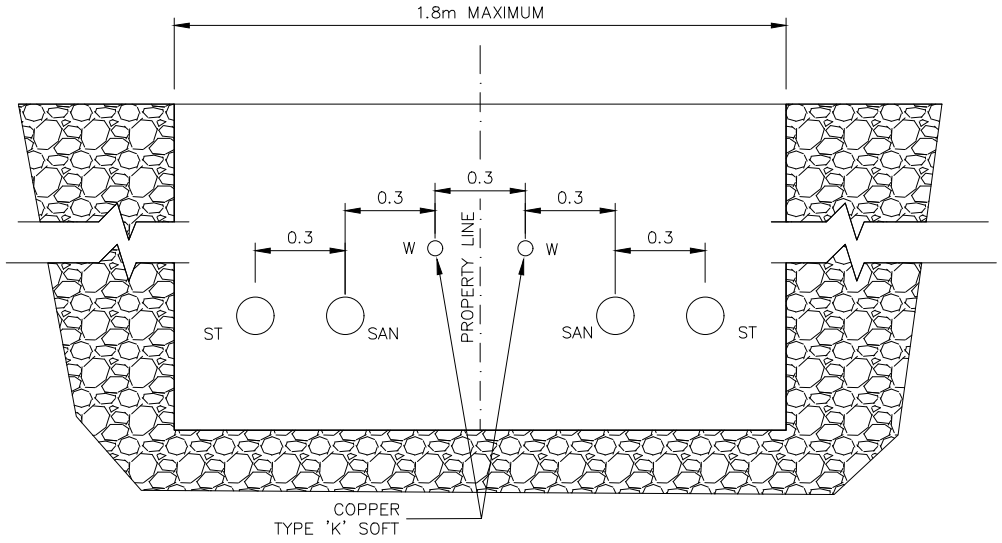
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PVC SANITARY SERVICE TEE CONNECTION

STANDARD DETAIL:	5-504
DATE.: JAN. 2021	REV: 3



TYPICAL MULTI SERVICED LOTS



TRENCH DETAIL
SECTION A–A

NOTES:

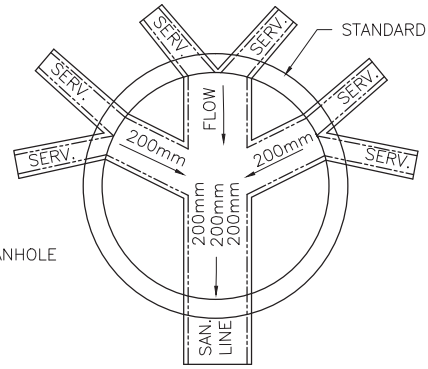
(1) SEE STANDARD DWG. NO. 7–304 FOR FURTHER SERVICE DETAILS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

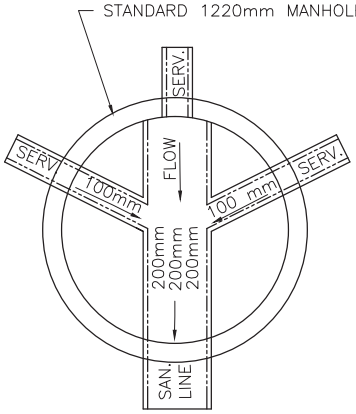
MULTI SERVICED LOTS

Time: 1:25pm
Date: Jan 28, 2021
File: V:\1161\active\116110892O\drawing\sheet_files\figures\Section 5\3658-5-500s.dwg by
Xrefs:

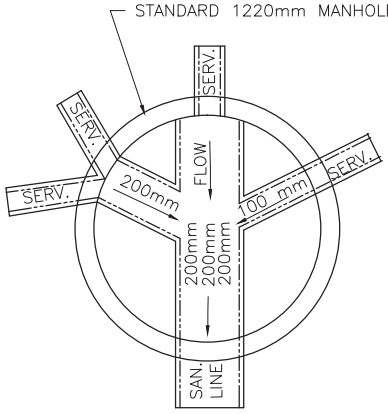
STANDARD DETAIL:	5- 505
DATE: OCT 2016	REV: 2



TYPICAL



ALTERNATE #1



ALTERNATE #2

NOTES:

(1) IN THE CASE OF MORE THAN 6 CONNECTIONS INTO A MANHOLE, A DETAIL DRAWING SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

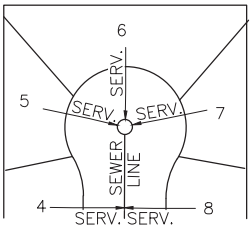
(2) SEWER MAIN TO GO STRAIGHT THROUGH MANHOLE WITH 0.50 PIPE TO OPPOSITE WALL.

(3) MAXIMUM HEIGHT OF INLET 300mm ABOVE INVERT OF OUTLET.

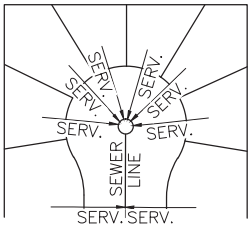
(4) 0.50 PIPE BENCHING TO ACCOMMODATE BRANCH CONNECTIONS.

(5) SERVICE CONNECTIONS INTO BARREL TO BE MACHINE CORED.

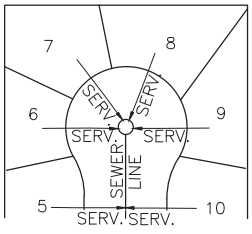
(6) MIN. 100 FOR 1 SERVICE, MIN 200 FOR 2 SERVICES.



ALTERNATE #1



TYPICAL

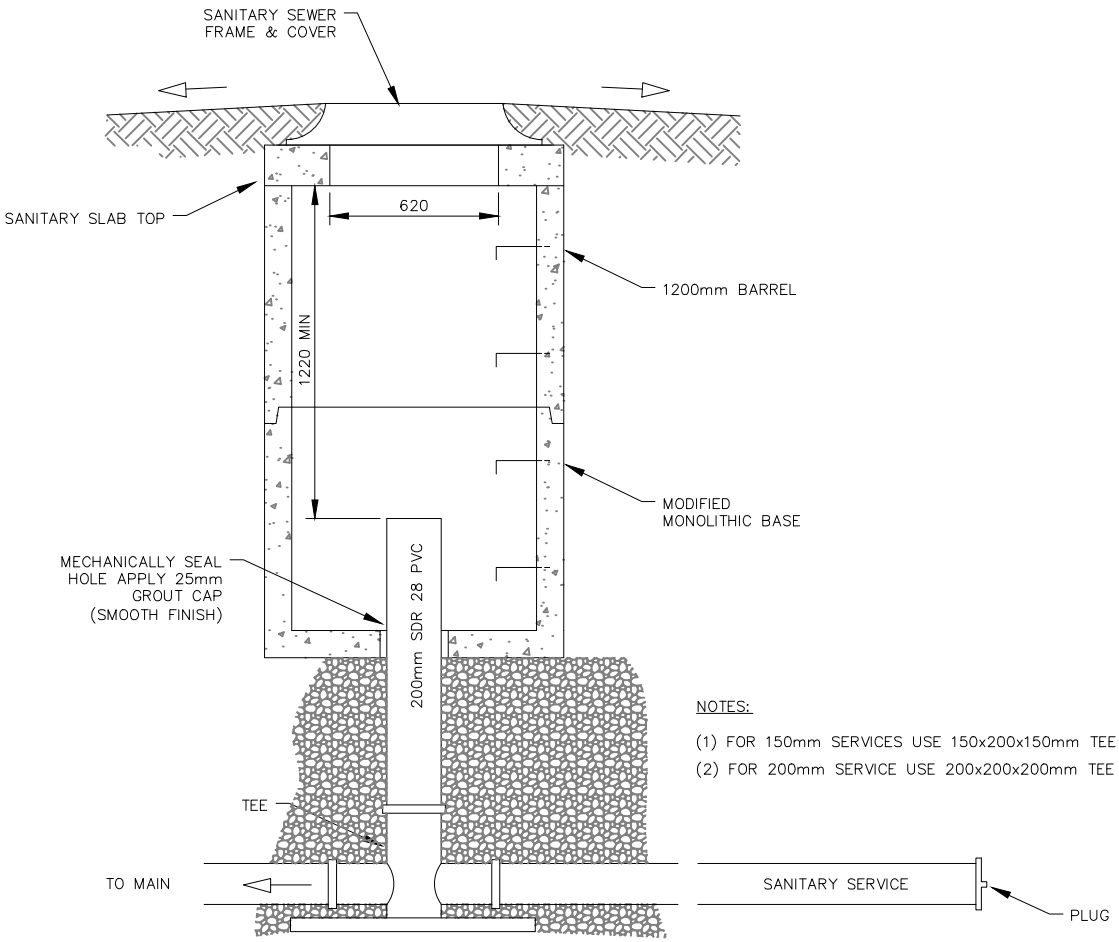


ALTERNATE #2

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SERVICE CONNECTION DETAILS FOR SEWER MANHOLE IN CUL-DE-SAC

STANDARD DETAIL:	5-506
DATE.: JAN. 2021	REV: 0



NOTES:

(1) FOR 150mm SERVICES USE 150x200x150mm TEE

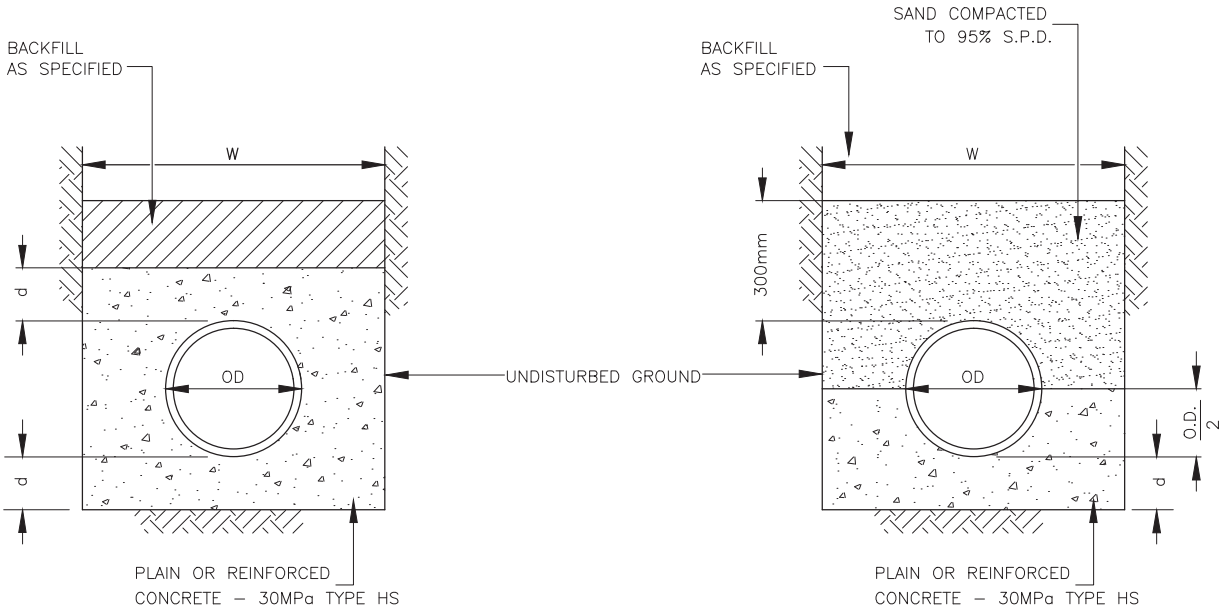
(2) FOR 200mm SERVICE USE 200x200x200mm TEE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SANITARY SEWER SERVICE INSPECTION/SAMPLING MANHOLE

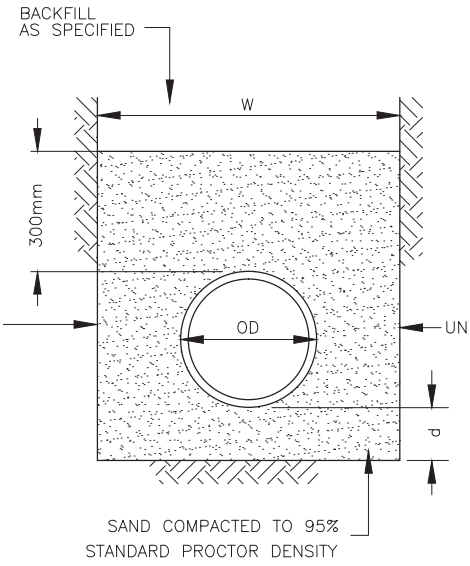
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Xrefs:

STANDARD DETAIL:	5-600
DATE: OCT 2016	REV: 3



CLASS A

CLASS A–1



CLASS B

PIPE SIZE	d MIN.(mm)
675mm OR SMALLER	75
750mm TO 1500mm	100
1650mm AND LARGER	150
W MIN.	2 X OD

LEGEND:

d = DEPTH OF BEDDING MATERIAL BELOW PIPE
W = TRENCH WIDTH.
OD = OUTSIDE DIAMETER OF PIPE

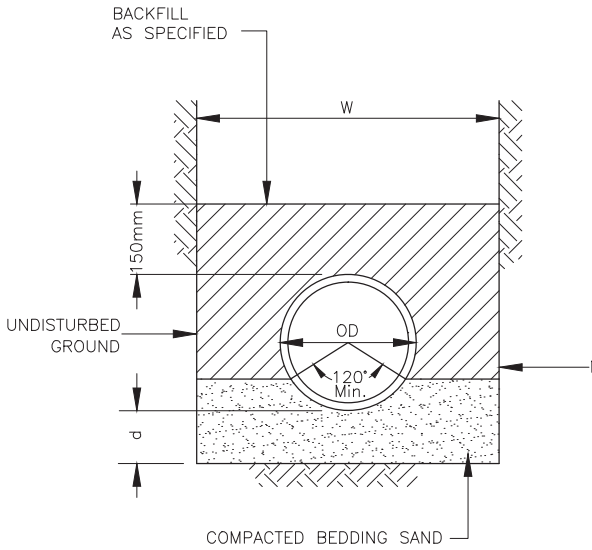
NOTES:

(1) ADD 100mm TO d IN ROCK EXCAVATION.

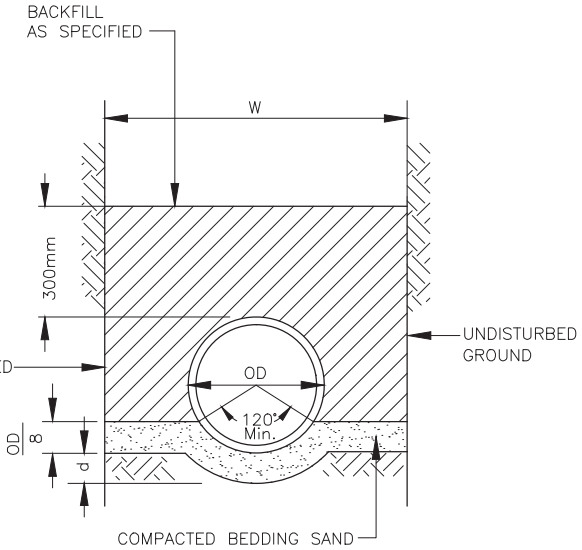
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE ZONE BEDDING DETAILS (CLASS A, A-1, B)

STANDARD DETAIL:	5-601
DATE: OCT 2016	REV: 3

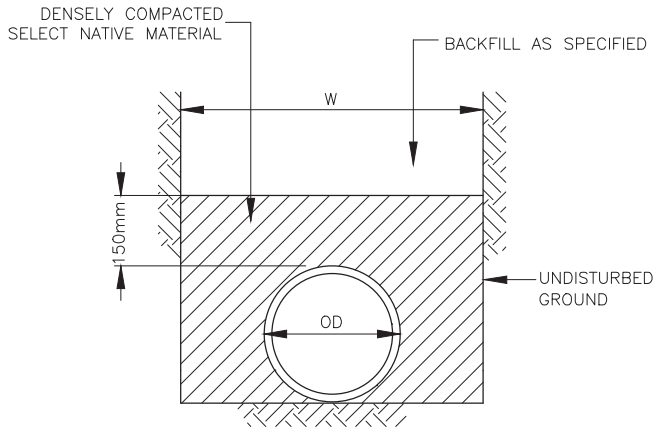


CLASS C



CLASS C-1

ALTERNATE- 375mm I.D. OR SMALLER



CLASS D

PIPE SIZE	d MIN.(mm)
675mm OR SMALLER	75
750mm TO 1500mm	100
1650mm AND LARGER	150
W MIN.	2 x OD

LEGEND:

d = DEPTH OF BEDDING MATERIAL BELOW PIPE
W = TRENCH WIDTH.
OD = OUTSIDE DIAMETER OF PIPE

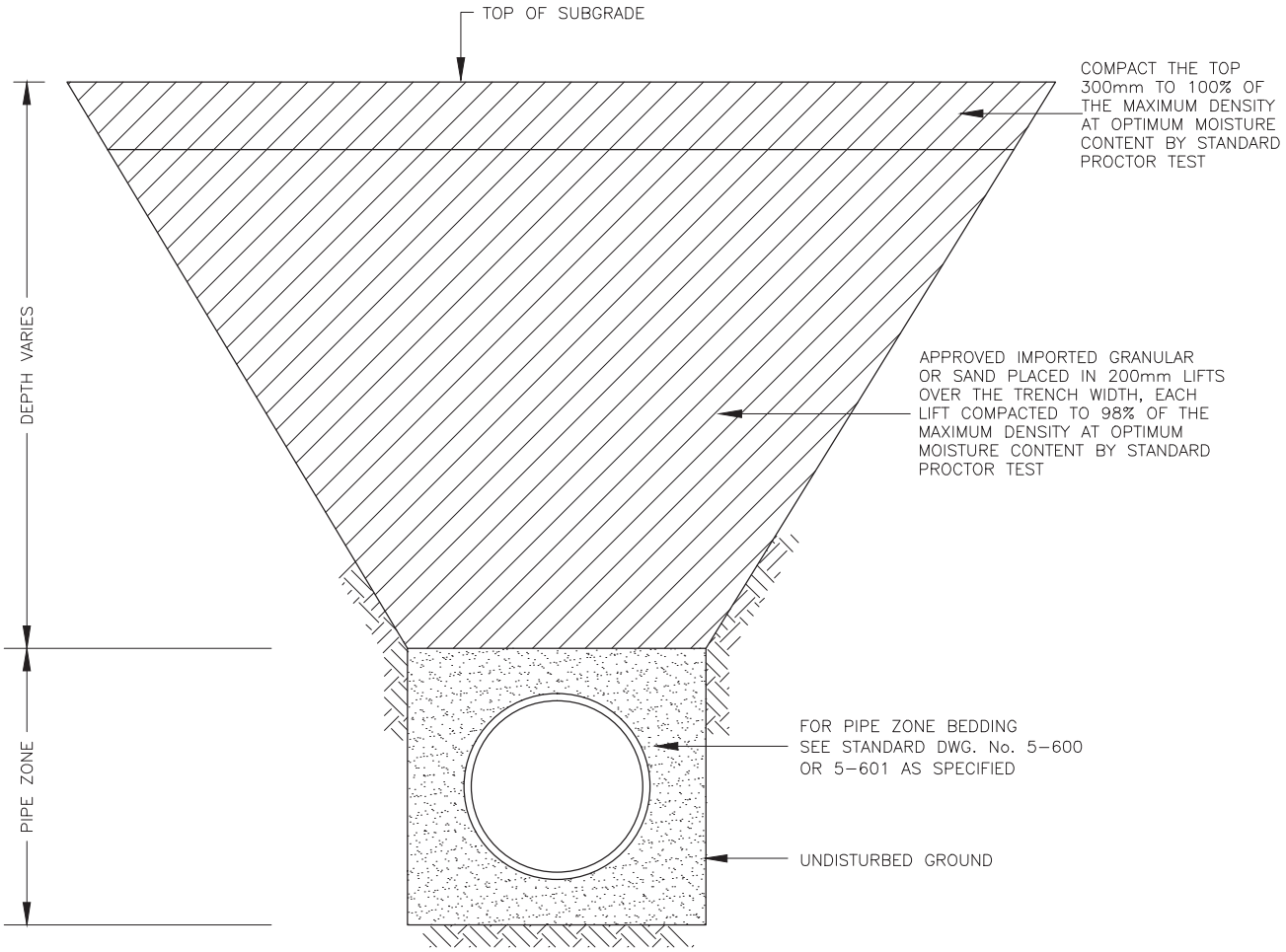
NOTES:

(1) ADD 100mm TO d IN ROCK EXCAVATION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE ZONE BEDDING DETAILS (CLASS C, C-1, D)

STANDARD DETAIL:	5-700
DATE: OCT 2016	REV: 3



NOTES:

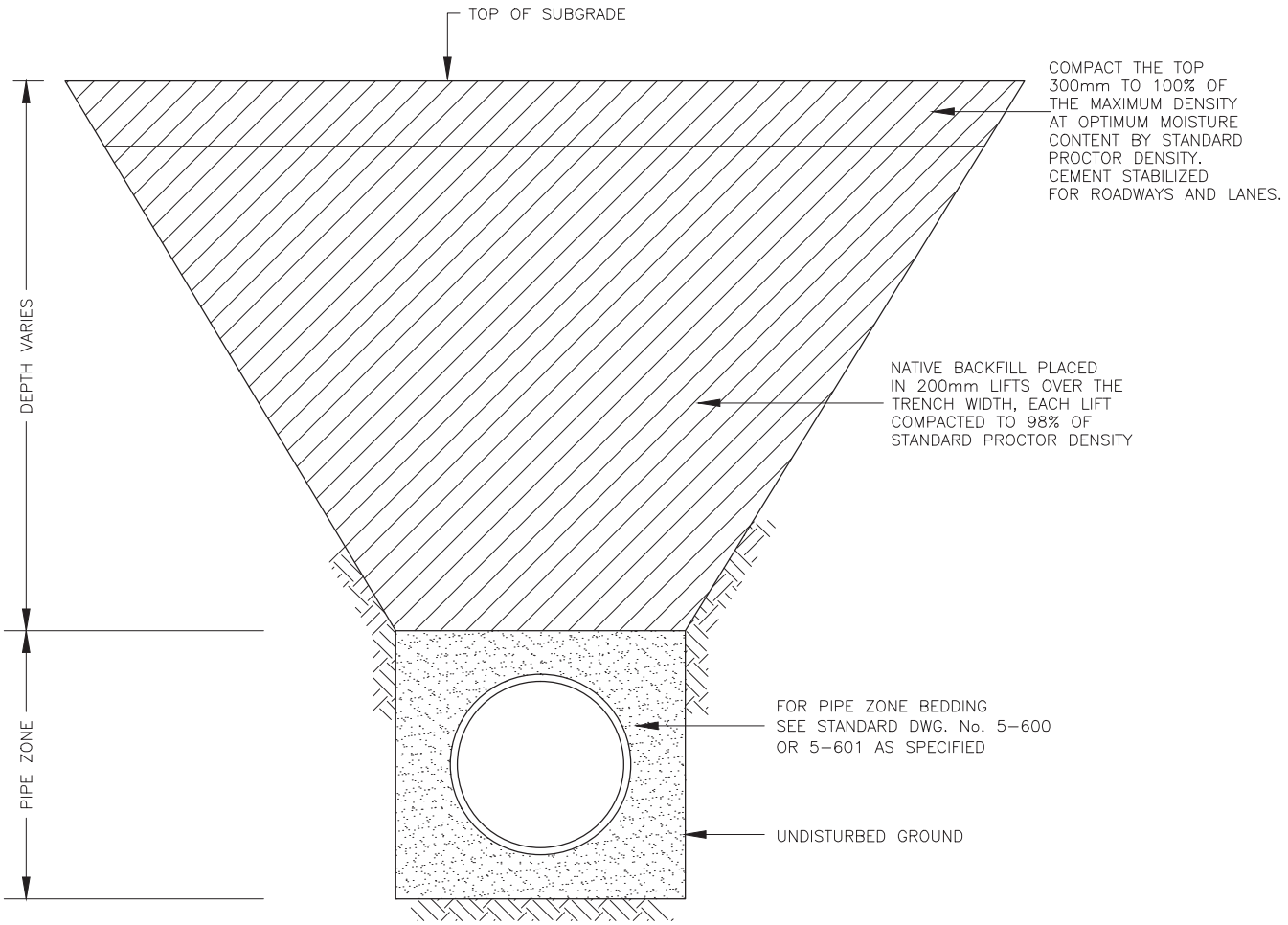
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS I TRENCH BACKFILL

STANDARD DETAIL:	5-701
DATE: OCT 2016	REV: 3



NOTES:

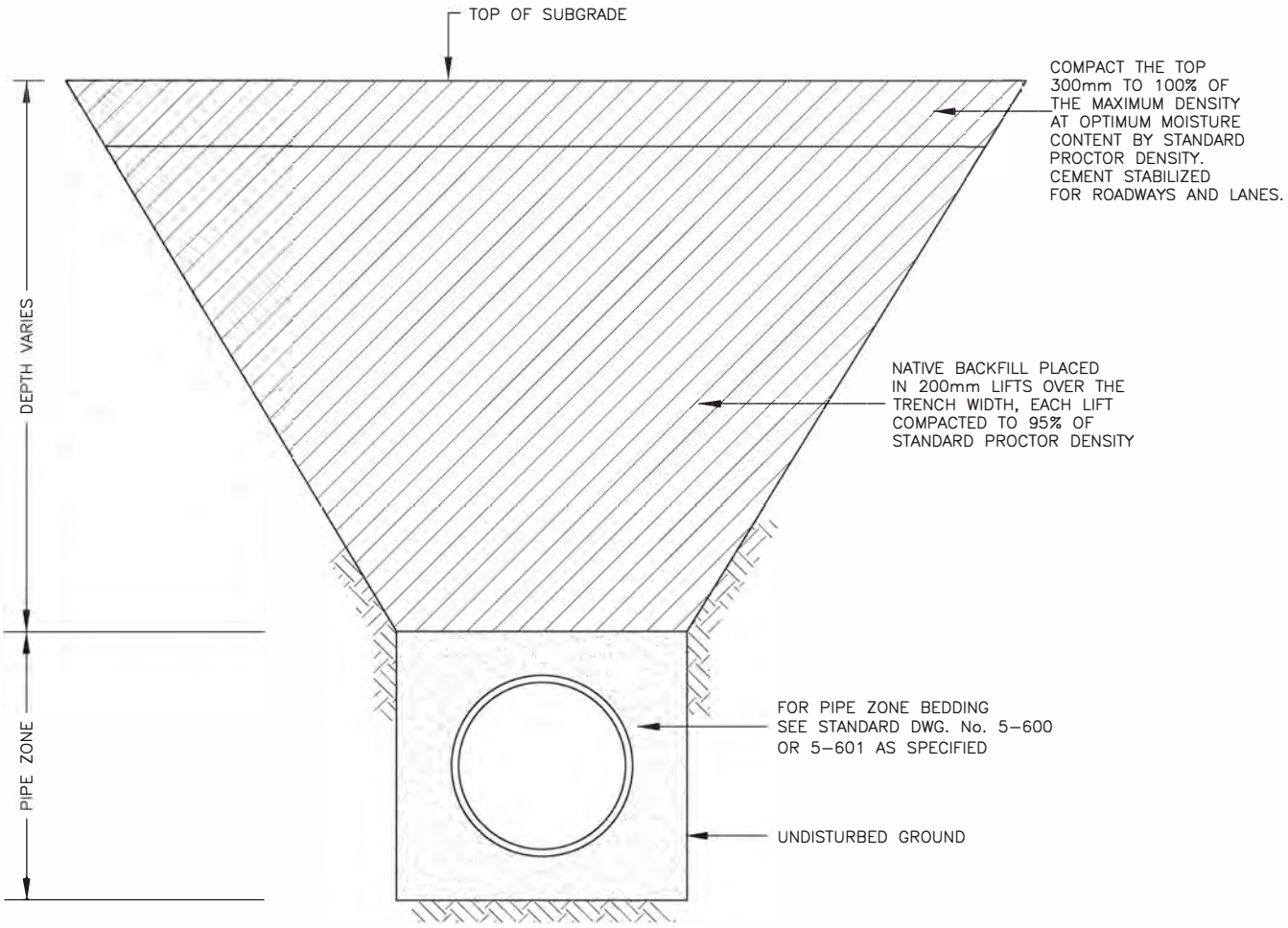
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS II TRENCH BACKFILL

STANDARD DETAIL:	5-702
DATE: APR 2017	REV: 4



NOTES:

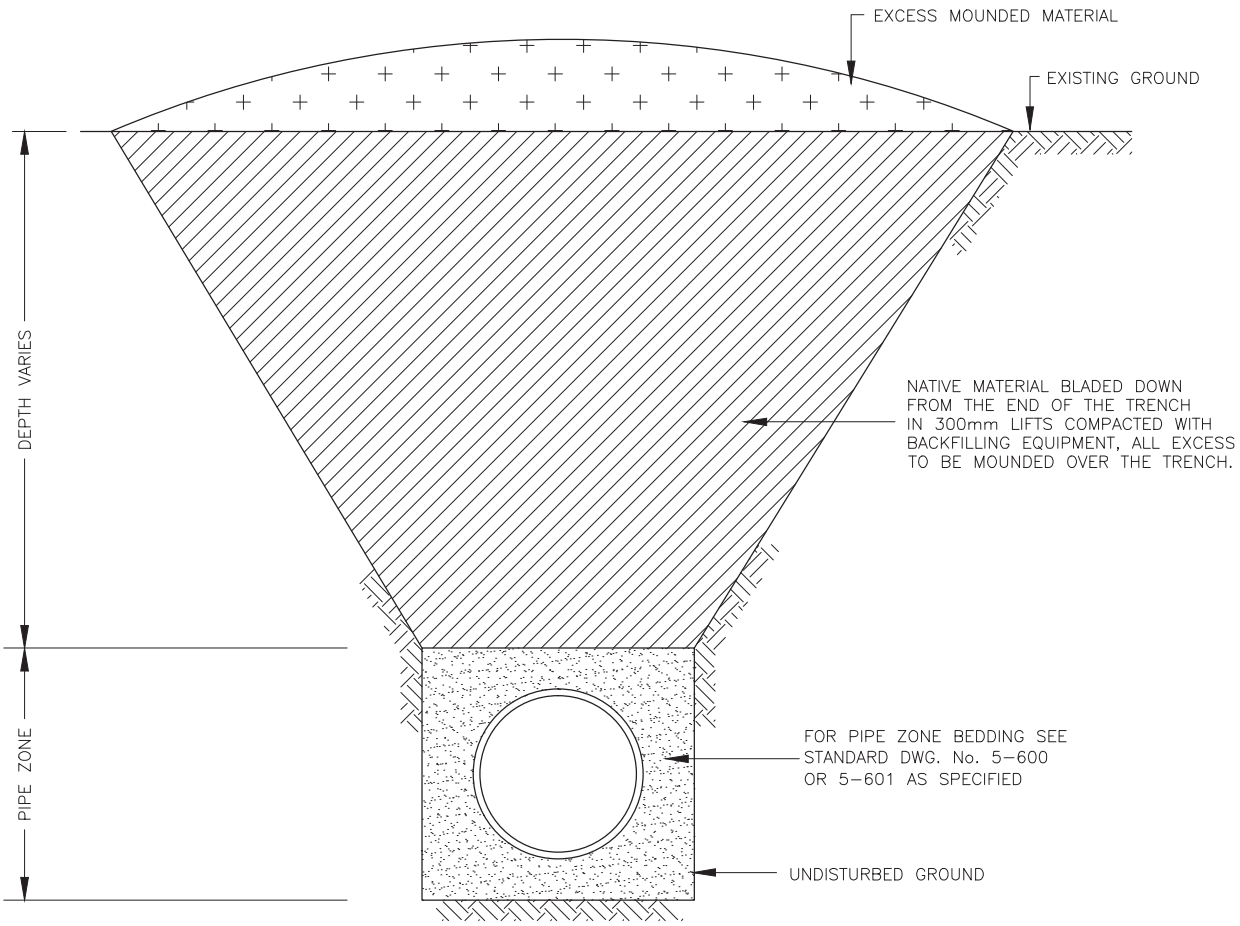
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS III TRENCH BACKFILL

STANDARD DETAIL:	5-703
DATE: OCT 2016	REV: 3



NOTES:

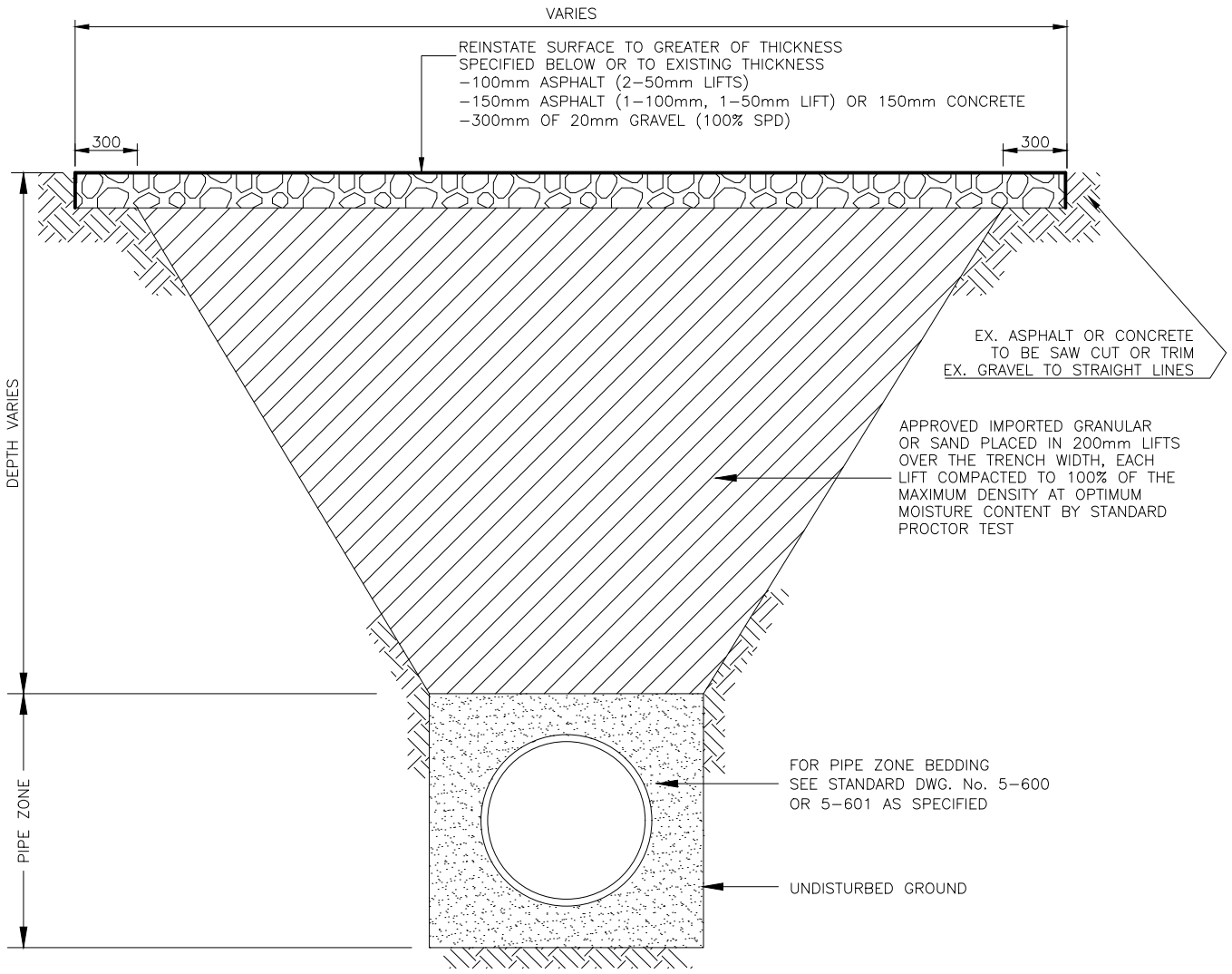
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SURFACE DRAINAGE TO BE RECTIFIED FOR IMMEDIATE AREA IF CLASS IV BACKFILL IS USED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS IV TRENCH BACKFILL

STANDARD DETAIL:	5-704
DATE.: JAN. 2021	REV: 2



NOTES:

(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

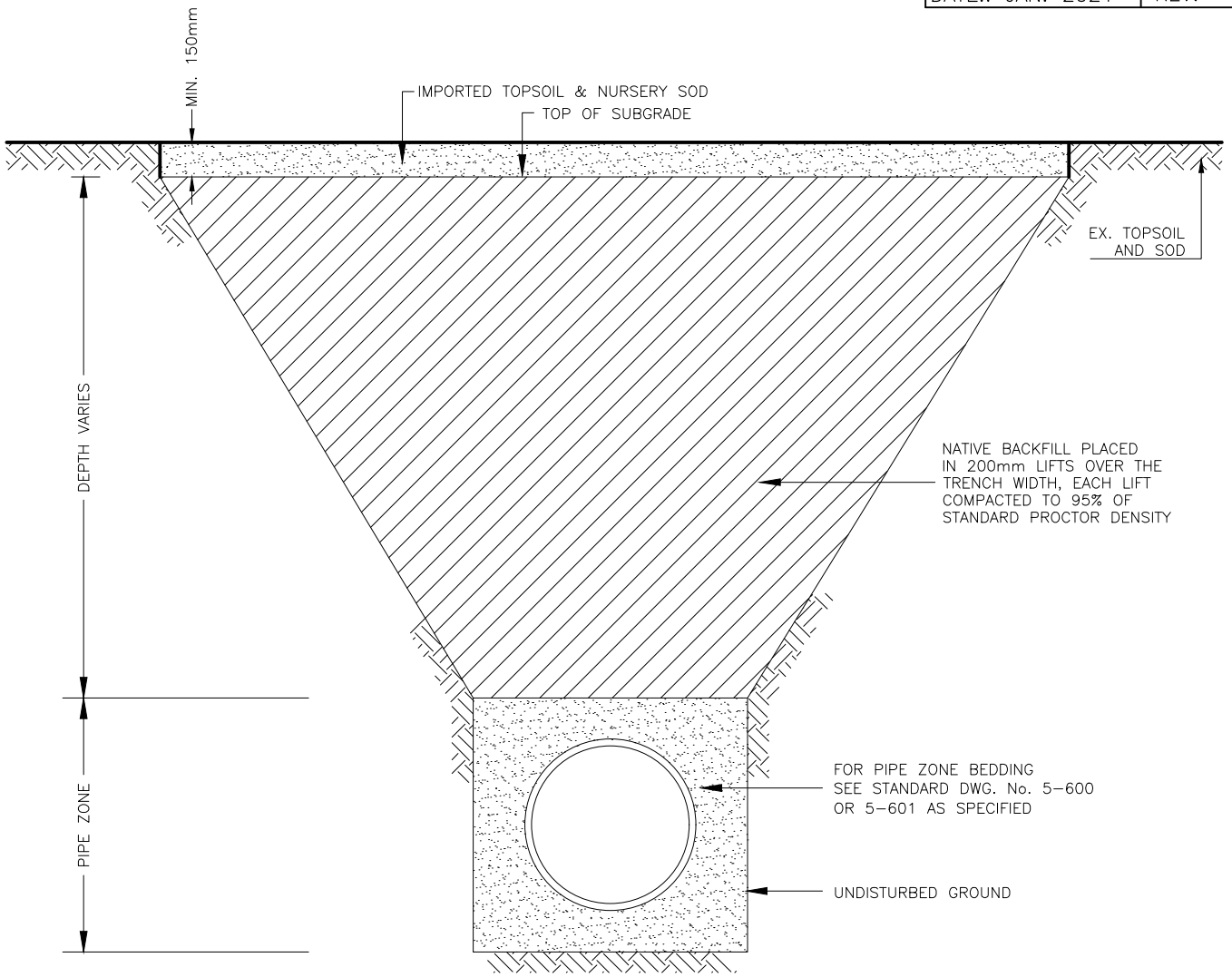
(2) PAVEMENT STRUCTURE DESIGN REQUIRED FOR ASPHALT AND CONCRETE SURFACES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRENCH BACKFILL FOR EMERGENCY REPAIRS IN PAVED AREAS

Time: 1:27pm
Date: Jun 28, 2021
File: V:\1161\active\116110892O\drawing\sheet_files\figures\Section 5\3658-5-700s.dwg by
Xrefs:

STANDARD DETAIL:	5-705
DATE.: JAN. 2021	REV: 3



NOTES:

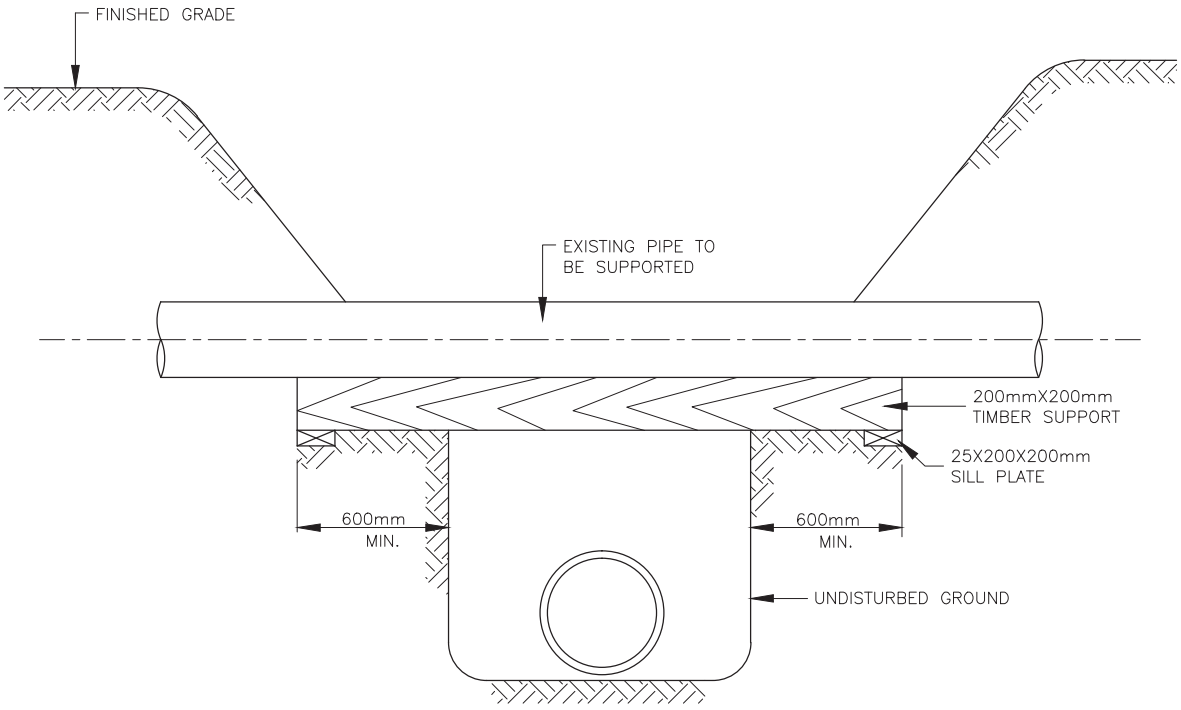
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRENCH BACKFILL FOR EMERGENCY REPAIRS GRASSED OR SODDED AREAS

Time: 1:27 pm
Date: Jan 28, 2021
File: V:\1161\active\116110892O\drawing\sheet_files\figures\Section 5\3658-5-700s.dwg by
Xrefs:

STANDARD DETAIL:	5-800
DATE: OCT 2016	REV: 3



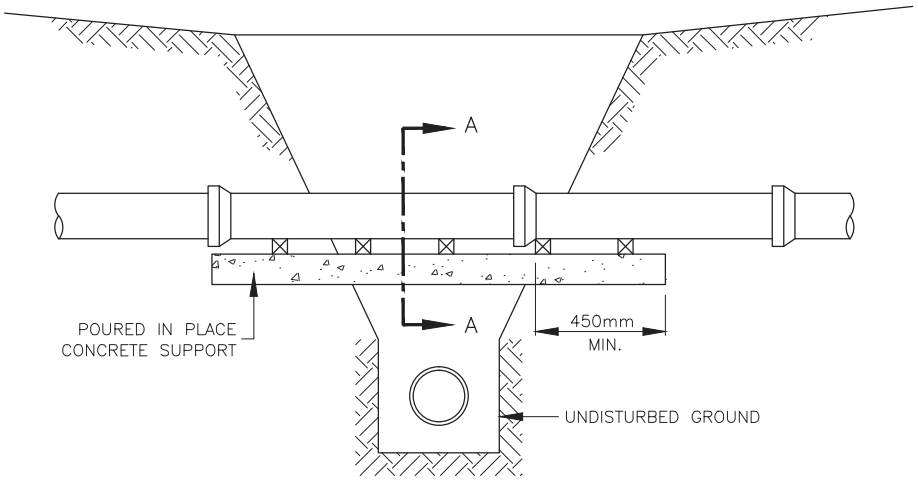
NOTE:

(1) ALL LUMBER TO BE PRESSURE TREATED.

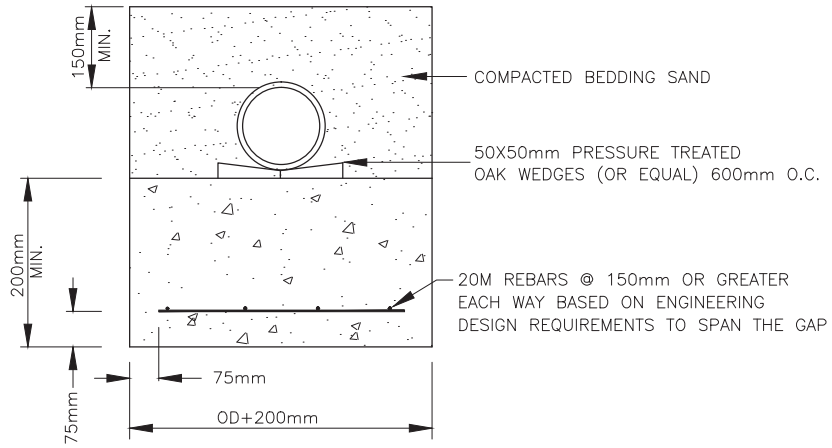
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE SUPPORT - TYPE I

STANDARD DETAIL:	5-801
DATE: OCT 2016	REV: 3



SECTION



SECTION A–A

NOTES:

(1) CONCRETE 28 DAYS COMPRESSIVE STRENGTH SHALL BE 30MPa, TYPE HS

(2) MAXIMUM LENGTH BETWEEN JOINTS ON SUPPORT 2m.

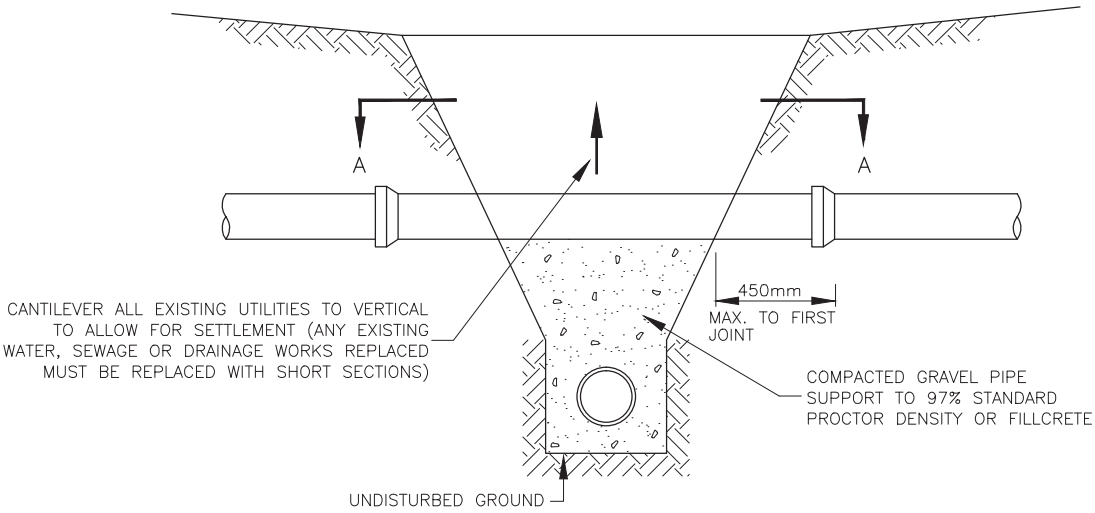
(3) ALL REINFORCEMENT BARS TO HAVE 75mm EDGE CLEARANCE.

(4) WHERE SPAN EXCEEDS 4.5m CONSTRUCT 300mm DIA. CONCRETE COLUMNS(SONO TUBES) SUPPORTS AT 3.5m O.C.

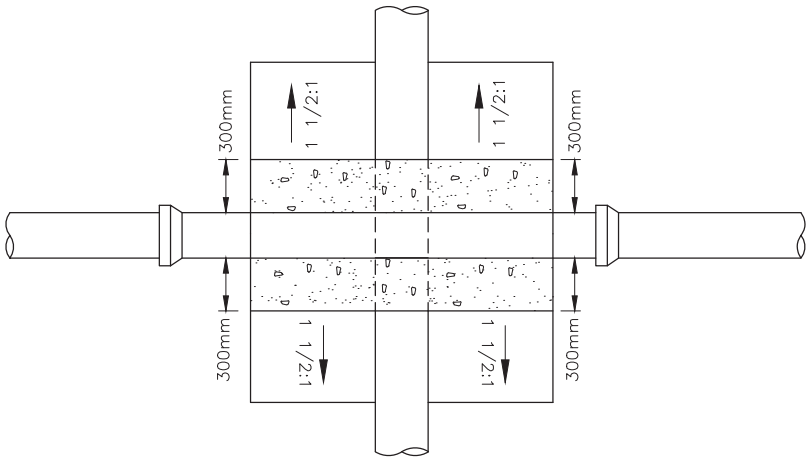
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE SUPPORT - TYPE II

STANDARD DETAIL:	5-802
DATE: OCT 2016	REV: 3



SECTION



SECTION A–A

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE SUPPORT - TYPE III

STANDARD DETAIL:	5-812
DATE.: JAN. 2021	REV: 1



SPECIFICATION:

SIZE: 432 X 305
MATERIAL: ALUMINUM/ENGINEER GRADE
BACKGROUND: RED/BLUE/BLACK ON WHITE BACKGROUND
CORNERS: ROUNDED HOLES/LOCATION; TOP AND BOTTOM
TYPE OF PROCESS: DI-CUT

NOTES:

(1) WARNING SIGNS TO BE INSTALLED ON RURAL/REGIONAL PIPELINES, OR IN URBAN LANDSCAPED AREAS OUTSIDE OF ROAD ROW, AT THE DIRECTION OF THE MUNICIPALITY.

(2) MOUNTED ON TELESPAR, SET 0.9m IN GROUND AT HEIGHT OF 1.5m.

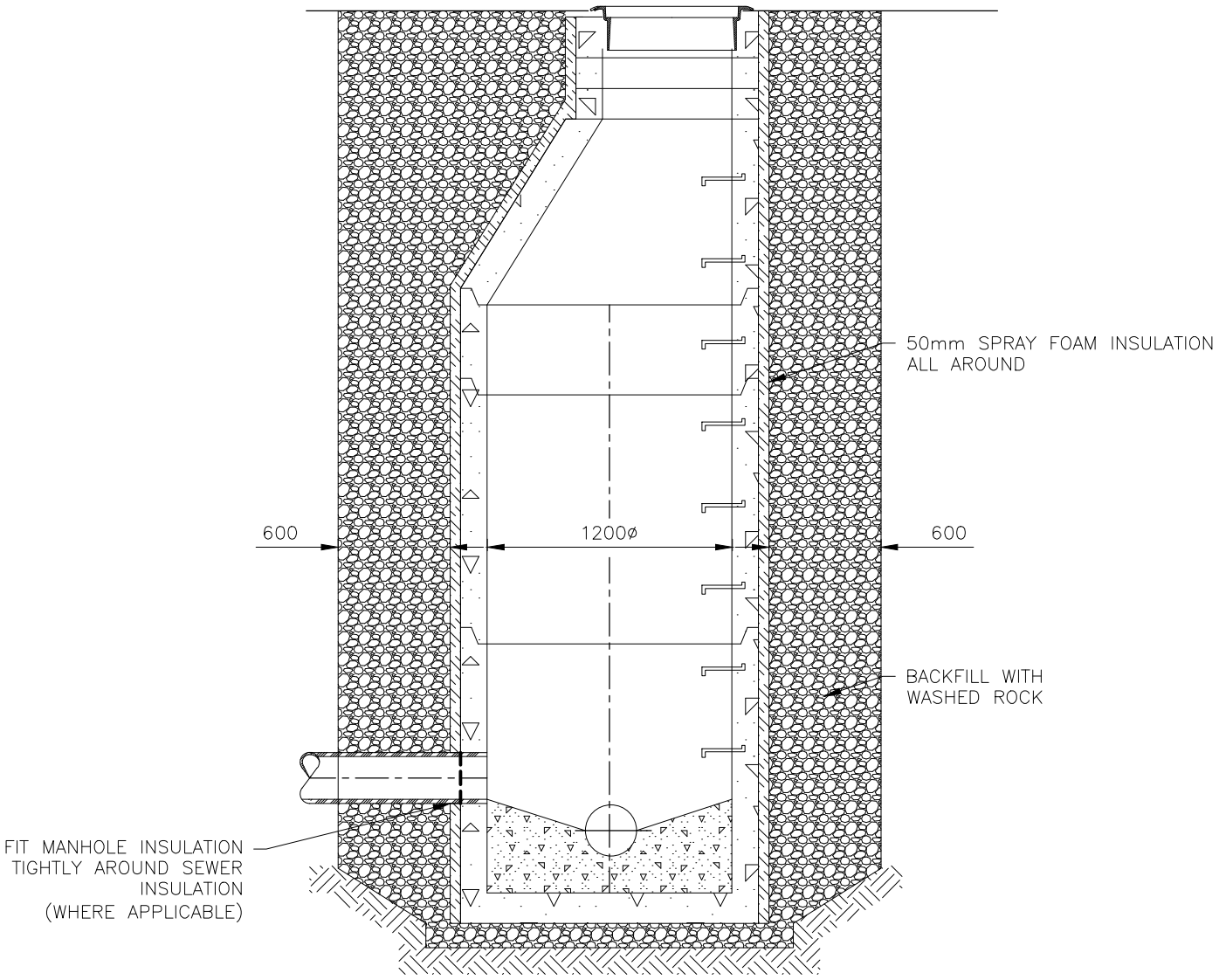
(3) AT 500m INTERVAL, AND AT BEND IN PIPELINE DIRECTION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WARNING SIGN SEWER LINE

Time: 2:36pm
Date: Feb 02, 2021
File: \\Cd1044-f06\work_group\11611\active\116110892\0\drawing\sheet_files\figures\Section 5\3658-5-800s.dwg by
Xrefs:

STANDARD DETAIL:	5-905
DATE.: JAN. 2021	REV: 0



SECTION A–A

NOTES:

(1) MANHOLE DETAILS AT PER DWG 5–100

(2) INSTALL 2 LAYERS EACH POLY & TARPAPER AS VAPOR BARRIER.

(3) INSTALL 50mm INSULATION AROUND MANHOLE BARREL.

(4) BACKFILL WITH WASHED GRANULAR MATERIAL FULL DEPTH TO 600mm WIDTH AROUND MANHOLES.

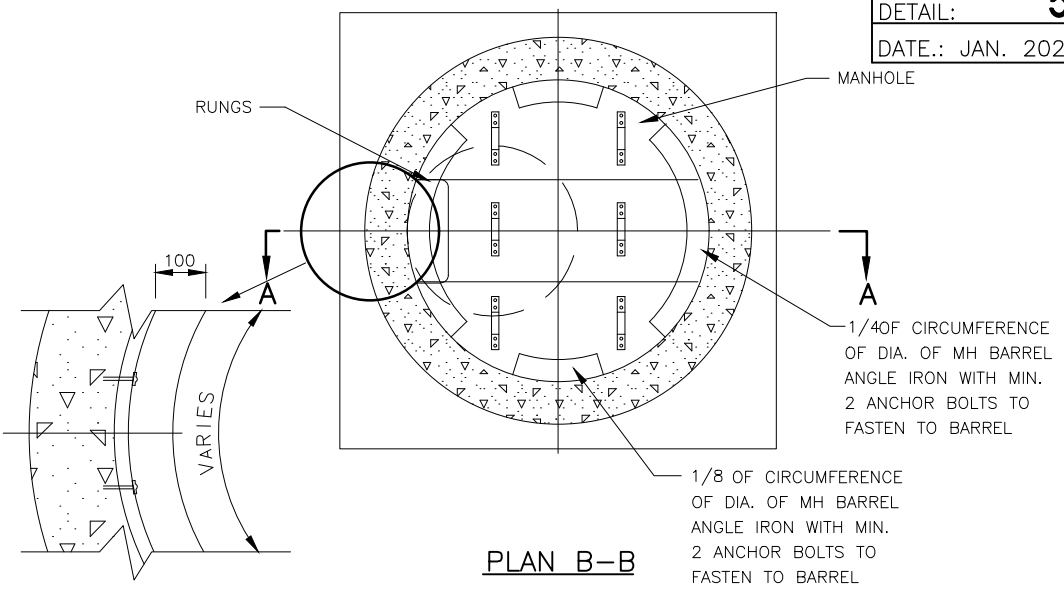
(5) THIS DETAIL TO BE SPECIFIED IN SITUATIONS WHERE THERE IS A HIGHER RISK OF THE SANITARY SYSTEM FREEZING. FOR EXAMPLE AT THE TOP END OF THE SANITARY SYSTEM ON AN URBAN INFRASTRUCTURE RENEWAL PROJECT.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

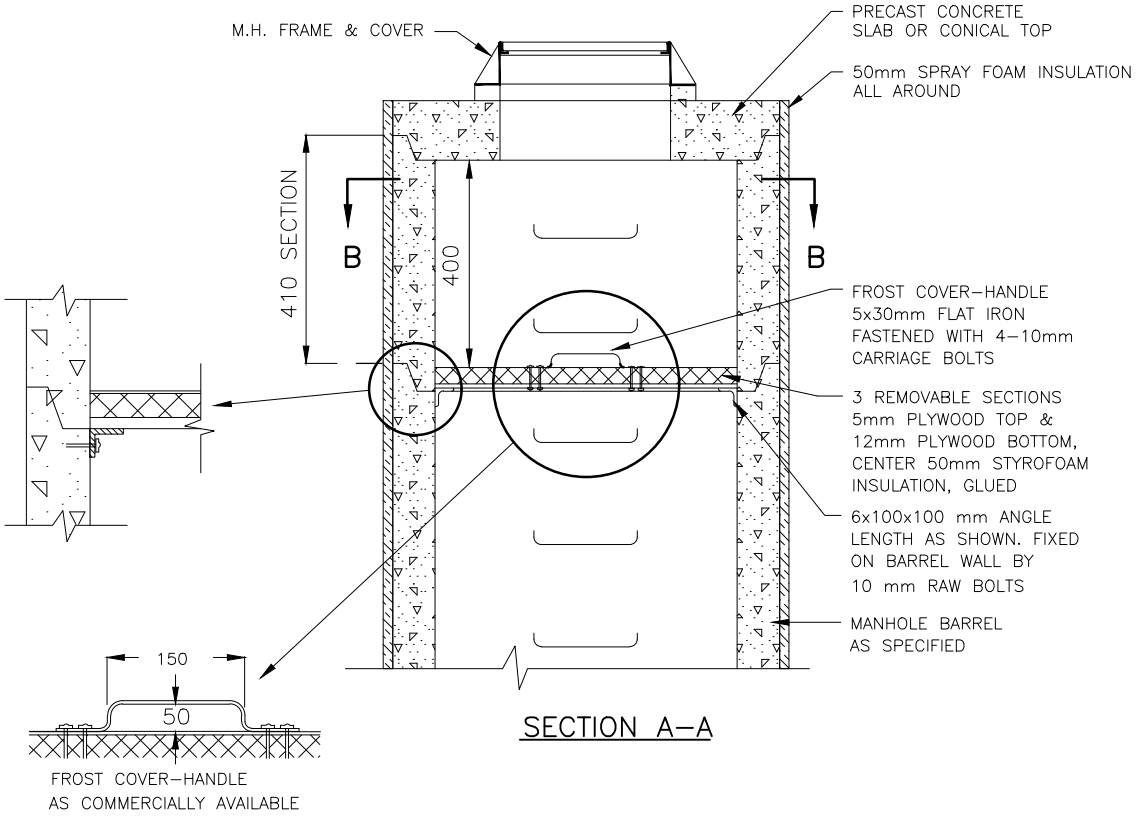
TYPICAL INSULATED PRECAST MANHOLE FOR PIPES UP TO 500mm DIA

Time: 10:33am
Date: Feb 01, 2021
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Xrefs:

STANDARD DETAIL:	5-906
DATE.: JAN. 2021	REV: 0



PLAN B–B



SECTION A–A

NOTES:

(1) ALL METAL PARTS IN MANHOLE TO BE PRIMED AND PAINTED.

(2) USE EPOXY ANCHOR BOLTS TO FASTEN TO BARREL.

(3) FABRICATE ANGLE TO SUIT BARREL RADIUS.

(4) INSTALL COVER IMMEDIATELY ABOVE VALVES.

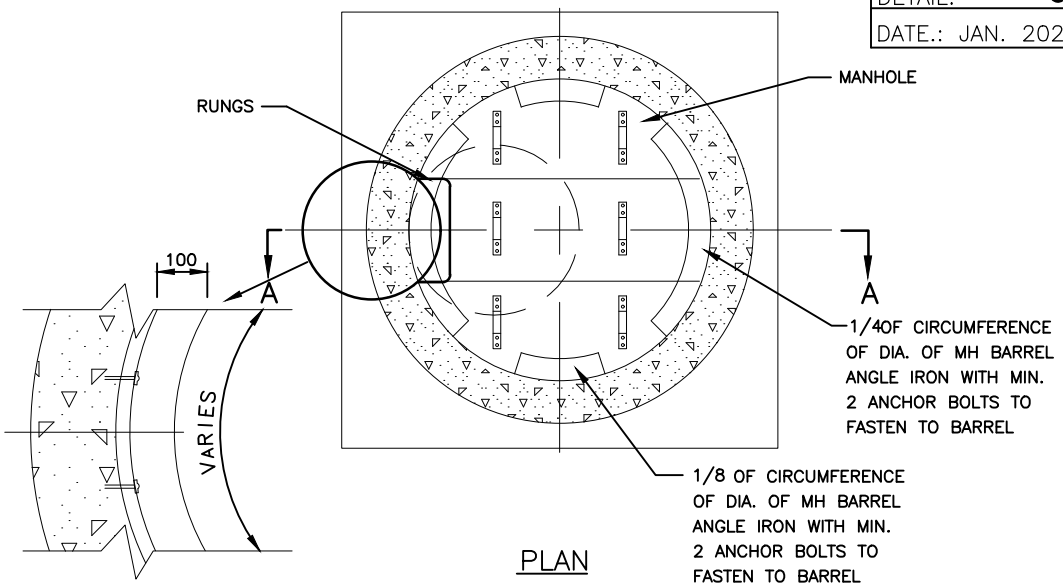
(5) THIS DETAIL TO BE SPECIFIED IN SITUATIONS WHERE THERE IS A HIGHER RISK OF THE SANITARY SYSTEM FREEZING. FOR EXAMPLE AT THE TOP END OF THE SANITARY SYSTEM ON AN URBAN INFRASTRUCTURE RENEWAL PROJECT.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

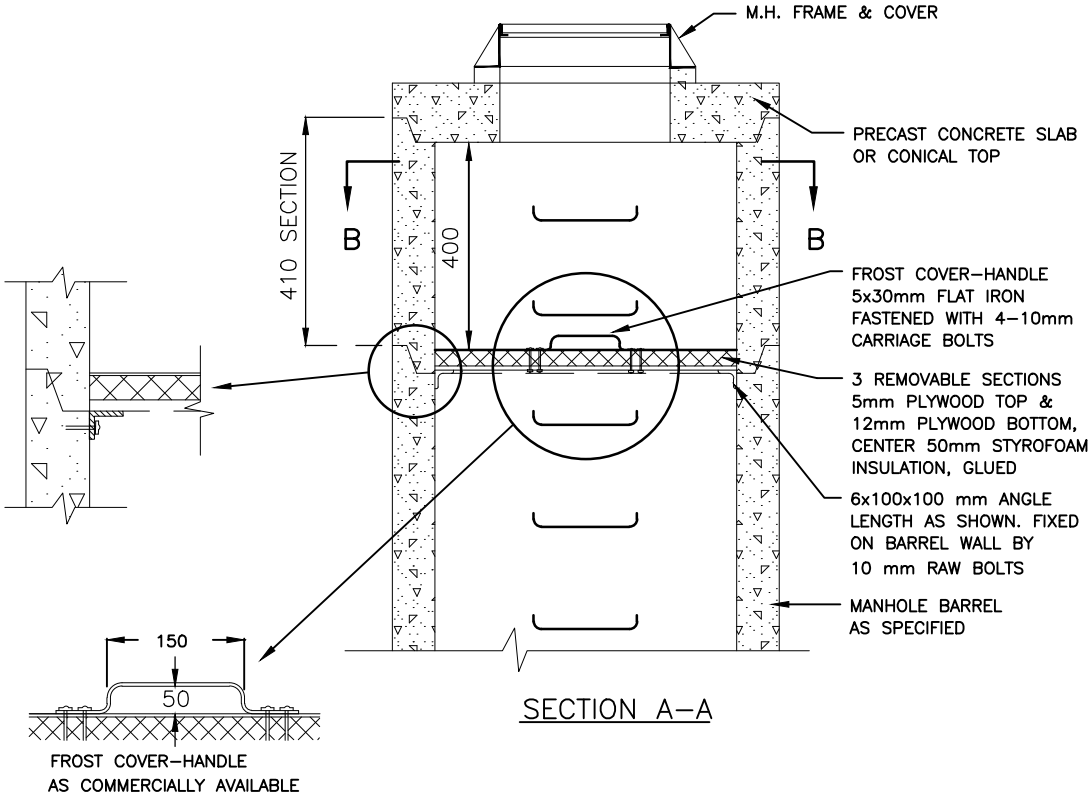
ENHANCED FROST COVER DETAIL

Time: 2:26pm
Date: Feb 02, 2021
File: \\Cd1044-f06\work_group\11611\active\1611108920\drawing\sheet_files\figures\Section 5\3658-5-900a.dwg by
Xrefs:

STANDARD DETAIL:	5-907
DATE.: JAN. 2021	REV: 3



PLAN



SECTION A–A

NOTES:

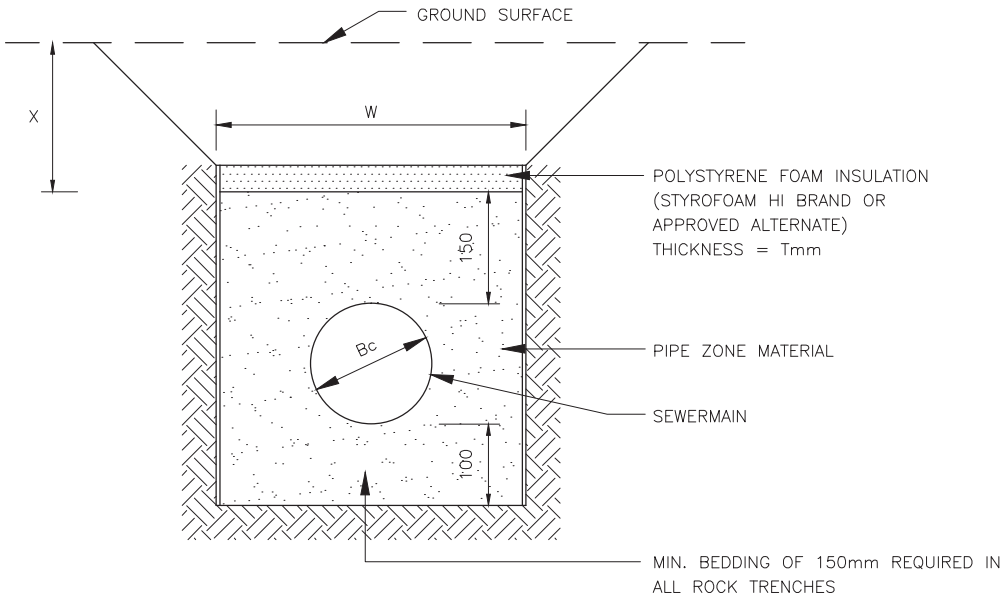
(1) ALL METAL PARTS IN MANHOLE TO BE PRIMED AND PAINTED.
(2) USE EPOXY ANCHOR BOLTS TO FASTEN TO BARREL.
(3) FABRICATE ANGLE TO SUIT BARREL RADIUS.
(4) INSTALL COVER IMMEDIATELY ABOVE VALVES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

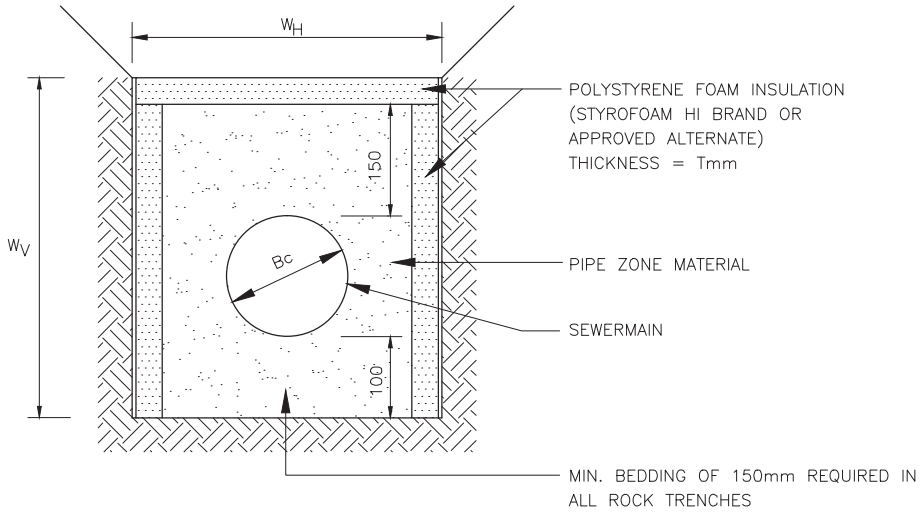
TYPICAL FROST COVER DETAIL

Time: 2:29pm
Date: Feb 02, 2021
File: \\Cd1044-f06\work_group\11611\active\1611108920\drawing\sheet_files\figures\Section 5\3658-5-900a.dwg by
Xrefs:

STANDARD DETAIL:	5-908
DATE: OCT 2016	REV: 2



SINGLE WIDTH OPTION



U OPTION

X (mm)	T (mm)	WIDTH OF INSULATION (W) FOR OUTSIDE PIPE DIAMETERS			
		0.15	0.20	0.25	0.30
1.6	65	3.0	3.1	3.3	3.4
1.8	50	2.6	2.7	3.9	3.0
2.0	50	2.2	2.3	2.5	2.6
2.2	40	1.8	1.9	2.3	2.4
2.4	25	1.4	1.5	1.9	2.0
2.6	25	1.0	1.1	1.5	1.6
2.8	25	0.6	0.7	1.1	1.2

NOTES:

X = DEPTH FROM GROUND SURFACE TO BOTTOM OF INSULATION (METRES)

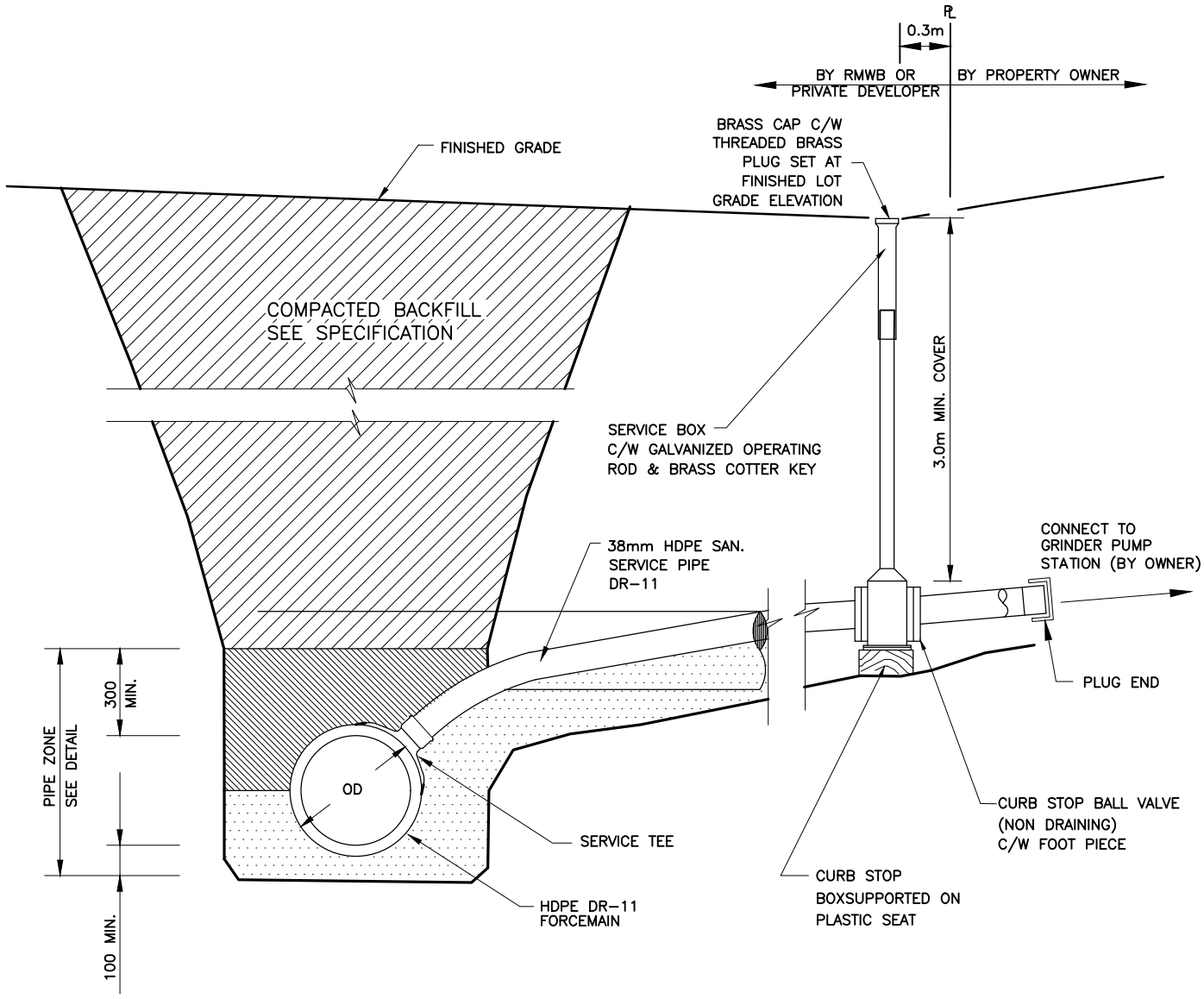
W = WIDTH OF INSULATION (METRES) = W + 2(W)

Bc = OUTSIDE DIAMETER OF PIPE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

INSULATED PIPE ZONE DETAIL

STANDARD DETAIL:	5-910
DATE.: JAN. 2021	REV: 3



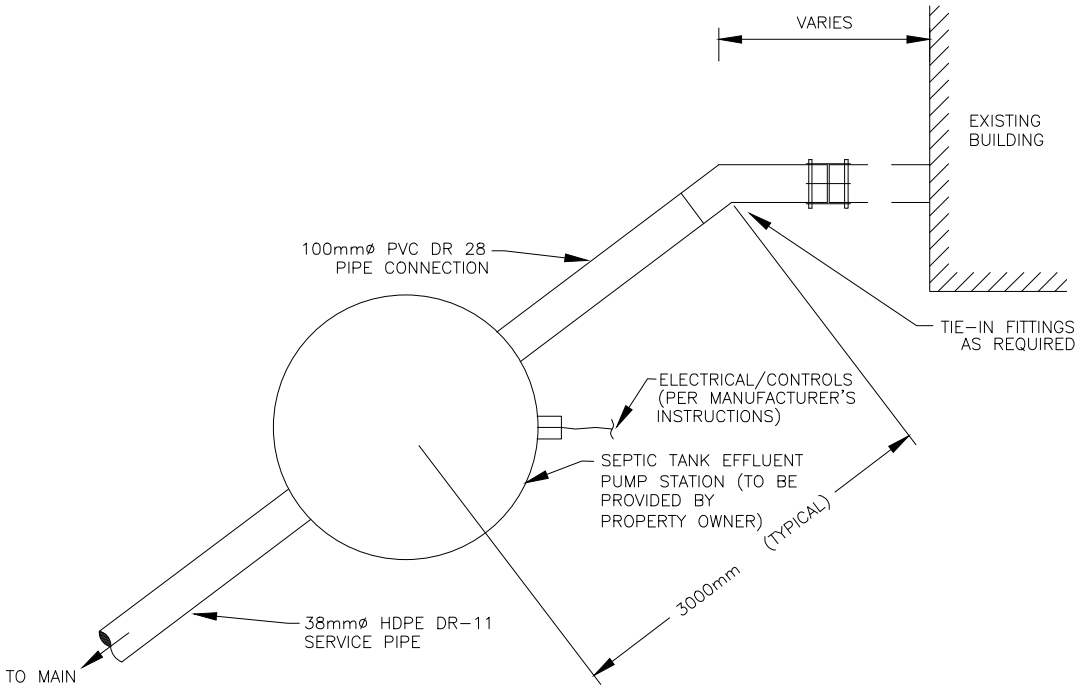
NOTES:
(1) CURB STOP TOP TO BE MARKED "SEWER".

REGIONAL MUNICIPALITY OF WOOD BUFFALO

LOW PRESSURE SEWER SERVICE CONNETION DETAIL

Time: 2:30pm
Date: Feb 02, 2021
File: \\Cd1044-06\work_group\11611\active\116110892O\drawing\sheet_files\figures\Section 5\3658-5-900s.dwg by
Xrefs:

STANDARD DETAIL:	5-911
DATE.: JAN. 2021	REV: 3



TYPICAL SEPTIC TANK EFFLUENT PUMP STATION INSTALLATION
AFTER CONNECTION TO LOW PRESSURE FORCEMAIN

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SEPTIC TANK EFFLUENT PUMP STATION INSTALLATION FOR LOW PRESSURE SEWER

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6 Stormwater Management

6.1 GENERAL

These standards cover the design and construction of stormwater management systems to be constructed or rehabilitated in the Regional Municipality of Wood Buffalo (Municipality), including storm sewers, stormwater ponds, ditches, swales, culverts, foundation drains and lot grading. Standard Drawings relating to stormwater system construction are provided at the end of this section.

These standards provide the minimum design criteria and general construction requirements and construction materials for Consulting Engineers to use in their preparation of specifications and drawings. These standards may be exceeded if warranted by the design consultant. Good engineering practices and designs must prevail on all projects.

The design of storm sewer system should conform to the Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems, as published by Alberta Environment and Parks and as amended by these Guidelines. Detailed storm water management standards and guidelines are described in the Alberta Environment and Parks publication entitled “Stormwater Management Guidelines for the Province of Alberta”.

6.2 STORMWATER MANAGEMENT PLAN

Stormwater runoff generated from within the subdivision 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.

A phased construction approach to match the expected development sequence may be acceptable upon approval by the Municipality, provided the requirements of this guideline are met. Temporary storm ponds and structures, without the required facilities and design components per this guideline, are not acceptable.

Prior to submission of any detailed design, a stormwater management plan shall be prepared by the Developer acceptable to the Municipality. Refer to Section 2.19 for stormwater management report requirements.

6.3 BEST MANAGEMENT PRACTICE

Best Management Practise (BMPs) are activities or practices, or a combination of practices, that are designed to reduce runoff volume and/or prevent or reduce the release of pollutants to receiving waters and streams. BMPs operate by trapping stormwater runoff and detaining it until unwanted pollutants such as sediment, phosphorous, and other harmful contaminants, can settle out or be filtered through the underlying soils.

The selection and design of stormwater BMPs must incorporate both water quantity and water quality concerns. Current stormwater quality criteria within the Municipality requires the removal of 85% TSS for particle sizes greater than (or equal to) 50 um.

Use of BMPs is recommended for all sites. However, BMPs are required for the following sites:

- Large commercial or industrial sites (greater than 2 ha)
- Gas stations, lube and oil change facilities, car wash, vehicle maintenance and mechanical shops, and sites with onsite storage of fuel.
- Heavy industrial and manufacturing sites.
- Or as required by the Municipality

In conjunction with any BMP measures an oil/grit separator is required for all sites that meet these criteria. The oil/grit separator is to be installed upstream of an inspection manhole with both being located prior to the site's connection to the common main. The inspection manhole to be located on public property (ideally 0.5m from the property line) or within an easement for Municipal access. The oil/grit separator to be located on private property and the property owner is responsible to ongoing maintenance and operation.

Refer to Section 12 Erosion and Sediment Control Measures for additional information relating to BMP's for erosion and sedimentation control.

6.4 LOW IMPACT DEVELOPMENT

Where practical, the following general principles should be considered for incorporated into the site plan to promote infiltration and reduce runoff from frequent minor storms. Site-specific design parameters are to be developed for each site based on input from the Geotechnical Engineer, Landscape Architect, Industry Best Practice, and Municipal requirements.

1. Soft landscaped areas to consist of deep absorbent soil. Where adjacent to roadways, subgrade protection is to be included in the design.
2. Underlay landscaping with sandy engineered soils to promote bio-filtration.
3. Consideration shall be given to rainwater harvesting for onsite irrigation or re-use.
4. Where appropriate soil and groundwater conditions exist, consider subsurface stormwater management systems for groundwater recharge.
5. Limit the use of grass turf / lawn landscaped areas as these areas require long term maintenance, irrigation and fertilizer. Use natural vegetation that contributes to diverse habitat and resilient ecology.
6. Maintain existing vegetation, in particular trees with canopies and deep roots.
7. Engineer bioswales and naturalized channels for the conveyance of stormwater.
8. Specify permeable hard-surfacing materials such as permeable pavers for low- traffic areas where appropriate.
9. Utilize green roofs on buildings to reduce runoff, provide habitat, increase the insulation value and reduce heat island effect.

6.5 MINOR AND MAJOR SYSTEMS

Each drainage system shall consist of the following components:

1. The Minor System comprised of pipes, manholes, catch basins, swales, storm water storage facilities, and outfall structures, shall convey run-off from snowmelt and rainfall events to an adequate receiving stream or pond without sustaining any surface ponding or excessive surface flows for events up to a 1 in 5-year return period.
2. The Major System shall consist of surface flood paths, roadways, parkways, outfall structures, and water courses which convey flows of a 100-year return frequency without damage to buildings and homes. The system shall include culverts crossing roadways. The major conveyance system accommodates flows not intercepted by or beyond the capacity of the minor drainage system through planned surface flow routes and stormwater management facilities. The design of the major drainage system must not be limited to the immediate development area but must consider overland flows that may enter the area from adjacent lands as well as downstream effects on adjacent development and receiving water bodies.

6.6 DESIGN FLOWS

Design flows for storm pipes shall be computed using one or more of the following methods:

6.6.1 Rational Method Design

The rational formula is applicable for the minor system storm sewer main design for watersheds (less than 50ha) which discharge into detention facilities or another outlet approved by the Municipality.

The rational formula is:

Where Q = Design flow in m^3/s
I = Rainfall intensity in mm/hr.
C = Runoff Coefficient (Refer to Section 6.7)
A = Drainage area in ha

6.6.2 Computer Modeling

Computer modelling shall be used for stormwater drainage design for:

1. Urban residential and commercial/industrial development areas greater than 50ha in size.
2. High density rural residential and commercial/industrial development areas greater than 50ha in size.
3. Low density rural residential development areas greater than 50ha in size.
4. Any development requiring storage or detention facilities.
5. Alternatively, computer modelling may be used for areas smaller than those outlined above.
6. The selection of an appropriate computer model shall be based on an understanding of their principles, assumptions, and limitations in relation to the system being designed. The RMWB currently maintains the stormwater modeling utilizing the PCSWMM software; therefore, it is the responsibility of the consultant to provide data in a compatible format.
7. Chicago Design Storms shall be used for conveyance system modeling and for the evaluation of short duration storage such as in roadway/parking trap lows. An R=0.30 shall be used. The A, B, C parameters shall be as outlined in the tables below. The Fort McMurray (3062696) values are based on the Environment Canada IDF curves utilizing 1966-2017 data. The Fort Chipewyan (3072658) values are based on the Environment Canada IDF curves utilizing 1969-1991 data. The A, B, C values were generated in PCSWMM by entering in the total rainfall depths provided in the Environment Canada IDF curves.

8. The storm duration used for modelling simulations will depend on the type of system being analysed. Depending on basin characteristics and outlet rates, short duration storms (1 - 4 hours) will generally govern the design of the storm sewer systems, and the longer duration storms (24 hours) will generally govern the design of stormwater management facilities. Therefore, several design storm durations should be evaluated to determine the worst-case scenario for the system being designed.
9. The Huff Design Storm, 1:100 year - 24 hour duration, with a rainfall depth of 95.9 mm, as provided in the table below, shall be used where long duration storge is required such as with stormwater management facilities.
10. Continuous Simulation must be performed for determining active storage requirements of stormwater management facilities when the facility Unit Area Release Rate (UARR) is low, such as is often the case for facilities that rely on infiltration and\or evaporation for stormwater disposal. This type of analysis is particularly important for these types of facilities because they do not necessarily have time to drain down prior to the next rainfall event occurring. The more conservative result obtained from Continuous Simulation and Single Event analyzes shall be used as the required active storage of the stormwater management facility.

Parameters	Fort McMurray Chicago Design Storm Return Period					
	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
A	232.047	375.344	474.085	599.323	695.999	792.190
B	1.597	2.517	2.963	3.246	3.525	3.742
C	0.683	0.701	0.708	0.715	0.719	0.722

Parameters	Fort Chipewyan Chicago Design Storm Return Period					
	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
A	218.639	356.793	452.850	579.483	665.014	759.403
B	2.982	3.178	3.300	3.486	3.414	3.460
C	0.697	0.723	0.734	0.744	0.748	0.753

Huff Design Storm, 1:100 Year - 24 Hour Duration; D=95.9mm							
Time (H:M)	Value	Time (H:M)	Value	Time (H:M)	Value	Time (H:M)	Value
0:00	0.0000	6:00	8.4857	12:00	2.1820	18:00	1.2047
0:05	0.2424	6:05	8.3341	12:05	2.1593	18:05	1.1971
0:10	0.4773	6:10	8.1826	12:10	2.1290	18:10	1.1895
0:15	0.7198	6:15	8.0311	12:15	2.1063	18:15	1.1819
0:20	0.9546	6:20	7.8492	12:20	2.0835	18:20	1.1744
0:25	1.1971	6:25	7.6674	12:25	2.0532	18:25	1.1744
0:30	1.4320	6:30	7.4856	12:30	2.0305	18:30	1.1668
0:35	1.6668	6:35	7.3113	12:35	2.0078	18:35	1.1592
0:40	1.9093	6:40	7.1446	12:40	1.9850	18:40	1.1592
0:45	2.1441	6:45	6.9704	12:45	1.9623	18:45	1.1516
0:50	2.3866	6:50	6.8037	12:50	1.9396	18:50	1.1440
0:55	2.6215	6:55	6.6294	12:55	1.9093	18:55	1.1440
1:00	2.8639	7:00	6.4627	13:00	1.8865	19:00	1.1365
1:05	3.1821	7:05	6.3036	13:05	1.8638	19:05	1.1289
1:10	3.5003	7:10	6.1370	13:10	1.8335	19:10	1.1213
1:15	3.8185	7:15	5.9778	13:15	1.8108	19:15	1.1137
1:20	4.4550	7:20	5.8490	13:20	1.7805	19:20	1.0986
1:25	5.0914	7:25	5.7278	13:25	1.7577	19:25	1.0910
1:30	5.7278	7:30	5.5990	13:30	1.7274	19:30	1.0759
1:35	6.3718	7:35	5.4778	13:35	1.7047	19:35	1.0607
1:40	7.0082	7:40	5.3490	13:40	1.6744	19:40	1.0456
1:45	7.6523	7:45	5.2278	13:45	1.6517	19:45	1.0304
1:50	8.2811	7:50	5.1066	13:50	1.6289	19:50	1.0152
1:55	8.9175	7:55	4.9778	13:55	1.5986	19:55	1.0077
2:00	9.5464	8:00	4.8565	14:00	1.5759	20:00	0.9925
2:05	10.1752	8:05	4.7277	14:05	1.5456	20:05	0.9774
2:10	10.8116	8:10	4.6065	14:10	1.5229	20:10	0.9622
2:15	11.4405	8:15	4.4777	14:15	1.4926	20:15	0.9471
2:20	11.8724	8:20	4.3792	14:20	1.4774	20:20	0.9395
2:25	12.2966	8:25	4.2883	14:25	1.4547	20:25	0.9243
2:30	12.7285	8:30	4.1898	14:30	1.4395	20:30	0.9168
2:35	12.8573	8:35	4.1368	14:35	1.4320	20:35	0.9092
2:40	12.9785	8:40	4.0913	14:40	1.4320	20:40	0.9016
2:45	13.1073	8:45	4.0383	14:45	1.4244	20:45	0.8940
2:50	13.2058	8:50	3.9852	14:50	1.4168	20:50	0.8864
2:55	13.3119	8:55	3.9398	14:55	1.4092	20:55	0.8789
3:00	13.4104	9:00	3.8867	15:00	1.4016	21:00	0.8713
3:05	13.5392	9:05	3.8337	15:05	1.3941	21:05	0.8637
3:10	13.6604	9:10	3.7882	15:10	1.3941	21:10	0.8561
3:15	13.7892	9:15	3.7352	15:15	1.3865	21:15	0.8486
3:20	13.8877	9:20	3.6822	15:20	1.3789	21:20	0.8410
3:25	13.9938	9:25	3.6291	15:25	1.3713	21:25	0.8334
3:30	14.0923	9:30	3.5761	15:30	1.3638	21:30	0.8258

Huff Design Storm, 1:100 Year - 24 Hour Duration; D=95.9mm							
Time (H:M)	Value	Time (H:M)	Value	Time (H:M)	Value	Time (H:M)	Value
3:35	14.0165	9:35	3.5306	15:35	1.3562	21:35	0.8183
3:40	13.9407	9:40	3.4776	15:40	1.3562	21:40	0.8031
3:45	13.8650	9:45	3.4321	15:45	1.3486	21:45	0.7955
3:50	13.6907	9:50	3.3791	15:50	1.3410	21:50	0.7880
3:55	13.5089	9:55	3.3337	15:55	1.3410	21:55	0.7728
4:00	13.3346	10:00	3.2806	16:00	1.3335	22:00	0.7652
4:05	13.1300	10:05	3.2276	16:05	1.3259	22:05	0.7501
4:10	12.9331	10:10	3.1821	16:10	1.3259	22:10	0.7425
4:15	12.7285	10:15	3.1291	16:15	1.3183	22:15	0.7273
4:20	12.5239	10:20	3.0836	16:20	1.3107	22:20	0.7198
4:25	12.3269	10:25	3.0306	16:25	1.3107	22:25	0.7046
4:30	12.1224	10:30	2.9851	16:30	1.3032	22:30	0.6970
4:35	11.9481	10:35	2.9321	16:35	1.2956	22:35	0.6819
4:40	11.7663	10:40	2.8866	16:40	1.2956	22:40	0.6743
4:45	11.5920	10:45	2.8336	16:45	1.2880	22:45	0.6592
4:50	11.3875	10:50	2.7881	16:50	1.2804	22:50	0.6516
4:55	11.1905	10:55	2.7503	16:55	1.2804	22:55	0.6364
5:00	10.9859	11:00	2.7048	17:00	1.2728	23:00	0.6288
5:05	10.7813	11:05	2.6593	17:05	1.2653	23:05	0.6137
5:10	10.5844	11:10	2.6139	17:10	1.2577	23:10	0.6061
5:15	10.3798	11:15	2.5684	17:15	1.2501	23:15	0.5910
5:20	10.1525	11:20	2.5230	17:20	1.2425	23:20	0.5834
5:25	9.9252	11:25	2.4851	17:25	1.2425	23:25	0.5682
5:30	9.6979	11:30	2.4396	17:30	1.2350	23:30	0.5607
5:35	9.4933	11:35	2.3942	17:35	1.2274	23:35	0.5455
5:40	9.2963	11:40	2.3563	17:40	1.2274	23:40	0.5379
5:45	9.0918	11:45	2.3108	17:45	1.2198	23:45	0.5228
5:50	8.8872	11:50	2.2654	17:50	1.2122	23:50	0.5152
5:55	8.6902	11:55	2.2275	17:55	1.2122	23:55	0.5000
						24:00:00	0.4925

6.7 RUNOFF COEFFICIENTS

The runoff coefficients for a 5-year event return period shall be taken from the following table:

Runoff Coefficients for 5-Year Event Return Period		
Surface	Slope 1:01 to 1:15	Slope 1:15 to 1:50
Pavements and Walks	0.95	0.95
Roofs	0.95	0.95
Clay Soils		
Sparse Vegetation	0.70	0.55
Lawns	0.30	0.20
Weeds and Bush	0.20	0.15
Dense Wood	0.17	0.12
Sandy Soils		
Sparse Vegetation	0.40	0.30
Lawns	0.17	0.12
Weeds and Bush	0.15	0.10
Dense Woods	0.13	0.08

However, based on land use, the runoff coefficients to be used are:

Agricultural	0.10
Low Density Rural Residential	0.15
High Density Rural Residential	0.25
Urban Residential	0.45
Commercial	0.75
Light Industry	0.75
Asphalt, Concrete, Roof	0.95

6.8 RATE OF PRECIPITATION

Generally, the rate of precipitation shall be obtained from the rainfall curves as outlined in Section 6.32. However, the Engineering Department shall be consulted prior to selecting rainfall curves for design purposes as updated and/or more applicable data may be available for the area of development.

The “Six Lakes” site shall be considered the separation line between the Fort McMurray and Fort Chipewyan areas. All areas south of “Six Lakes” will consider use of the Fort McMurray rainfall data, and all areas north of “Six Lakes” will consider use of the Fort Chipewyan rainfall data.

The five-year frequency curve shall be used for all minor systems. The 100-year frequency curve shall be used for major systems, as well as roadway culverts, storm ponds outfall structures, and other critical infrastructure.

The inlet time is the time for run-off from the furthest reach of the catchment to flow overland to the first inlet; and should not exceed 10 minutes.

6.9 SITE AND LOT GRADING

Proper lot grading is the first step towards a well-planned major drainage system. The goal of the lot grading shall be to protect private property and critical infrastructure, by ensuring that water flows away from the buildings, and into a municipal drainage system. Where applicable, site grading shall also be used to protect groundwater supply wells and septic beds.

The following criteria shall be used:

1. Each lot should be graded to drain to the municipal storm drainage system, independently of adjacent lots where possible. Generally, stormwater discharge to adjacent private property is not permitted.
2. Flow from lots shall always have an escape route to a public right-of-way. The lot-grading plan shall develop a proper balance between the road and gutter elevations, proposed building elevations, surrounding development and existing topography.
3. Buildings should be above the Major System hydraulic grade line for a 100-year storm event plus a minimum of 0.30 m freeboard to the building threshold. Note: this may not apply to replacement of structures/developments within existing flood plains. In these areas, suitable precautions such as mounting electrical panels above the 1:100-year level shall be taken.
4. Areas around buildings shall be graded away from the foundations to prevent flooding. An initial grade of 1 in 10 (10%) sloping away from the building for a distance of 2m shall be required on all sides for landscaped areas and 3% for hard surfaces.
5. The slope shall continue at a minimum grade of 1 in 50 (2.0%) and maximum grade 1 in 3 (33.3%) to the property boundary.
6. Note that steep slopes may require special consideration for contouring, erosion control, and terracing with retaining walls, subject to the landscaping and geotechnical requirements.

7. Private lots that are lower than adjacent roadways, alleys, PUL's or utility ROW's should be avoided where possible.
8. To provide basic positive drainage until a lot is developed, the lot(s) shall be rough graded, allowing for earth balancing of future basement excavation and landscaping. Rough grading is to be within +/- 50 mm and may allow for a lot-by-lot balancing of fill from basement excavations.
9. All lots where the lot grading plan has been designed to allow for walk out basements shall be indicated on the overall drainage plan for the subdivision. Deviations from the approved plan will not be considered.
10. All retaining walls and drainage easements shall be registered on title by the Developer as part of the Subdivision Plan. If a retaining wall is required between adjacent lots, the swale shall be constructed above the retaining wall.

6.10 FOUNDATION DRAINS

Foundation drains shall be pumped and discharged to the surface, away from buildings or to a storm service pipe (weeping tile drain) which is the requirement for all new developments. Where foundation drains are pumped to the surface it is the Lot Owners responsibility to ensure water is discharged to a landscape area and directed away from private and public sidewalks. Unless approved by the Municipality, foundation drains shall not discharge to existing (older) storm sewer systems and under no circumstances shall they be discharged to the sanitary system.

6.11 STORM SERVICE (WEEPING TILE DRAIN)

Storm services to collect drainage from building weeping tiles/foundation subdrains, is required on all new developments and developments with underground parking.

For single family residential lots the storm service shall be 100 mm PVC and installed such that the sanitary service is situated between the water and storm service.

6.12 ROOF DRAINAGE

1. Roof drainage from single family and duplexes shall be discharged to the ground and dispersed via splash pads at the downspouts. The point of discharge shall be a minimum 1.5m away from the building (including downspout extensions) to ensure water flows away from it. Provisions shall be made to prevent soil erosion.
2. Roof drainage from apartment buildings and commercial/industrial areas shall subscribe to the principles of Low Impact Development described in Section 6.4 and may only discharge directly to the storm sewer system upon approval by the Municipality.
3. The municipality will only approve direct discharge of roof leaders to the storm sewer when conditions warrant in order to prevent erosion and/or property damage, and no other cost-effective solution is available and there is sufficient capacity in the system to accommodate the flows.

6.13 FLOW CAPACITIES

6.13.1 Storm Sewers and Open Channel Design

The following formulas are to be used for pipe flow design or the storm pipe system.

Using Manning's formula:

For closed pipe systems, including storm sewers, catch basin leads and foundation drains, the required minimum pipe diameter can be determined as follows:

Where Q = Rate of flow in m^3/s

D = Internal pipe diameter (m)
A = Flow area (m^2)
R_h = Hydraulic Radius (m) = Flow Area / Wetted Perimeter = D/4 for full flow
S = Pipe Slope (m/m)
n = Roughness Coefficient, as follows:

Pipe or Channel Material	Roughness Coefficient (n Value)
PVC or other smooth walled plastic pipe	0.011
Smooth walled concrete pipe	0.013
Corrugated steel pipe (unpaved)	0.024
Corrugated steel pipe (invert paved)	0.020
Gravel lined channels	0.020
Concrete or asphalt lined channels	0.013
Natural streams and grassed channels	0.050

6.14 PIPE ALIGNMENT

1. See standard drawings for typical location within road right-of-way.
2. Service connections, if approved, should be located adjacent to sanitary service connection at property line and shall be as shown on the standard drawings.
3. Minimum separation of storm sewer from water mains:
    - 3.0 m horizontally.
    - 0.5m vertically above or below water pipe and in separate trench if 3m horizontal separation is not possible.
4. Minimum separation of storm sewer from sanitary sewer is 3.0 m horizontally.
5. With Municipal approval, the minimum pipe separation can be reduced for lanes with three utilities.

6.15 MINIMUM DEPTH OF COVER

The minimum depth of cover on storm sewer pipe shall be as follows:

Storm sewers in roads (600mm and smaller)	minimum 2.5m to obvert
Storm sewers in roads (larger than 600mm)	Minimum 2.0m to obvert
Culverts across roads	minimum 1.0m to obvert
Catch basin leads at the catch basin	minimum 2.0m to obvert
Landscaped areas	minimum 2.5m to obvert

Pipe insulation may be considered where minimum depth of cover cannot be met. Pre-insulated pipe is not recommended for storm sewers exposed to atmospheric conditions via catch basin vents.

6.16 MINIMUM PIPE DIAMETER

Subject to the hydraulic flow capacities, the minimum pipe diameters are as follows:

Storm sewers	300 mm
Culverts crossing roads	500 mm
Driveway Culverts - Residential	400 mm
Driveway Culverts – Industrial / Commercial	500 mm
Catch basin leads	250 mm
Storm service leads	100 mm (Single Family Residential Storm Service)

6.17 MINIMUM PIPE VELOCITY AND GRADE

Storm sewer velocities shall not be less than 0.6m/sec when flowing full. Flow velocities of less than 0.9m/sec are not recommended. When the flow velocity exceeds 3.0 m/sec, special consideration shall be given to the design of junctions and bends in the system. See Minimum Design Slopes for Storm Sewer in Alberta Environment and Parks publication titled “Standards and Guidelines for Municipal Waterworks, Wastewater, and storm Drainage Systems in Alberta”, Table 5.1.

The minimum grades are as follows; steeper grades are desirable:

Pipe Size mm	Minimum Grade, %
100*	1.0
200*	0.40
250	0.3% (2.0% for CB Leads)
300	0.23
375	0.17
450	0.13
525	0.11
600 and larger	0.10

*To be used for Storm Services only.

6.18 CURVED SEWERS

Curved sewers shall be aligned parallel to the road centreline. Maximum joint deflection shall be as recommended by the pipe manufacturer; tighter curvature shall be accommodated through deflections at manholes. Minimum grade on curved sewers shall typically be 50% greater than the aforementioned grades. This may be reduced if proper analysis has been completed and will be considered on a case-by-case basis.

6.19 MANHOLES

1. Generally, the crown of the downstream pipe shall not be higher than the crown of the upstream pipe.
2. A smooth transition shall be provided between the inverts of incoming sewers and the outlet sewer and extreme changes in elevation at manholes should be avoided wherever feasible.
3. Minimum drop in invert levels across manholes to account for energy loss:
    a. straight run - 0mm drop minimum
    b. deflections up to 45° - 30mm drop minimum
    c. deflection 45° to 90° - 60mm drop minimum
    d. Deflections greater than 90° shall be accommodated using two (2) or more manholes.
4. Benching is to be provided in all manholes to provide a smooth transition from the inlet to the outlet, minimize hydraulic losses, and prevent debris from getting caught in the manhole. Reference Standard Drawing detail.
5. Where drops greater than 1.0m cannot be avoided, a specifically designed drop manhole may be required to address the hydraulic requirements of the change in elevation. Considerations include:
    a. Upstream flow shall be sub-critical, and the pipe shall be of sufficient size so that it does not surcharge.
    b. A smooth vertical curve shall be formed between the inlet pipe and the drop shaft with no breaks in grade, projections or edges.
    c. The drop shaft diameter shall be equal to or greater in size than that of the largest inlet pipe. For multiple connections, a larger drop shaft shall be supplied.
    d. Air vents shall be provided.
    e. Cover shall be able to withstand pressures from air discharge and surcharging.
    f. The outlet shall provide a hydraulic jump basin to dissipate energy, to convert the flow to sub-critical velocity and to allow for the release of air.
6. Baffled vertical drop shafts are generally not permitted due to potential maintenance and access problems. Vortex type drop shafts are preferred. Proposals to use vortex type drop shafts must be supported by the appropriate design calculations and approved by the Engineering Department.
7. For manhole abandonment, plug all pipes with non-shrink grout, remove and dispose of manhole to 1m below ground and fill with fillcrete.

6.20 MANHOLE SPACING

1. Manholes shall be provided at the end of each line and at all changes in pipe sizes, grade and alignment.
2. The maximum distance between manholes shall be 150 m.
3. For curved sewers, manholes spacing shall be 90m maximum for sewers 1,200mm and smaller and 120m for sewers larger than 1,200mm

6.21 CATCH BASINS

1. Catch basins shall be of sufficient number and have sufficient inlet capacities and adequate catch basin leads to receive and convey the calculated stormwater flow.
2. Catch basins shall be provided to intercept surface runoff and shall be spaced a maximum of every 120 metres.
3. Maximum distance to the first catch basin along a gutter flow path shall be 150 metres.
4. All catch basin bodies shall be of precast concrete sections conforming to the most recent ASTM specifications, 900mm diameter and constructed so as to provide a 600mm sump to trap rocks and gravel.
5. Catch basins leads shall be installed to provide a minimum depth of cover, from design finish grade of 2m to obvert unless otherwise approved. The minimum slope on catch basin leads shall be 2 percent.
6. All catch basin leads shall discharge directly into a storm sewer manhole or catch basin manhole, direct connection to the storm sewer main will not be accepted.
7. The length of catch basin leads shall not exceed 30m. If it is required to extend a lead more than 30m, a catch basin manhole shall be used.
8. All urban lots to be serviced which are greater than 0.3ha in size shall require a private underground storm sewer system with outlets into the existing Municipality system.
9. For abandonment of catch basins follow procedure for abandonment of manholes.
10. Catch basin placement to avoid commercial/industrial driveway crossings.

6.22 SWALES

1. Swales are required to intercept runoff between adjacent private properties where the overall gradient of the land is perpendicular to the property lines. Swales must be within a registered drainage easement. Grass swales may be used for longitudinal slopes steeper than or equal to 2%, with provision for erosion protection per above. Where the longitudinal slope of the swale is less than 2%, a concrete swale is required. Refer to the standard detail drawings.
2. Drainage easements of a minimum 2.0 m width are to be registered with the Plan of Subdivision. Restrictive covenants will also be required to be registered on title of private properties where the drainage easements and related infrastructure are installed.
3. 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 end of the swale.
4. Concrete swale is required when the length of the grass swale exceeds 100m in length or the swale is designed to accommodate flow from three or more adjacent lots.
5. 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 and ice melt.

6.23 DITCHES

Open ditches may be used along rural roads as a means of conveying and storing stormwater. Ditches along the streets and lanes within urban developments are not permissible unless they are a part of a properly designed Low Impact Development (LID) Storm Water Management System approved by the Municipality.

1. The minimum allowable roadside ditch grade shall be 0.5%. Ditch grades in excess of 2.0% shall be protected against erosion through rock ditch checks, silt fences, Enviroberm fences and/or erosion control blankets. Typical ditch check installations are illustrated in the Standard Detail Drawings.
2. The minimum ditch bottom width shall be 1.5m sloping away from the roadway at a minimum of 5.0%.

6.24 CULVERTS

1. Culvert design should consider flow capacity and back water effects over a range of flows. The design capacity of the culvert requires assessment for both its nominal design and its performance during the 100-year storm event. For maintenance purposes the minimum nominal diameter for culverts is as follows:

Culvert Type	Diameter
Roadway Crossing	500mm
Residential Approach	400mm
Industrial Approach	500mm
Trail Crossing	300mm

2. Culverts shall be new galvanized C.S.P. (corrugated steel pipe) with a minimum wall thickness of 1.6mm, or as required by the loading criteria. All culverts shall be installed in accordance with the manufacturer's recommendations and shall be installed complete with bevelled end sections on both the inlet and outlet ends with the invert extended to the toe of the side slope.
3. All roadway culverts shall be installed to provide a minimum depth of cover of 500mm or one-half (½) the culvert diameter, whichever is greater, as measured from the finished shoulder grade of the roadway to the top of the culvert. A typical culvert installation detail is illustrated in the Standard Drawings.
4. Riprap shall be placed around the inlet and outlet of all culverts. Riprap material shall consist of rock ranging in size from 150mm to 350mm with 50% of the rock material being larger than 200mm and 300mm nominal thickness. Typical riprap installations are illustrated in the Standard Detail Drawings.
5. Geotextile Fabric shall be a non-woven fabric with a minimum tensile strength of 1300 N.
6. Where required, trash screens are to be mounted to the sloped face of a culvert headwall. Do not install trash screens inside the culvert barrel.
7. Maximum length of culverts are as follows. Longer culverts will require an intermediate access point (i.e. catch basin or manhole) to be installed.

Culvert Size	Maximum Length
Up to 600 mm	60 meters
600 mm up to 1200 mm	120 meters
Larger than 1200	No maximum length

6.25 EROSION AND SEDIMENT CONTROL

1. All land development and capital works projects shall have Erosion and Sediment Control measures in place for the project site during construction, to prevent erosion of the site and sediment discharge via runoff to receiving waters. Refer to Section 12 Erosion and Sedimentation Control for additional information.
2. All excavation sites and stockpile sites shall be surrounded by silt fencing to prevent the migration of silts and sediments from the site.
3. All catch basins on, within and downslope of a development site with the potential to receive silt and sediment from the road surface shall be fitted with a Catch Basin Sediment Trap or similar technology, sized appropriately for the catchment area, anticipated runoff rates, sediment loads and other potential contaminants, including oils and nutrients.
4. All exposed earth slopes subject to surface runoff shall be landscaped and vegetated to prevent the mobilization and erosion of silts and materials from the slope. Erosion control blankets or straw / coco-matting shall be installed at the Developer's cost at the direction and discretion of the Municipality if there is an identified risk of erosion prior to the establishment of vegetation on slopes.
5. Outfalls of storm sewers shall be designed to control local erosion to the conveyance channel or receiving stream and not change the hydraulic characteristics of the receiving stream.
6. All storm drainage systems, including pipe outlets and other drainage channel outlets or overflows shall be designed to control erosion that may result from piped or overland stormwater flows and discharge into the storm drainage system.
7. Rip rap used for erosion protection shall be sized appropriately for the design flow and velocity and be underlain by either an appropriately graded gravel mat or geotextile depending on the native substrate. Rip rap to be individually hand-placed or machine-placed, and not end-dumped. Gabion blocks or gabion "Reno" mattresses may also be considered subject to approval by the Municipality.
8. For private land development projects, the developer will be responsible for all the erosion control costs and maintenance as required up to FAC. Before issuing FAC, the Municipality will indicate if any sediment traps are to be cleaned and retained at the Developer's cost; all other sediment traps are to be removed by the Developer. Maintenance and ultimate removal of retained sediment traps following FAC will be the responsibility of the Municipality.

6.26 PIPE, MANHOLE AND BEDDING MATERIALS AND SPECIFICATIONS

6.26.1 Pipe Materials

Pipe shall comply with the specifications listed in the following table. Pipe shall be jointed with rubber gasketed fittings or couplings.

Acceptable Pipe Materials		
Material	**Range (mm)**	**Specification**
Reinforced Concrete	300mm and up	CAN/CSA A257.2-03, ASTM C76M Class III min.
PVC (solid wall)	100 to 1500mm	ASTM D3034 DR35 (CSA B182.2)
PVC Open Profile	200 to 1500mm	CSA-B182.4, 320 kPa pipe stiffness
HDPE Open Profile	100 to 900 mm	CSA B182.8
Polypropylene (PP)	100 to 1500mm	CSA B182.13, 320 kPa pipe stiffness
Corrugated Steel Culverts	400mm and up	CAN3-G401, AASHTO-M-36

6.26.2 Manholes

1. Storm Manholes shall conform to Section 5.16.3 and Standard Drawing Details
2. Exterior waterproofing requirements described in 5.16.3 will not be required on Storm manhole and catch basins.

6.26.3 Bedding Material

For bedding material gradation and specification refer the Standard Drawings & the Standard Construction Specifications.

6.27 MAJOR STORM DRAINAGE SYSTEM

The major storm system shall consist of the overland flow routes, storm ponds and trunk storm sewers to convey stormwater away from buildings and homes in a manner that prevents flooding and damage to downstream habitat and infrastructure.

Overland flow routes shall be clearly identified as part of the stormwater management plan and engineering drawings, including the requirement for any drainage PUL's to be registered as part of the Plan of Subdivision. Cross-sections shall be included for the 100-year event on back easements.

6.27.1 Trap Lows

1. Trap lows can be used to manage stormwater major drainage on public road rights-of-ways, and on private and public lots within parking areas, and other flat-graded areas.
2. The maximum depth of ponding shall be 350 mm in parking lots and roadways, and the minimum freeboard to the nearest building entrance threshold shall be 300 mm. On arterial roadways the maximum depth of ponding shall be 150 mm.
3. Where Trapped Low Areas are included into the design of a stormwater overland drainage system, the Developer, at its sole cost and expense and to the satisfaction of the Municipality, shall register a Stormwater Impoundment Easement and Restrictive Covenant against all certificates of title for each of the lots adjacent to the Trapped Low Areas where the maximum depth of the storm water located in the streets and lanes is designed to be greater than 0.30 metres in depth.
4. This restrictive covenant states the following:
    a. Permitting the collection and storage of stormwater on such property.
    b. Prohibit any grading or regrading of the lot, expect in strict accordance with the building grade plan as approved by the Municipality.
    c. Prohibiting the construction of any opening in the walls of any structure withing any lot adjacent to the trapped low area unless the openings are higher than 0.3m above the maximum elevation of the trapped low area.
5. All trapped lows to be shown on the Engineering Consultants Major Overland Drainage Plan as well as the Building Grade Plan.
6. The velocities and depths of flow in the major drainage system shall not exceed the following:

Depth of Flow (m)	Maximum Water Velocity (m/s)
0.8	0.5
0.3	1.0
0.2	2.0
0.1	3.0

7. Trapped low storage should be implemented to offset peak flows where necessary to keep water velocities and depths below those noted above.
8. The Engineering Consultant shall recommend a building elevation to the lot purchaser that is above trapped low ponding elevations and designed to drain surface run-off to the street or lane/utility right of way.

6.27.2 Controlled Release Rate

For new development areas the post development rate of discharge from the development shall not exceed 3.5L/s/ha for the 100-year design storm event, unless otherwise prescribed by Alberta Environment for the receiving water body. Lower rates may be required depending on the receiving stream.

Fore re-developments the stormwater flows will be restricted to the allowable capacity in the existing storm sewer pipe system. All stormwater that exceeds the capacity of the existing storm pipe system to be retained/stored onsite.

6.28 STORM WATER MANAGEMENT FACILITY (SWMF)

6.28.1 General

Construction of stormwater management facilities (e.g., storm ponds, constructed wetlands and/or overland drainage channels and bioswales), including any storm sewer mains required to drain the stormwater management facility, require Alberta Environment and Parks approval.

6.28.2 Design Requirements

6.28.2.1 General

The use of SWMF is required to reduce peak flow rates to downstream sewer systems and/or watercourses, or to provide a temporary receiving area for peak major drainage flows. Their approximate location and size must be identified at the time of Area Structure Plan or Outline Plan approval to avoid conflicts with adjacent land uses. The effects of the maximum pond water levels shall be considered in the design of the minor system and lot grading. If possible, the crown elevations of the pipes in the first manhole upstream of a pond shall be at or above the maximum pond level during the five-year storm event.

6.28.2.2 Geotechnical Considerations

Soils investigations specific to the SWMF shall be undertaken to determine the soils permeability and salinity (or other potential contaminants), and the elevation of the groundwater table. Where the facility is sited above a shallow aquifer, the potential for groundwater contamination must be minimized.

If the pond is to be a dry pond and the pond bottom is below the water table, a weeping tile system may be required to keep the pond bottom dry enough to support grass growth and maintenance equipment.

6.28.2.3 Water Quality

To achieve water quality in accordance with provincial and federal regulations, the Engineering Consultant shall incorporate stormwater treatment measures ranging from mechanical treatment unites (oil/grit separators) to the various forms of retention ponds in the design of any SWMF.

6.28.2.4 Erosion and Sediment Control

An erosion and sediment control plan is required as part of the Stormwater Management Study to define measures which must be undertaken for the control of sediment into the SWMF and into the receiving body of water. Refer to Section 12 Erosion and Sedimentation Control for more information.

6.28.2.5 Storage Alternatives

As part of the review of the stormwater management alternatives for application to a specific area, the following storage methods should be considered:

1. Dry Pond Storage
    a. Dry pond (detention) storage is the stormwater management method where the storm run-off is collected, and the excess run-off is temporarily detained for a short duration and released after the storm run-off from the contributing area has ended. Generally, low flows do not enter the pond. A mechanical treatment unit is generally required for this method of storm detainment to achieve required water quality treatment before releasing the detained stormwater into the storm sewer system.
2. Wet Pond Storage
    a. Wet pond (retention) storage functions the same as dry pond detention except that a portion of the stormwater is permanently retained below the detention volume.
3. Constructed Wetlands
    a. Constructed Wetlands are treatment systems that capture stormwater and use natural processes involving wetland vegetation, soils, and their associated microbial assemblages to improve water quality that are beneficial to both humans and wildlife.
4. Overland Drainage
    a. Stormwater is guided through vegetated swales, rather than concrete pipes. Use of this alternate system is at the discretion of the Municipality.

6.28.3 Outflow Control

The outlet from a SWMF must incorporate appropriate means for the control of outflow and to limit the rate of discharge.

6.28.4 Emergency Spillway Provisions

The feasibility of an emergency overflow spillway is to be evaluated for each SWMF (wet or dry) design, and where feasible, such provisions are to be incorporated in the pond design.

As part of the pond design process, the probable frequency of operation of the spillway should be determined. Where it is not possible to provide an emergency spillway route, the design is to include an analysis of the impact of over-topping the pond and a significant (greater than 0.6m) freeboard above the 100-year level.

The functional requirements of the spillway and the impact analysis for the absence of one, are to consider the possible consequences of blockage of the system outlet or overloading due to run-off events, such that the storage capacity of the facility may be partially or completely unavailable at the beginning of a run-off event.

6.28.5 Landscaping Requirements

For landscaping requirements, refer to Section 10 Landscape and Park Development Standards.

6.28.6 Signage for Safety

The design of SWMF shall include adequate provisions for the installation of signage to warn of anticipated water level fluctuations. Warning signs will be as per Standard Drawing Detail 6-505.

6.28.7 Vehicle Access for Maintenance

1. A combination of pathway and reinforced turf shall be designed to provide pond access for maintenance vehicles to reach the ponds inlet/outlet structure, inlet pipes and/or treatment unit as well as providing a working area.
2. The access road is to be the most direct route between the road/lane and the storm structure.
3. The access design and working area are to be site specific and approved by the Municipality subject to the following:
    a. Base structure equal or great than a lane (consideration may be given to the base being in a wet state).
    b. Reinforced turf product acceptable for turf growth and east of maintenance.
    c. Minimum access width of 4.5m.
    d. Working area of up to 500 m^2 at inlet structures.
    e. Turf reinforcement product to be installed as per manufactures specifications.
    f. Pond slope along access may require adjustment to meet typical road grade requirements.
    g. A minimum centreline radius of 10.25 m to be provided on curved portions of the vehicle access road including any portions of pathway that may be used.

6.28.8 Dry Detention Ponds

Although dry ponds are not preferred, they may be acceptable if proposed, provided that they can meet the water quality treatment requirements. As dry ponds become a “green space” within a subdivision they should have gentle side slopes and be aesthetically contoured and landscaped to provide an attractive feature for the neighbourhood.

Integration of dry ponds with compatible land uses such as flood-resistant recreational amenities and sports fields should be considered.

The following general design parameters should be considered for a dry pond in a development:

1. Storage capacity for up to the 100-year storm event.
2. Detention time to be determined based on downstream capacity, recommended maximum detention time is 24 hours.
3. Maximum active detention storage depth to be 1.5m. The maximum water level should be below adjacent house basement footings (a greater freeboard will be required if an emergency overflow route cannot be provided).
4. Maximum interior side slopes of 5:1 (7:1 is recommended)
5. All outflow piping shall be sized for a flow of 25% greater than the maximum designed control flow. Water release shall be controlled by means of an orifice or other approved means and shall include provisions for increasing the release rate in an emergency.
6. Maximum 4:1 ration of effective length to effective width measured at 100-year high water level.
7. Minimum lateral slope in the bottom of the pond of 2.0% and minimum longitudinal slope of 1.0%.
8. Low flow bypass for flows from minor events to be provided.
9. Address potential safety issues (e.g. catch basin as a mowing hazard, access to pipe system by a person, etc.) through design and warning signage.

6.28.9 Wet Detention Pond

Wet detention ponds are to be approved at the Area Structure Plan or Outline Plan stage.

Design of a wet pond is to be in accordance with the Alberta Environment and Parks publication entitled "Storm Water Management Guidelines". Some general design parameters to consider are:

1. Minimum water surface area of 2.0 ha.
2. Maximum side slopes of 7:1 between the High-Water level (HWL) and 1.0m below Normal Water level (NWL).
3. Minimum permanent pool depth of 2.0 m; maximum permanent pool depth of 3.0m.
4. Maximum 1:100-year active storage depth of 2.0m.
5. The minimum freeboard above the HWL shall be 0.30 m.
6. There shall be a minimum pond water turnover rate of twice per year based on the 1:5-year low precipitation rate as selected for the water balance over the five-month period of May through September within the Municipality.
7. Dead bay areas shall not be permitted.
8. All inlet and outlet structures shall be submerged a minimum of 1.2m below the NWL.
9. The normal water 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, under a 1:5-year storm.
10. Sedimentation forebays required at each inlet to the pond.
11. Edge treatment required along the pond perimeter, designed to protect against erosion.
12. Design of outlet control structure is to be capable of maintain the permanent pool depth.
13. The wet pond design should incorporate a pedestrian pathway connected to the regional trail network. Refer to Section 10 Landscape and Park Development Standards.
14. When possible preserve existing wetlands by incorporating them into the stormwater management plan.

6.28.10 Wet Pond Water Quality

All wet ponds within new developments shall have a system for the prevention of water stagnation and algae blooms, to be paid for and installed by the Developer. It must be demonstrated through calculations provided by the Engineering Consultant that the combination of annual turnover-rate, aerators and fountains is sufficient to prevent nuisance problems arising from stagnation. If any nuisance events occur during the warranty period, the Developer shall install additional aerators and fountains as required at their cost prior to the issuance of Final Acceptance Certificate (FAC).

Where a powered aerator is required, the following standards shall apply:

1. Main power 100 Amps 120/240 volts AC single phase.
2. Combination panel with 24crt capacity minimum.
3. Concrete pedestal base with entrance from beneath and access to mounting of cabinet through support on top.
4. Pedestal base to be situated above the High-Water Level of the pond.
5. Heater with temperature control to reduce moisture in the cabinet.
6. Working light built into the cabinet for working in the dark.
7. Photo control and time clock to control spray pump at set times and also if installed lights on spray pump.
8. Second cabinet and base for the controls for the spray pump control and connections of the same size as the main power box.
9. Color of the cabinets to be dark forest green to blend into the landscape.
10. Allow sizing of the power cabinet at least 200 mm around all components for future equipment installation if required.
11. Sealing of openings from moisture below entering equipment using a foam sealant.

6.28.11 Constructed Wetlands

1. Wetland size should be approximately 5% of the watershed area that will be serviced.
2. Approximately 10% of the wetland surface area should be a 1.5 to 2.0m deep sediment forebay upstream of the wetland area for settlement of suspended solids.
3. Average permanent wetland water depth is 0.3m with 1m deep zones for flow redistribution and for fish and submerged or floating aquatic vegetation habitat.
4. Active storage is 0.3 to 0.6m deep.
5. Vegetation can be cost effectively transplanted from local donor sites including ditches maintained by the Province and construction sites where small pocket wetlands are to be removed.
6. Length to width ratios can be as low as 1:1. Increase where required to maximize treatment and to prevent short-circuiting.
7. Bottom slope of 0.5 to 1.0% is recommended and a smooth bottom to promote sheet flow through the system.
8. Wetland shall be sized such that there will be storage for a one-in-100-year storm event.
9. Regulated inflow and outflow structures are required that will consider a wide range of rainfall intensities.
10. Design with the landscape, not against it. Take advantage of natural topography, drainage patterns, etc.
11. Incorporate as much "edge" as possible and design in conjunction with a buffer and the surrounding land and aquatic systems.
12. Design to protect the wetland from any potential high flows and sediment loads.
13. Design for self-sustainability and to minimize maintenance.
14. The constructed wetland should be surrounded by a pedestrian pathway which should be connected with the other pathways and trails, to the satisfaction of Parks Department. The pathway must sit above the 1:25 year water level.
15. There should be an easy access for maintenance vehicles to the bottom of the pond.
16. An emergency overland drainage route shall be provided from the pond to the receiving stream with capacity to transport storm runoff should a malfunction occur within the outlet structure. The drainage route shall be on public property and designed with appropriate erosion protection in place.

6.28.12 Recreation

1. Recreational use of the ponds above the 1:25 year event elevation will be regulated by the Parks Department.
2. Suitable recreation facilities such as bicycle trails, benches, trees, and so on shall be provided for all Stormwater Management Facilities. Refer to the Section 10 Landscape and Park Development Standards for amenities.
3. Primary recreational activities will not be allowed upon wet ponds. The ponds will be posted prohibiting primary recreational activities (i.e. all water-based activities where there is body contact with the water, such as swimming and wading, as well as winter activities including ice skating).

6.28.13 Inspection and Maintenance

1. The Engineering Consultant is fully responsible for the inspection of the construction of stormwater management facilities. The Municipality will inspect the site periodically based on need. The Municipality will have free and immediate access to the site for inspection, taking samples of materials, and access to records related to design and construction.
2. After finishing the construction of the storm pond, before submission of CCC application, the Developer will invite the Municipality for a joint inspection to confirm the side slope, depth, inlet pipe, outlet pipes and forebay of the storm pond. That inspection should be done in an empty pond situation.
3. The Municipality will only conduct inspection for CCC and FAC issuance respectively once the water level in the stormwater management facility has established the design Normal Water Level (NWL). Following a rainfall event, the water levels must also subside to NWL before a CCC or FAC inspection can take place.
4. The Developer shall be responsible for any defects of the works and lands associated with the facility, including adjacent park lands, for a period of two years from the date upon which the facility is operational and the Construction Completion Certificate (CCC) is issued.
5. The Developer shall assume full responsibility with respect to the operation and maintenance of the ponds in all aspects relating to flows, water volumes, surface debris, aeration, hydrological and hydraulic performance, utility devices such as outlet structures, vegetation control, insect control and onshore facilities until issuance of Final Acceptance Certificate (FAC).
6. The Developer will be responsible for all silting and debris problems which are caused due to poor erosion control in the catchment area. Should silting and debris problems occur in the ponds which are the result of stormwater draining lands beyond the Developers control, the Developer shall assume responsibility for any necessary remedial actions.
7. The monitoring and maintenance of water quality to eliminate any nuisance factors and to protect against health hazards (to the utility service level) shall be the responsibility of the Developer.

6.28.14 Pond Boundary Control and Use

1. All pond areas and shoreline areas must be sufficient to accommodate the 1:100-year design event or the historical flood event (whichever is greater) and will be retained in public ownership.
2. Land above the 1:100-year design flood level, or historical flood event when no overflow is provided, shall be protected by a restrictive covenant, registered against the title of the property, indicated that the land is subject to flooding and that the Owner will not construct any permanent structures susceptible to flood damage.
3. Noxious industrial land uses are considered as unacceptable adjacent to or upstream of storm ponds.
4. Minimum lot dimensions and rear yard depths as measured from the property line shall conform to the requirements of the Regional Municipality of Wood Buffalo Land Use Bylaw and Area Structure Plan/Outline Plan.

6.28.15 Site Acquisition and Financing of Construction

1. The acquisition of all pond sites shall occur prior to subdivision approval and at no cost to the Municipality. In addition, the pond site shall be excluded from all subsequent outline and tentative plans for the purposes of roadway, public utility, density, and potentially municipal reserve calculations (with the exception noted in 6.28.16). The parcel of land acquired shall be designated as a utility lot within a Public Service (PS) District.
2. All design and construction of stormwater ponds, interconnecting pipe systems and outfall lines shall be completed to the Municipality's approval and paid for by the Developer and such works shall be closely coordinated with the grading and dirt balance of the remainder of the subdivision.
3. Where the development utilizes an existing system or the work is undertaken by others, the Municipality will recover the costs from the Developer through off-site levies or development charges.

6.28.16 Credit for Municipal Reserve

Municipal Reserve credit may be granted for land areas within the Public Service lot of storm water management facilities, provided that the land is at least 10.0 m wide and the maximum slope in any direction is 5%, and that suitable amenities are incorporated into the development to the satisfaction of the Parks Department. Refer to Section 10.1.5.3 Land Assembly for Municipal Reserve (MR) credits with respect to storm water management facilities.

- 100% Credit for lands above the 1:100-year High Water Level
- 50% Credit for lands between the 1:25 year and the 1:100-year High Water Level.

6.28.17 Legal Liability and Safety

1. Given that primary water contact (i.e. swimming and wading) will be forbidden, 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, and so on) shall be provided by the Developer.
3. Fencing of municipal park areas shall be determined during the detailed design stage and provided by the Developer, if required.
4. Lighting shall be provided by the Developer at the interface between the pond and the adjacent land. Full Cut-off Light Fixtures to be considered in all areas where light pollution is undesirable. Additional lighting requirements are to be determined at the detailed design stage.

6.29 DRAINAGE CHANNELS

Drainage Channels, if approved by the Municipality, may be utilized to convey large volumes of storm water under controlled conditions through or around a development. Drainage Channels shall be designed in accordance with the “Stormwater Management Standards” as published by Alberta Environmental Protection (refer Drainage Parkway) and good engineering practice.

The minimum Drainage Channel cross section shall be as follows:

- 3m bottom sloped to drain to a low flow trickle channel to be installed in the bottom.
- Maximum side slopes of 5 horizontal to 1 vertical.
- Terraced side slopes when depth exceeds 3m or for amenities such as trails or treed terraces.
- 3 metres wide sloped terrace.
- 1.5m clearance between top of excavation and property line.
- Landscape the area above the 1:25 year flood elevation for recreational uses complete with trails, benches, trees, and so on. Refer to Section 10 Landscape and Park Development Standards.

6.30 BIOSWALES

Bioswales may be appropriate Low-Impact Development facilities that provide multiple functions of conveying stormwater, promoting infiltration to reduce runoff, and treating stormwater by capturing sediment and up-taking nutrients through the naturalized vegetation in the bioswale. Bioswales can also provide habitat enhancement and may become a community amenity.

If properly constructed, the intention of the bioswale is that maintenance over time is minimal, provided that the vegetation is able to establish itself, and influence from anthropogenic contaminants is minimized.

The Municipality supports the use of bioswales at appropriate locations, including through drainage PUL's, along the rear or flankage of industrial or commercial lots, and as part of site grading of passive recreational and Parks sites.

The Municipality does not typically support the implementation of bioswales adjacent to roadways, due to the expected impact of road salt and sand from winter operations. By contrast, the Municipality expects that roadside ditches be properly maintained, to control vegetation, ensure drainage conveyance capacity is not compromised, and protect the subgrade of the adjacent roadway from becoming saturated.

For details on Bioswale design, materials, and vegetation, refer to Section 10, Sections 10.3.2 and 10.4.2.

6.31 OUTFALLS

1. Obverts of outfall pipes shall be above the five-year flood level in the receiving stream. Inverts of outfall pipes shall be above winter ice level. Outfalls shall be located to avoid damage from moving ice during break-up. Drop structures and energy dissipaters shall be used where necessary to prevent erosion.
2. Inlet/Outfall structures in detention ponds are to be aesthetically blend into the landscape design, include adequate erosion protection, and shall be designed to require low maintenance.
3. Storm outfalls must include gratings over outlets for public safety. Gratings shall have a maximum clear bar spacing of 150 mm and shall be properly anchored to the outfall structure. Grated outlet structures must be designed with twice the required hydraulic capacity to prevent plugging and designed for a maximum flow velocity of 1.0 m/s through the grating. Gratings must be designed to allow maintenance access.
4. Storm outfall structures must be protected with suitable fencing and guardrails.
5. Storm outfalls shall be located such that there is minimal impact to adjacent property. Landscaping around outfalls shall be compatible with adjacent land use and provide low maintenance, using native plant materials and grass seed mix.
6. All-weather vehicle access must be provided to all storm outfalls for maintenance purposes.
7. Outfalls to a receiving water body require approvals under the Water Act, Fisheries Act, Public Lands Act Historical Resources Act, and other pertinent Acts at the time of construction.
8. Special design considerations will be required on outfalls that are situated in the river floodplain which may include the installation of backflow protection.

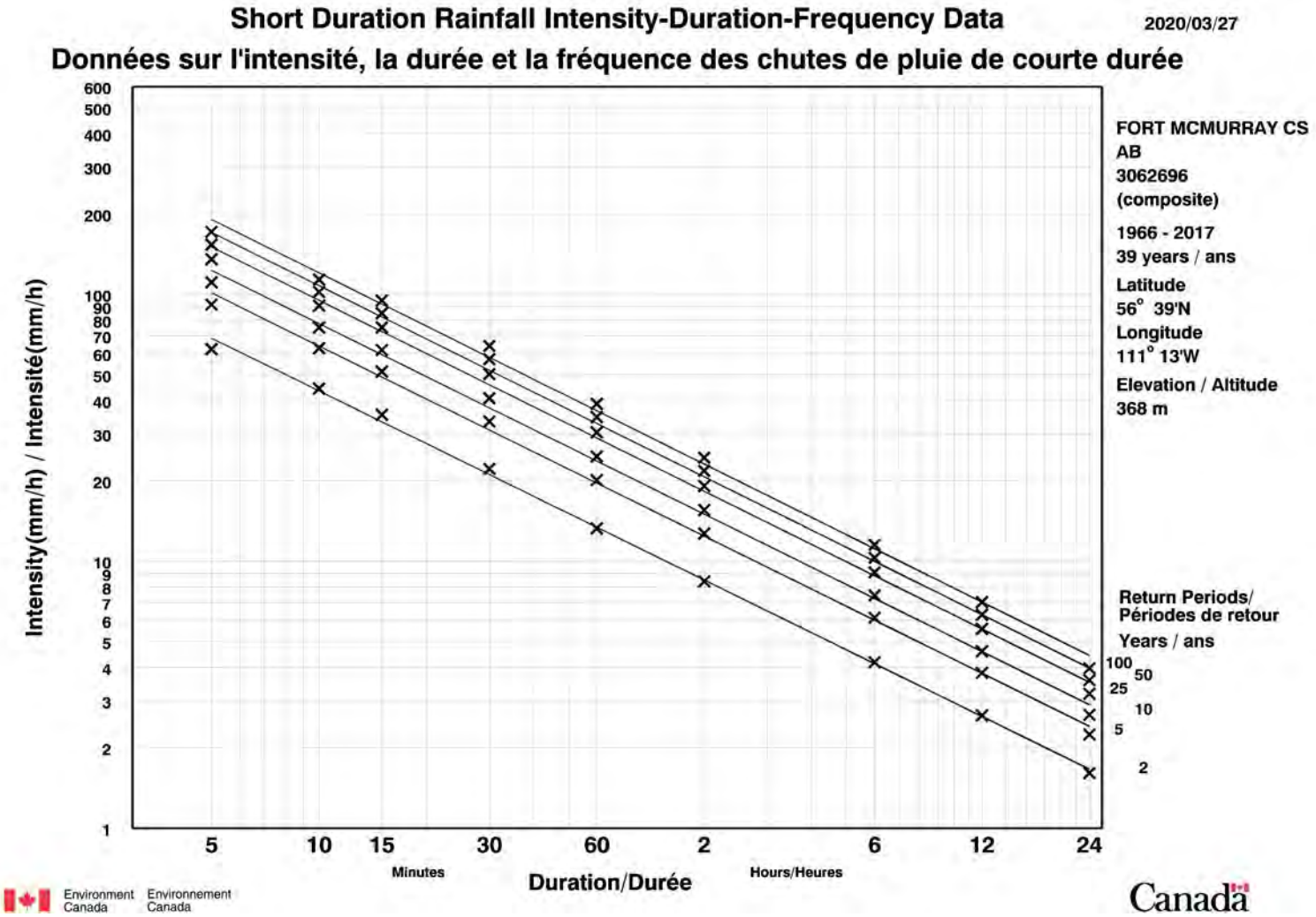
6.32 DESIGN RAINFALL INTENSITIES

6.32.1 Fort McMurray Area

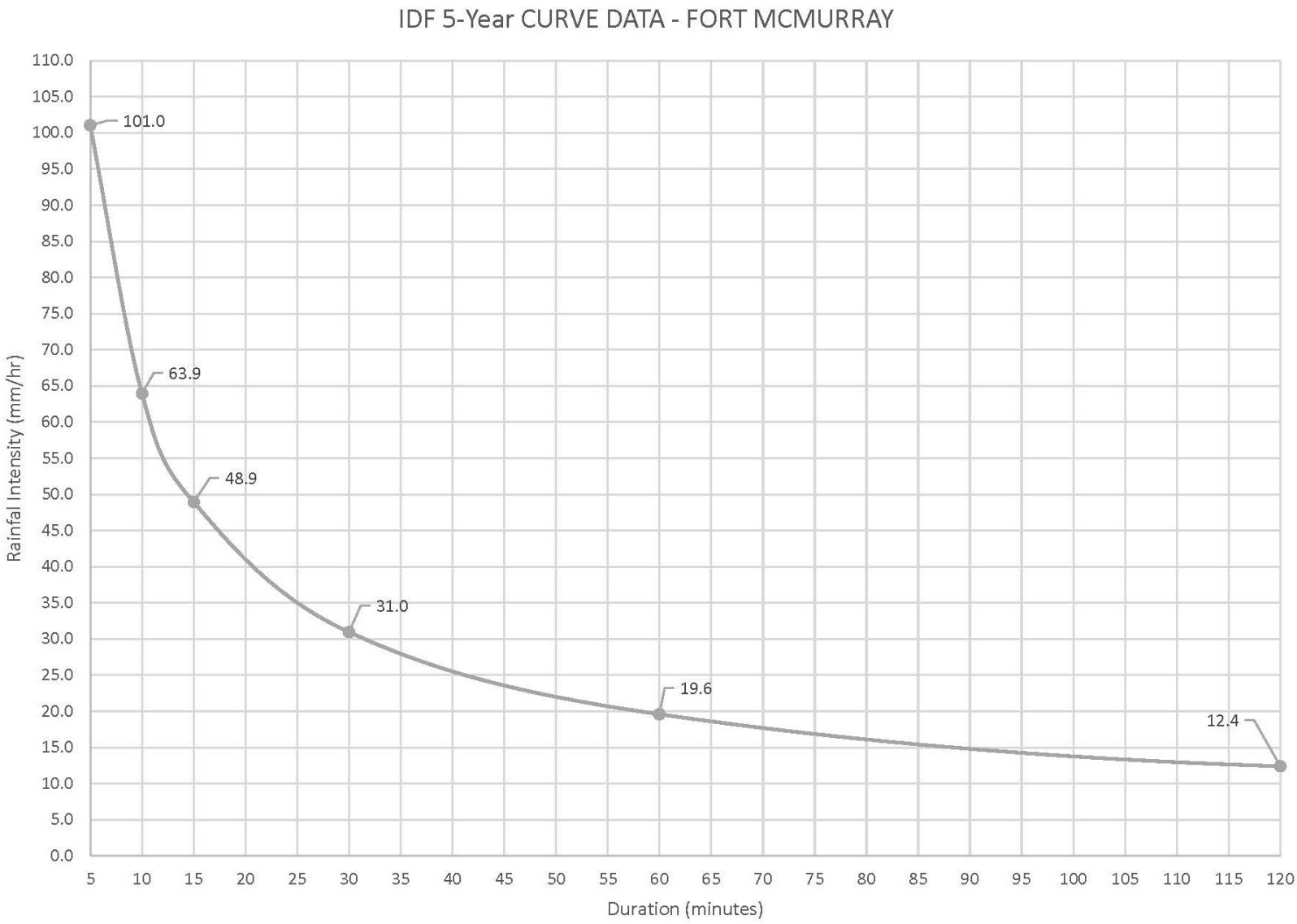
Design rainfall intensities based on data records compiled by Environment and Climate Change Canada between 1966 to 2017 at the Fort McMurray Airport.

Interpolation Equation $R = A(T)^B$, where:						
R =	Rainfall Rate (mm/hr)					
T =	Time in Hours					
A =	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
	13.4	19.6	23.8	29.0	32.8	36.7
B =	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
	-0.656	-0.660	-0.662	-0.663	-0.664	-0.664

Short Duration Rainfall Intensity (mm/h) For the Regional Municipality of Wood Buffalo - FORT MCMURRAY AREA							
Time (min)	Time (h)	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5	0.083	68.4	101.0	123.3	150.6	170.8	191.1
10	0.167	43.4	63.9	77.9	95.1	107.8	120.6
15	0.25	33.3	48.9	59.6	72.7	82.3	92.1
30	0.5	21.1	31.0	37.7	45.9	52.0	58.2
60	1	13.4	19.6	23.8	29.0	32.8	36.7
120	2	8.5	12.4	15.0	18.3	20.7	23.2
360	6	4.1	6.0	7.3	8.8	10.0	11.2
720	12	2.6	3.8	4.6	5.6	6.3	7.0
1440	24	1.7	2.4	2.9	3.5	4.0	4.4


Short Duration Rainfall Intensity-Duration-Frequency Data
2020/03/27
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée
Intensity(mm/h) / Intensité(mm/h)
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
2
1
5
10
15
30
60
2
6
12
24
Minutes
Hours/Heures
Duration/Durée
FORT MCMURRAY CS
AB
3062696
(composite)
1966 - 2017
39 years / ans
Latitude
56° 39'N
Longitude
111° 13'W
Elevation / Altitude
368 m
Return Periods/
Périodes de retour
Years / ans
100
50
25
10
5
2
Environment Canada
Environnement Canada
Canada

Rainfall Intensities Based on 5-Year I-D-F Curve For the Regional Municipality of Wood Buffalo - FORT MCMURRAY AREA					
Time (min)	Intensity (mm/h)	Time (min)	Intensity (mm/h)	Time (min)	Intensity(mm/h)
10	63.9	49	22.4	88	15.2
11	60.1	50	22.1	89	15.1
12	56.7	51	21.8	90	15.0
13	53.8	52	21.5	91	14.9
14	51.2	53	21.3	92	14.8
15	48.9	54	21.0	93	14.7
16	46.9	55	20.8	94	14.6
17	45.1	56	20.5	95	14.5
18	43.4	57	20.3	96	14.4
19	41.9	58	20.0	97	14.3
20	40.5	59	19.8	98	14.2
21	39.2	60	19.6	99	14.1
22	38.0	61	19.4	100	14.0
23	36.9	62	19.2	101	13.9
24	35.9	63	19.0	102	13.8
25	34.9	64	18.8	103	13.7
26	34.0	65	18.6	104	13.6
27	33.2	66	18.4	105	13.5
28	32.4	67	18.2	106	13.5
29	31.7	68	18.0	107	13.4
30	31.0	69	17.9	108	13.3
31	30.3	70	17.7	109	13.2
32	29.7	71	17.5	110	13.1
33	29.1	72	17.4	111	13.1
34	28.5	73	17.2	112	13.0
35	28.0	74	17.1	113	12.9
36	27.5	75	16.9	114	12.8
37	27.0	76	16.8	115	12.8
38	26.5	77	16.6	116	12.7
39	26.0	78	16.5	117	12.6
40	25.6	79	16.3	118	12.5
41	25.2	80	16.2	119	12.5
42	24.8	81	16.1	120	12.4
43	24.4	82	15.9		
44	24.1	83	15.8		
45	23.7	84	15.7		
46	23.4	85	15.6		
47	23.0	86	15.5		
48	22.7	87	15.3		

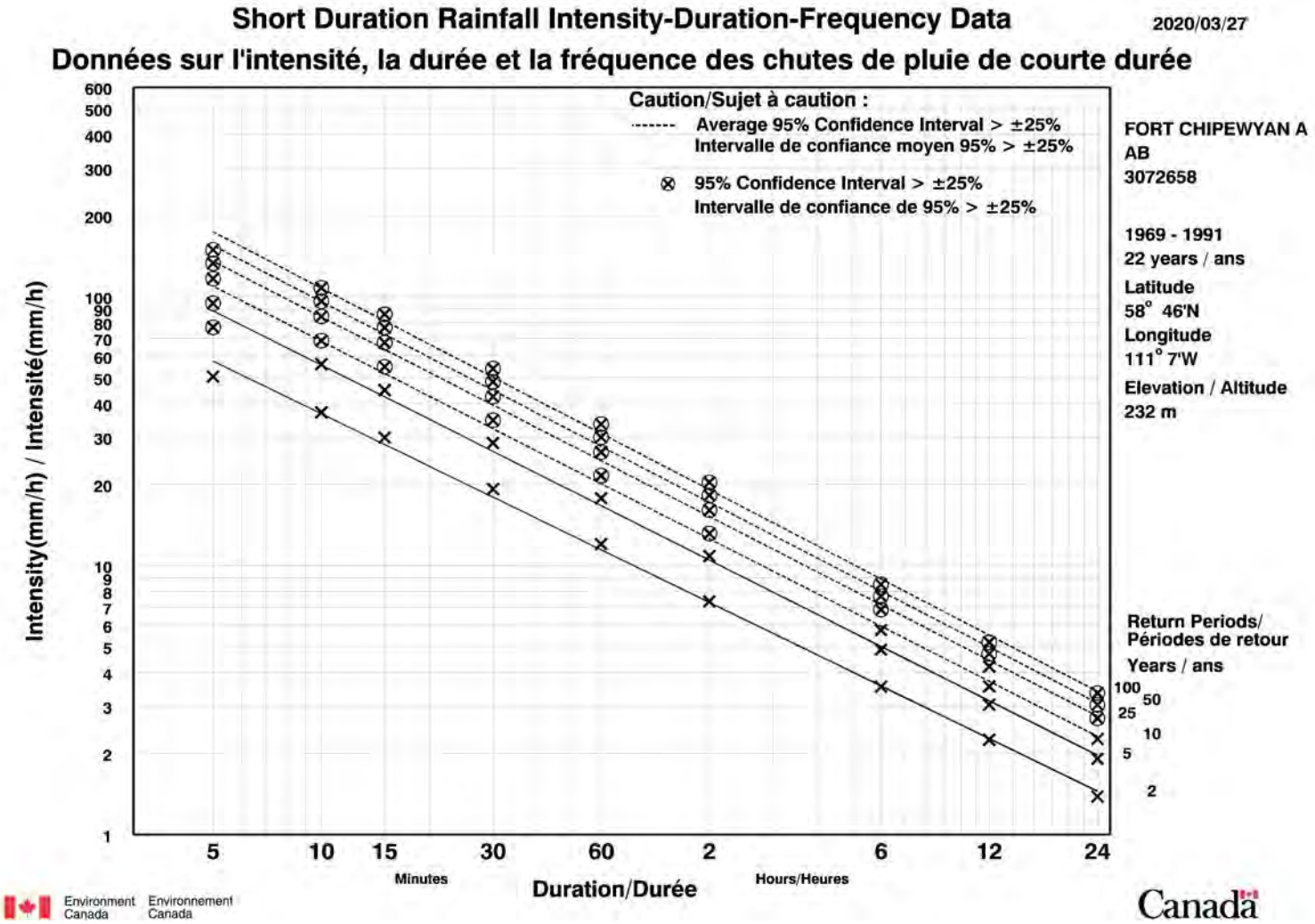

IDF 5-Year CURVE DATA - FORT MCMURRAY
Rainfal Intensity (mm/hr)
Duration (minutes)
101.0
63.9
48.9
31.0
19.6
12.4

6.32.2 Fort Chipewyan Area

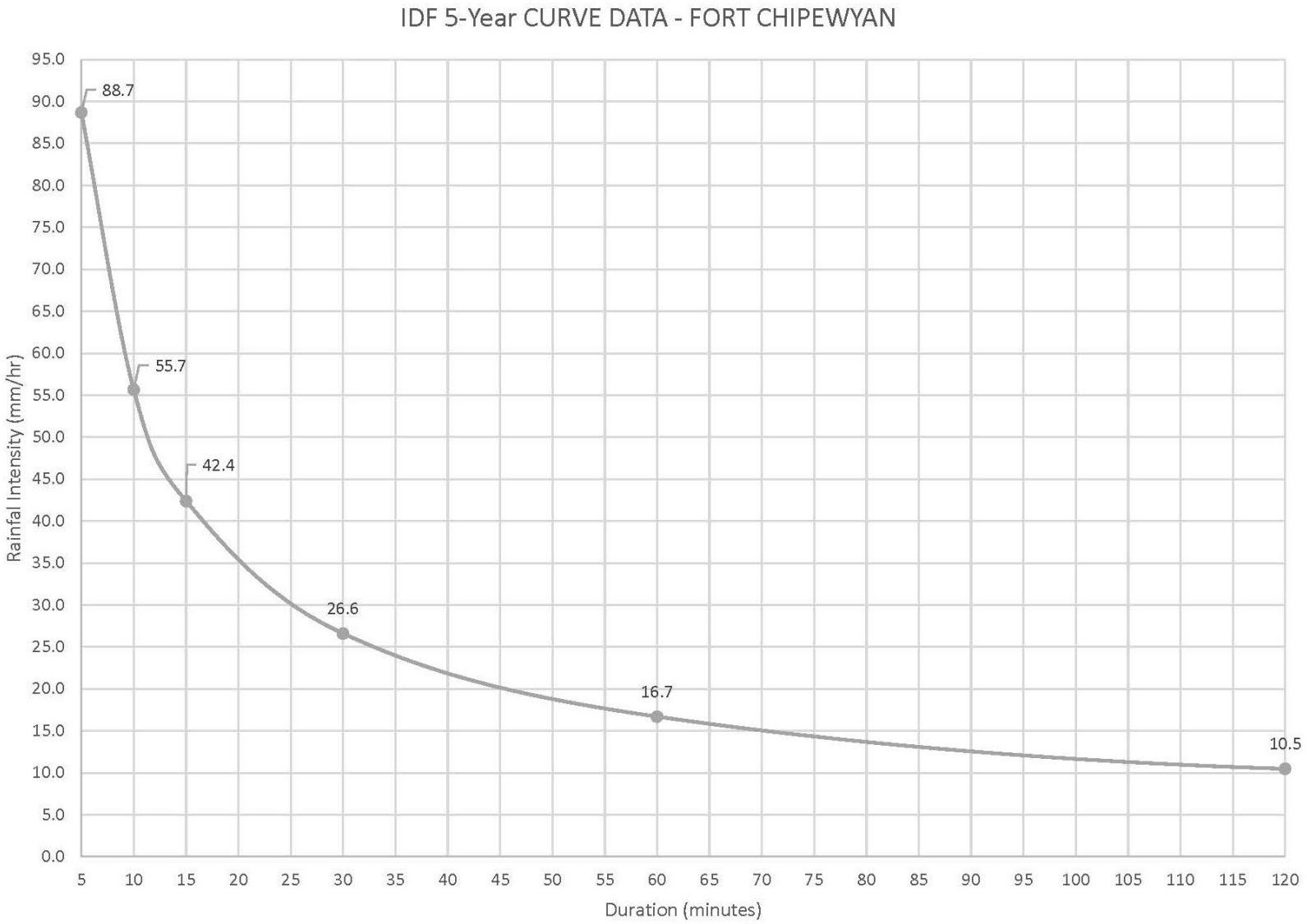
Design rainfall intensities based on data records compiled by Environment and Climate Change Canada between 1969 to 1991 at Fort Chipewyan.

Interpolation Equation $R = A(T)^B$, where:						
R =	Rainfall Rate (mm/h)					
T =	Time in Hours					
A =	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
	11.5	16.7	20.2	24.5	27.8	31.0
B =	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
	-0.650	-0.672	-0.680	-0.688	-0.692	-0.695

Short Duration Rainfall Intensity (mm/h) For the Regional Municipality of Wood Buffalo - FORT CHIPEWYAN AREA							
Time (min)	Time (h)	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
5	0.083	50.4	76.9	94.5	116.7	133.1	149.4
10	0.167	37.1	56.1	68.6	84.4	96.2	107.8
15	0.25	29.9	45.0	54.9	67.5	76.8	86.0
30	0.5	19.3	28.6	34.7	42.5	48.3	54.0
60	1	12.0	17.8	21.6	26.4	30.0	33.6
120	2	7.4	10.8	13.2	16.1	18.2	20.4
360	6	3.5	4.9	5.8	6.9	7.7	8.5
720	12	2.3	3.0	3.6	4.2	4.7	5.2
1440	24	1.4	1.9	2.3	2.7	3.0	3.4


Short Duration Rainfall Intensity-Duration-Frequency Data
2020/03/27
Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée
Caution/Sujet à caution :
Average 95% Confidence Interval > ±25%
Intervalle de confiance moyen 95% > ±25%
95% Confidence Interval > ±25%
Intervalle de confiance de 95% > ±25%
FORT CHIPEWYAN A
AB
3072658
1969 - 1991
22 years / ans
Latitude
58° 46'N
Longitude
111° 7'W
Elevation / Altitude
232 m
Intensity(mm/h) / Intensité(mm/h)
600
500
400
300
200
100
90
80
70
60
50
40
30
20
10
9
8
7
6
5
4
3
2
1
5
10
15
30
60
2
6
12
24
Minutes
Hours/Heures
Duration/Durée
Return Periods/
Périodes de retour
Years / ans
100
50
25
10
5
2
Environment Canada
Environnement Canada
Canada

Rainfall Intensities Based on 5-Year I-D-F Curve For the Regional Municipality of Wood Buffalo - FORT CHIPEWYAN AREA					
Time (min)	Intensity (mm/h)	Time (min)	Intensity (mm/h)	Time (min)	Intensity(mm/h)
10	55.7	49	19.1	88	12.9
11	52.2	50	18.9	89	12.8
12	49.3	51	18.6	90	12.7
13	46.7	52	18.4	91	12.6
14	44.4	53	18.2	92	12.5
15	42.4	54	17.9	93	12.4
16	40.6	55	17.7	94	12.4
17	39.0	56	17.5	95	12.3
18	37.5	57	17.3	96	12.2
19	36.2	58	17.1	97	12.1
20	34.9	59	16.9	98	12.0
21	33.8	60	16.7	99	11.9
22	32.8	61	16.5	100	11.8
23	31.8	62	16.3	101	11.8
24	30.9	63	16.2	102	11.7
25	30.1	64	16.0	103	11.6
26	29.3	65	15.8	104	11.5
27	28.6	66	15.7	105	11.5
28	27.9	67	15.5	106	11.4
29	27.2	68	15.4	107	11.3
30	26.6	69	15.2	108	11.3
31	26.0	70	15.1	109	11.2
32	25.5	71	14.9	110	11.1
33	25.0	72	14.8	111	11.0
34	24.5	73	14.6	112	11.0
35	24.0	74	14.5	113	10.9
36	23.5	75	14.4	114	10.8
37	23.1	76	14.2	115	10.8
38	22.7	77	14.1	116	10.7
39	22.3	78	14.0	117	10.7
40	21.9	79	13.9	118	10.6
41	21.6	80	13.8	119	10.5
42	21.2	81	13.6	120	10.5
43	20.9	82	13.5		
44	20.6	83	13.4		
45	20.3	84	13.3		
46	20.0	85	13.2		
47	19.7	86	13.1		
48	19.4	87	13.0		

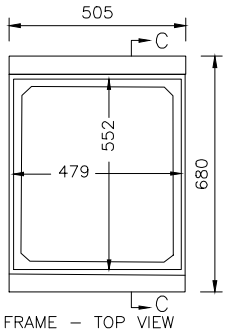

IDF 5-Year CURVE DATA - FORT CHIPEWYAN
Rainfal Intensity (mm/hr)
Duration (minutes)
88.7
55.7
42.4
26.6
16.7
10.5
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120

6.33 STANDARD DRAWINGS – STORMWATER MANAGEMENT

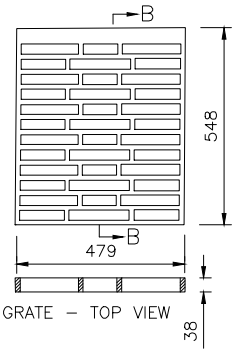
Dwg.No.	Title
6-100	900mm dia. Catch Basin K-7 Frame and Cover
6-101	1200mm dia Catch Basin Manhole
6-102	900mm dia Catch Basin Type K1
6-103	Type F-51 Catch Basin Two Piece Side Inlet with Locking Device
6-200	Standard Manhole Frame and Cover
6-201	Floating Type Manhole Frame and Cover
6-202	Lane Paving Catch Basin c/w C.B. Manhole Frame and Top
6-203	Round Catch Basin/C.B. Manhole Frame and Top
6-204	Type K-2 Catch Basin Frame and Cover
6-205	Type F-51 Grate (Angled)
6-206	Type K-1 Catch Basin Curb Finishing Detail
6-300	Ditch Inlet with Sump
6-400	Poured Concrete Outfall Structure
6-401	Bar Screen for Culvert
6-500	Rock Rip Rap Detail for Outfall or Open Channels
6-501	Typical Rural Rock Rip Rap for Culverts
6-502	Typical Bagged Rip Rap for Culverts
6-503	Typical Rural Rock Ditch Checks
6-504	Permeable Ditch Check
6-505	Stormwater Management Pond Sign
6-550	Type A and Type A1 Rear to Front Drainage
6-551	Type B Rear to Front Drainage
6-552	Type C Rear to Front Drainage (>6% Slope)
6-553	Type D Standard Split Drainage
6-554	Type W Walkout Basement Split Drainage
6-556	Typical Drainage Swales
6-557	Bioswale within Rural Roadway
6-558	Typical Weeping Tile and Sump Pump Discharge

Dwg.No.	Title
6-559	Typical Weeping Tile and Sump Pump Discharge Plan View
6-600	Pipe Zone Bedding Details (Class A, A-1, B)
6-601	Pipe Zone Bedding Details (Class C, C-1, D)
6-700	Class I Trench Backfill
6-701	Class II Trench Backfill
6-702	Class III Trench Backfill
6-703	Class IV Trench Backfill
6-704	Trench Backfill for Emergency Repairs in Paved Areas
6-705	Trench Backfill for Emergency Repairs in Grassed or Sodded Areas
6-800	Pipe Support Type I
6-801	Pipe Support Type II
6-802	Pipe Support Type III

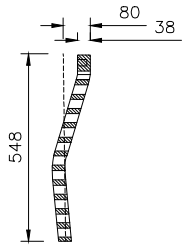
STANDARD DETAIL:	6-100
DATE.: JAN. 2021	REV: 4



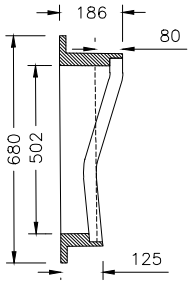
FRAME – TOP VIEW



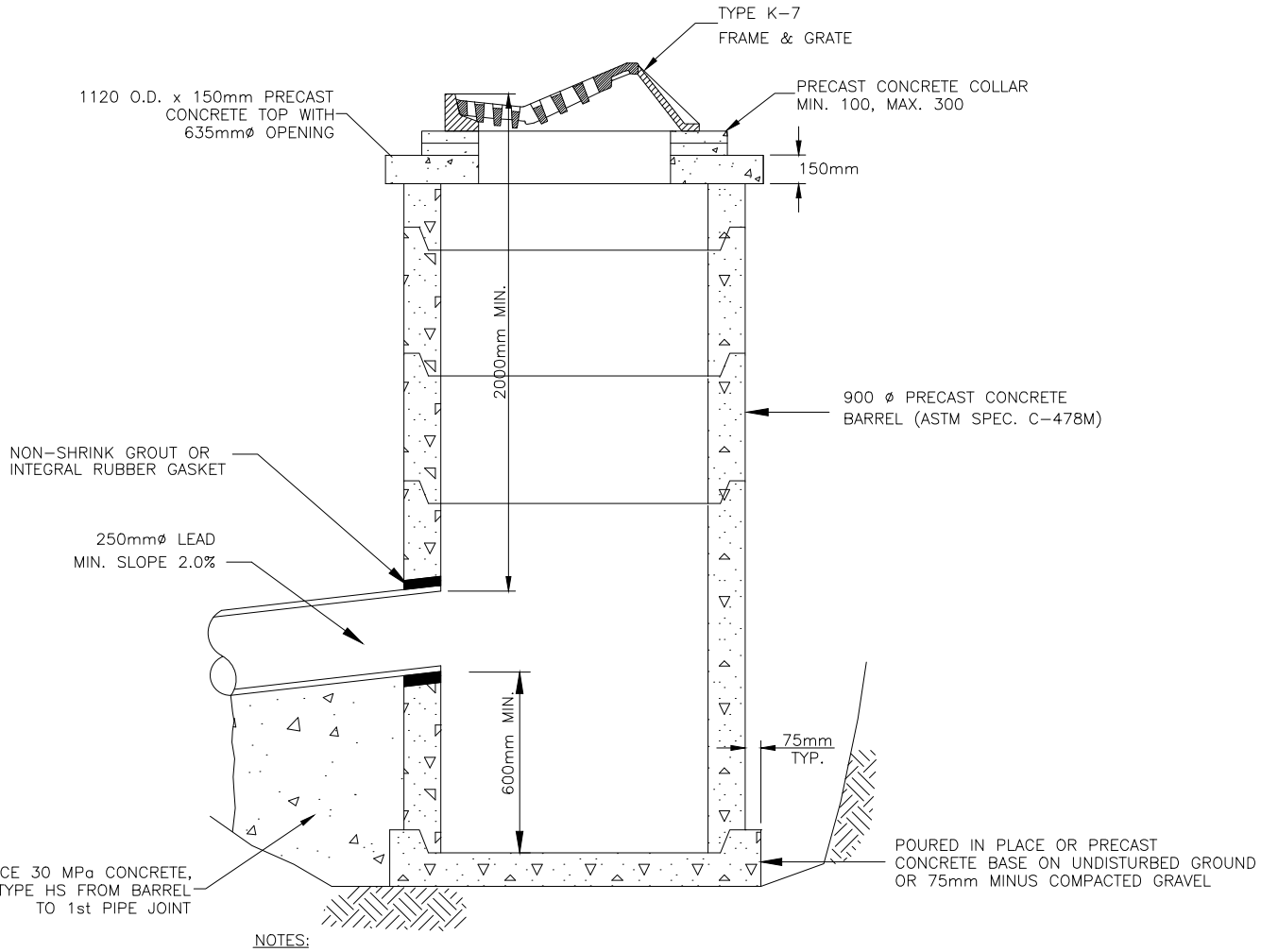
GRATE – TOP VIEW



SECTION B–B



SECTION C–C



NOTES:

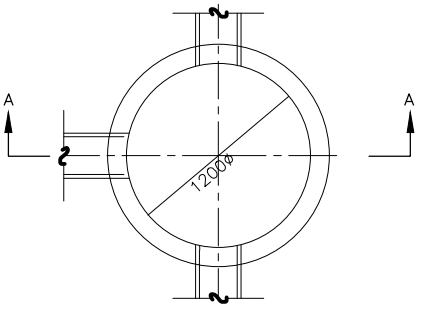
(1) THE DETAIL ALSO APPLIES TO THE REHABILITATION OF TYPE F–33 CATCH BASINS. REPLACE F–33 FRAME AND COVER WITH K–7 AS SHOWN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

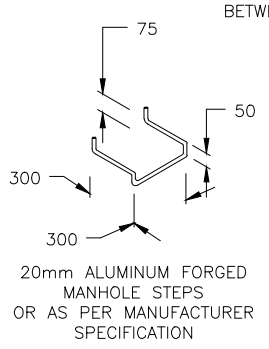
900mm DIA. CATCH BASIN TYPE K-7 FRAME AND COVER

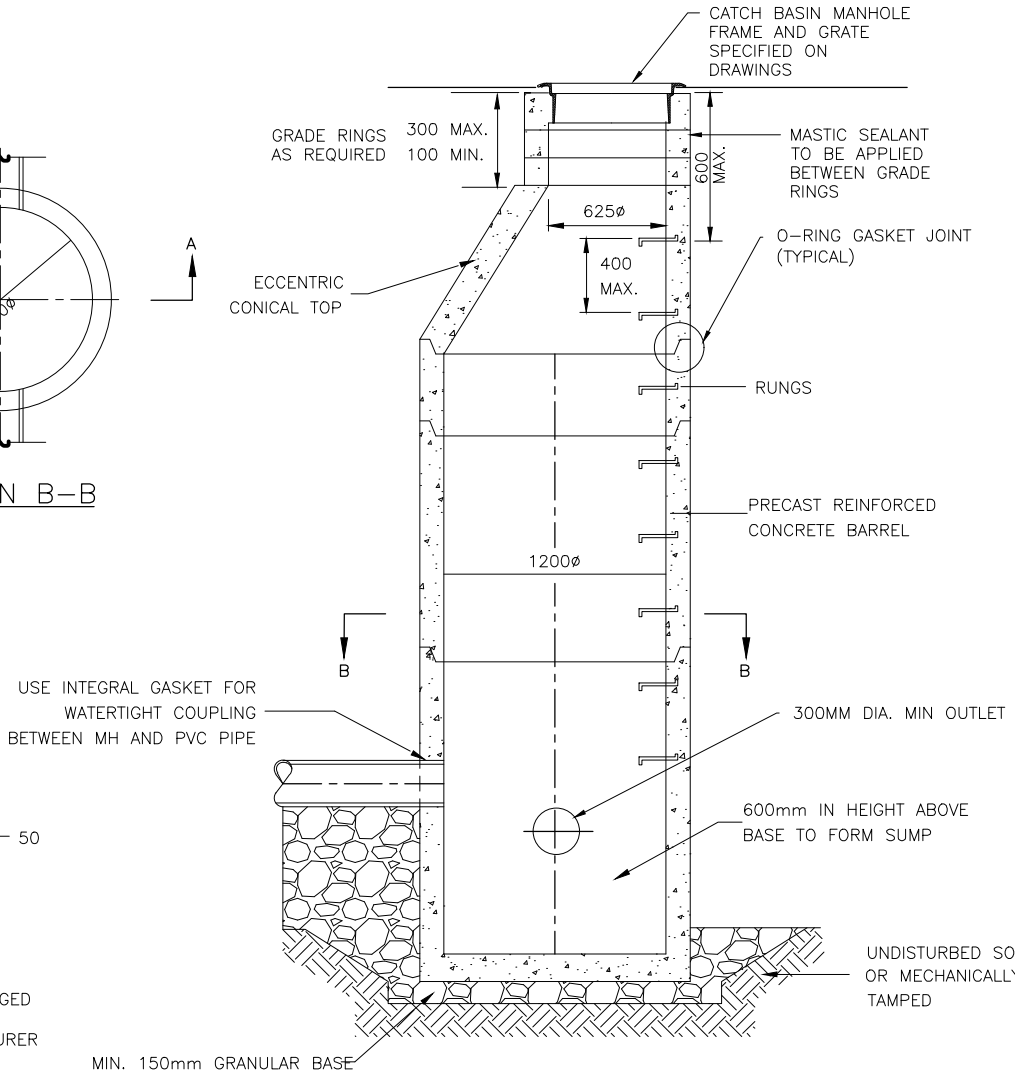
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Date: Feb 02, 2021
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Xrefs:

STANDARD DETAIL:	6-101
DATE.: JAN. 2021	REV: 0



SECTION B–B





SECTION A–A

NOTES:

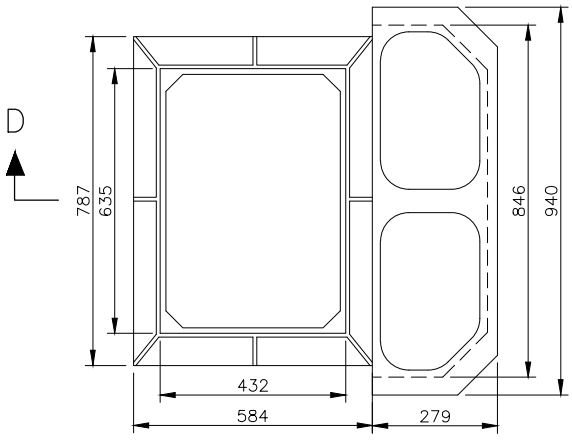
(1) PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT A.S.T.M. C478M STANDARDS.
(2) SPECIAL BASE DESIGN REQUIRED FOR DEPTHS OVER 9.0m.
(3) CHANNELLING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
CONTINUE MAIN PIPE WHERE POSSIBLE.
(4) VERTICAL SIDE OF CONICAL MH ON UPSTREAM SIDE.
(5) INSTALL SAFETY PLATFORMS FOR ALL MH OVER 6.0m DEEP. REFER TO DRAWING 5–400
(6) MANHOLE FRAME AND COVER TO BE AS PER STANDARD DWG. NO. 5–300, 5–301.
(7) BENCHING CONCRETE SHALL BE A MINIMUM OF 30MPa COMPRESSIVE STRENGTH, TYPE HS.
(8) RETROFIT RUNGS TO BE EPOXIED IN PLACE (NO PLASTIC SLEEVES)
(9) FRAME AND GRATE AS SPECIFIED ON DRAWINGS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

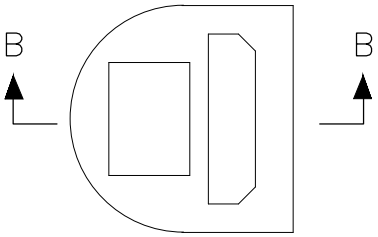
1200mm DIA. CATCH BASIN MANHOLE

Time: 10:42am
Date: Feb 03, 2021
File: V:\1161\active\116110892O\drawing\sheet_files\figures\Section 6\3658-6-100s.dwg by
Xrefs:

STANDARD DETAIL:	6-102
DATE.: JAN. 2021	REV: 4

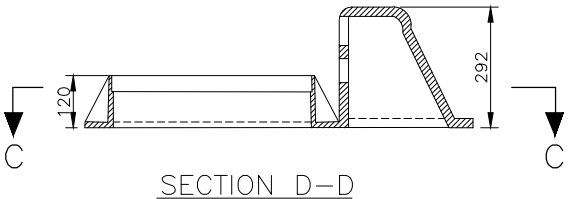


PLAN C–C

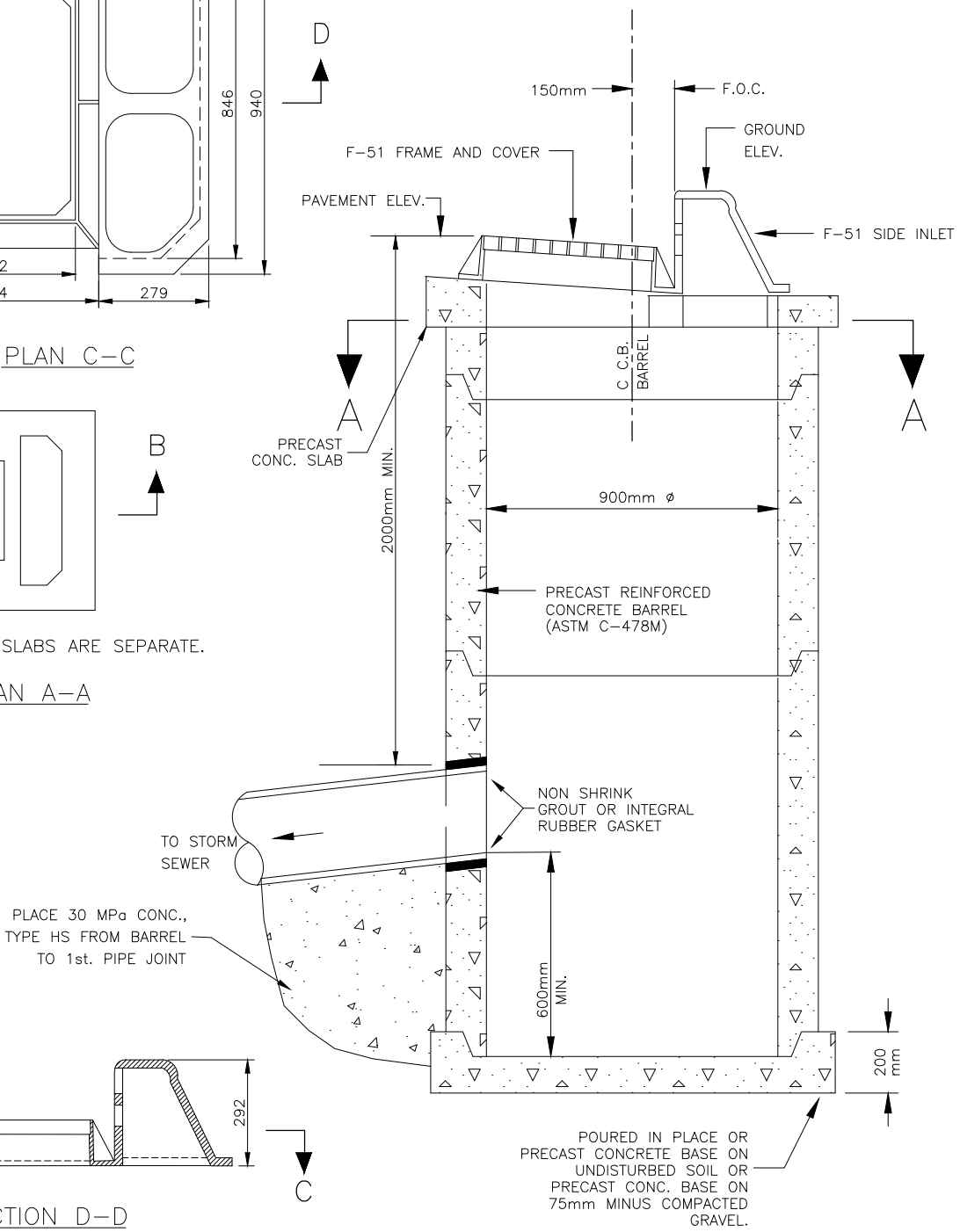


NOTE: ALL TOP SLABS ARE SEPARATE.

PLAN A–A



SECTION D–D



SECTION B–B

NOTE:

(1) FRAME AND COVER F–51 SIDE INLET TYPE OR APPROVED EQUAL (BICYCLE SAFE) PER 6–205.

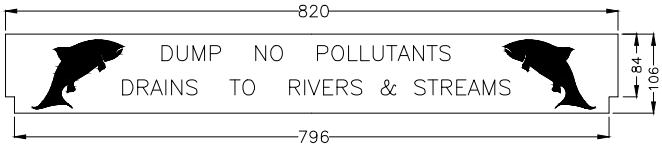
(2) ALL GRADE EXTENSION RINGS ARE TO BE PRECAST CONCRETE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

900mm DIA CATCH BASIN TYPE K1

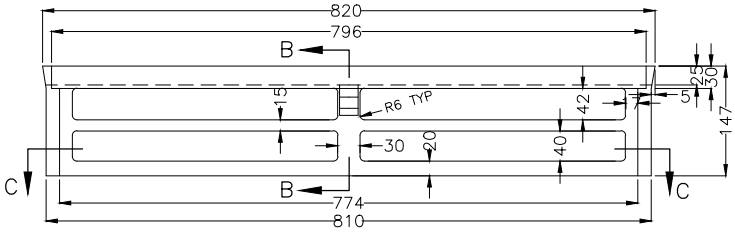
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Xrefs:

STANDARD DETAIL:	6-103
DATE.: JAN. 2021	REV: 1

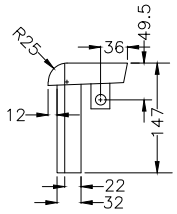


PLAN

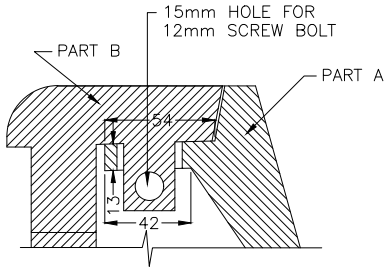
K-1A-2PIECE SIDE INLET-PART B



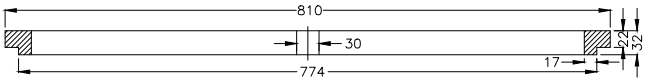
FRONT VIEW



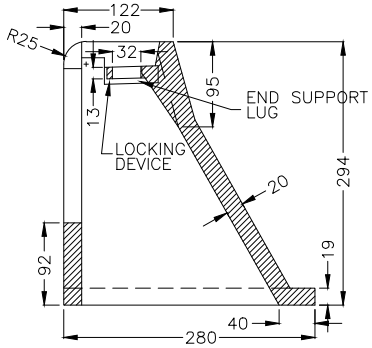
END VIEW



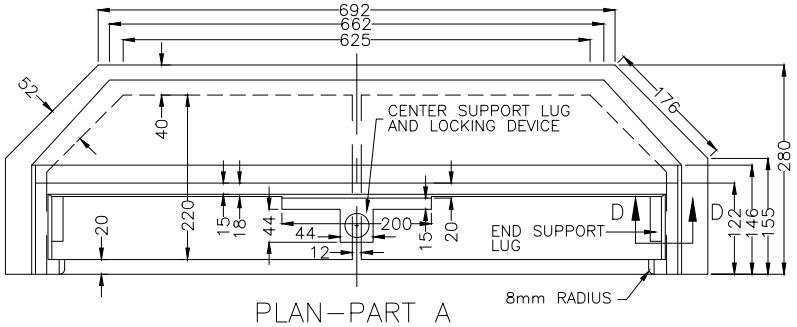
LOCKING DEVICE DETAIL



SECTION C-C

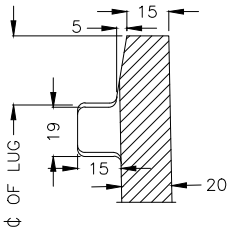


SECTION A-A



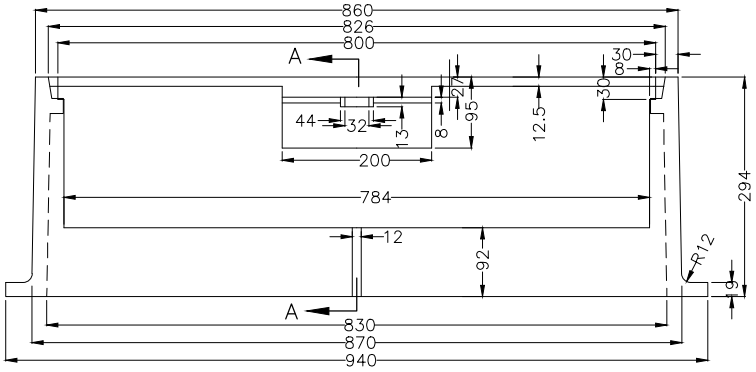
PLAN-PART A

K-1A-2PIECE SIDE INLET-PART A

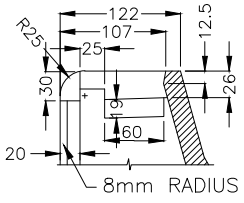


SECTION D-D

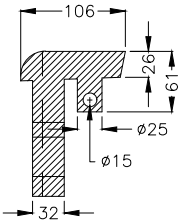
END SUPPORT LUG-PART A



FRONT VIEW



END OF PART A



SECTION B-B

NOTES:

(1) MATETIAL SPECIFICATION:
*DUCTILE IRON TO CONFORM TO A.S.T.M. A536 GRADE 60-40-18.

(2) MEASUREMENTS IN MILLIMETERS.

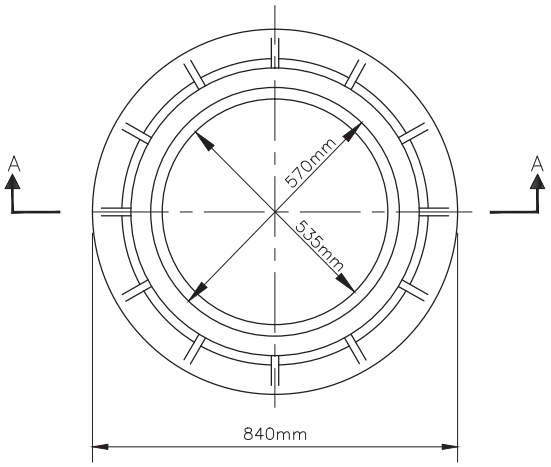
(3) ALL COMPONENTS TO BE CAST TO ±1 TOLERANCE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

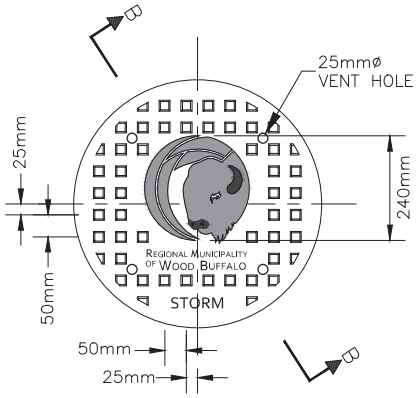
TYPE F-51 CATCH BASIN
TWO PIECE SIDE INLET
WITH LOCKING DEVICE

Time: 2:11 pm
Date: Jan 28, 2021
File: V:\1161\active\116110892O\drawing\sheet_files\figures\Section 6\3658-6-100s.dwg by
Xrefs:

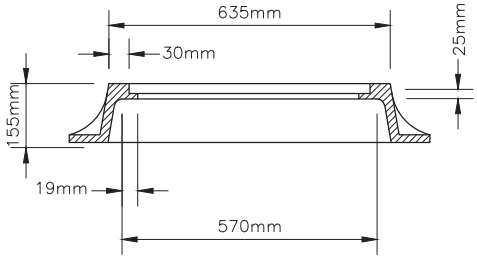
STANDARD DETAIL:	6-200
DATE: FEB 2017	REV: 5



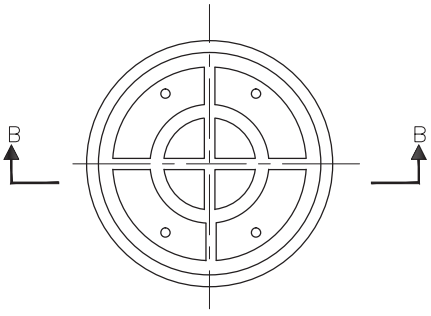
FRAME PLAN



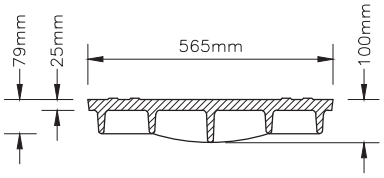
COVER SURFACE PLAN



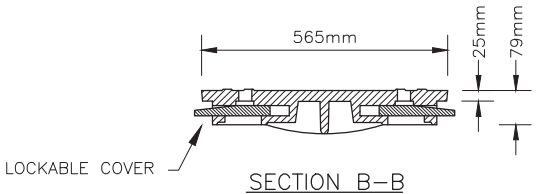
SECTION A–A



COVER STRUCTURE PLAN



SECTION B–B



SECTION B–B

NOTES:

(1) COVER LETTER HEIGHT – 25mm LETTER TYPE – CORBEL

(2) CASTING SHALL BE TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS AND EXCESSIVE SHRINKAGE.

(3) CASTING SURFACES SHALL BE FREE FROM BURNT ON SAND AND SHALL BE SMOOTH

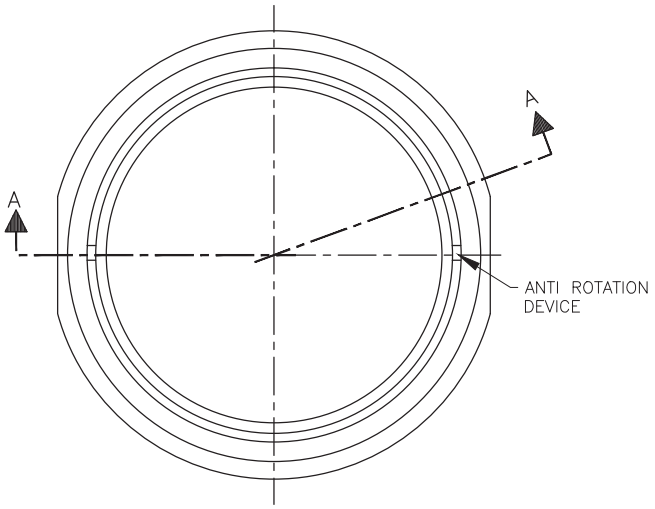
(4) CAST ON PIECES SUCH AS RUNNERS AND FINS SHALL BE REMOVED.

(5) TO BE USED IN OFF ROAD LANDSCAPED AREAS ONLY

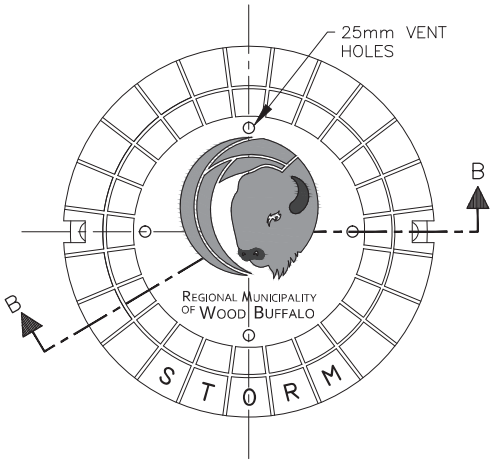
REGIONAL MUNICIPALITY OF WOOD BUFFALO

STANDARD MANHOLE FRAME AND COVER

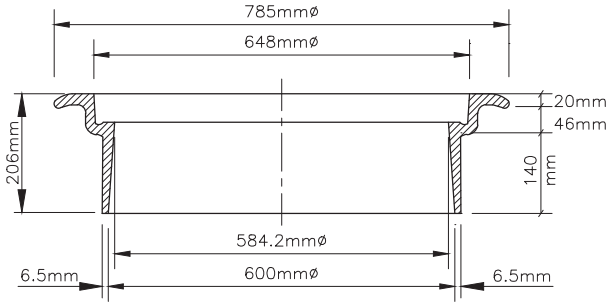
STANDARD DETAIL:	6-201
DATE: FEB 2017	REV: 1



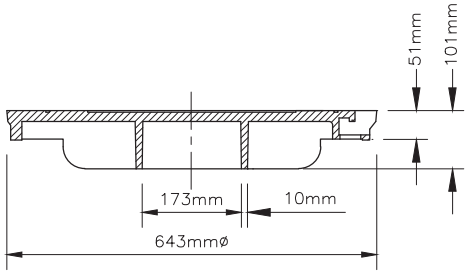
FRAME–PLAN



COVER–PLAN



SECTION A–A



SECTION B–B

NOTES:

(1) COVER LETTER HEIGHT – 30mm LETTER TYPE – CORBEL.

(2) CASTINGS SHALL BE TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS, SHRINKAGE AND BEARING SURFACE SHALL BE MACHINED TO PREVENT ROCKING.

(3) USE FOR ALL ROADWAY, GRAVEL AND SIDEWALK APPLICATIONS IN GRAVEL GROUT BETWEEN LIP OF FRAME AND GRADE RING.

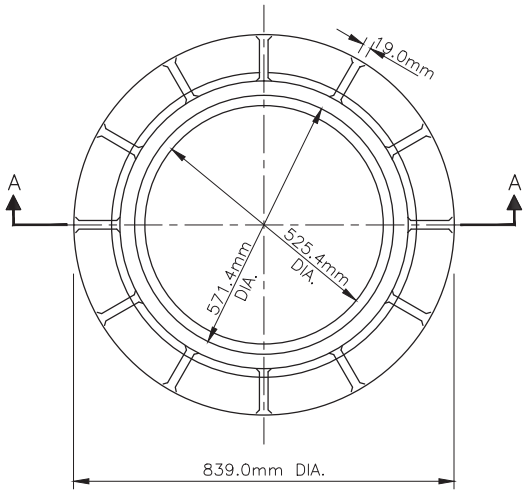
(4) NOT FOR USE IN LANDSCAPED AREAS.

(5) MANHOLE COVER TO BE LABELLED AS BELOW, AS APPROPRIATE
SANITARY SEWER
STORM SEWER
WATER UTILITY

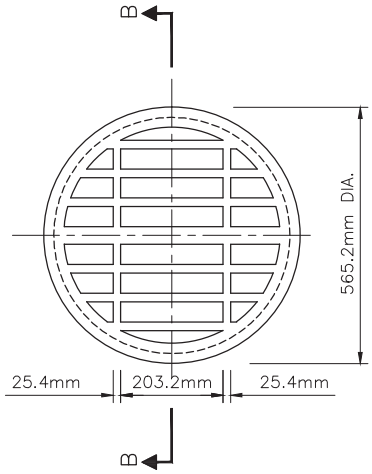
REGIONAL MUNICIPALITY OF WOOD BUFFALO

FLOATING TYPE MANHOLE FRAME AND COVER

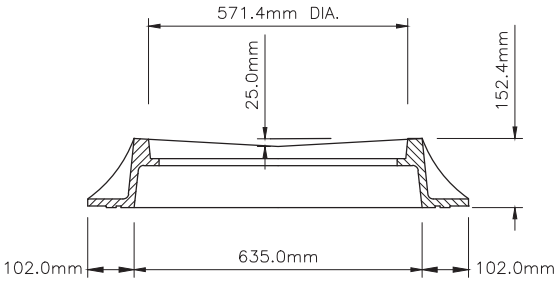
STANDARD DETAIL:	6-202
DATE: OCT 2016	REV: 3



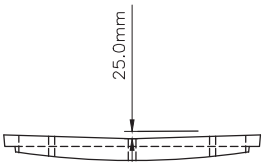
STANDARD FRAME – PLAN



STANDARD TOP – PLAN



SECTION A–A



SECTION B–B

NOTES:

(1) CASTINGS SHALL CONFORM TO ALL REQUIREMENTS OF A.S.T.M. DESIGNATION A 48 CLASS 30B.

(2) CASTINGS SHALL BE TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS AND EXCESSIVE SHRINKAGE.

(3) CASTING SURFACES SHALL BE FREE FROM BURNT ON SAND AND SHALL BE SMOOTH.

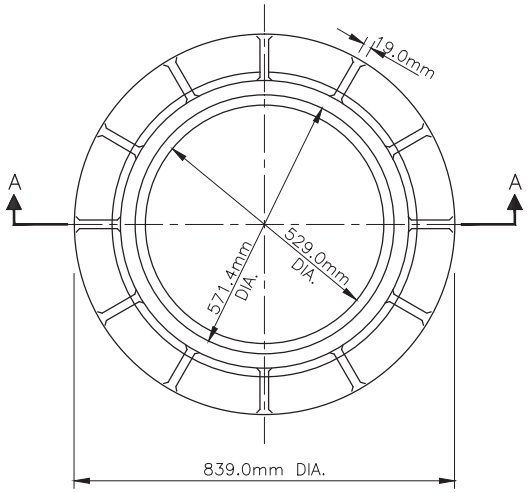
(4) CAST ON PIECES SUCH AS RUNNERS AND FINS SHALL BE REMOVED.

(5) CASTING SHALL NOT ROCK WHEN INSTALLED.

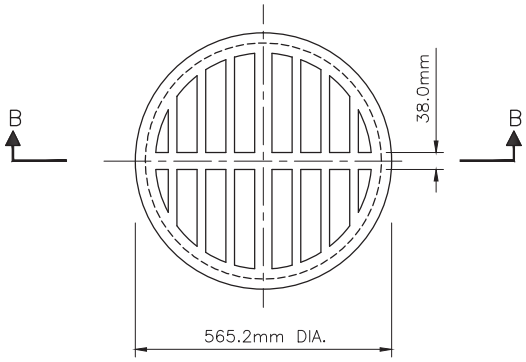
REGIONAL MUNICIPALITY OF WOOD BUFFALO

LANE PAVING CATCH BASIN c/w C.B. MANHOLE FRAME AND TOP

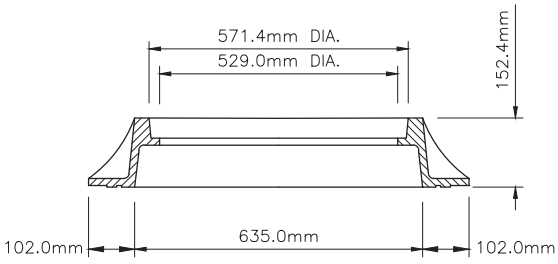
STANDARD DETAIL:	6-203
DATE: OCT 2016	REV: 3



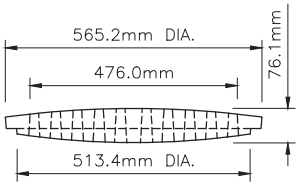
STANDARD FRAME – PLAN



STANDARD TOP – PLAN



SECTION A–A



SECTION B–B

NOTES:

(1) CASTINGS SHALL CONFORM TO ALL REQUIREMENTS OF A.S.T.M. DESIGNATION A 48 CLASS 30B.

(2) CASTINGS SHALL BE TRUE TO PATTERN AND FREE FROM CRACKS, GAS HOLES, FLAWS AND EXCESSIVE SHRINKAGE.

(3) CASTING SURFACES SHALL BE FREE FROM BURNT ON SAND AND SHALL BE SMOOTH.

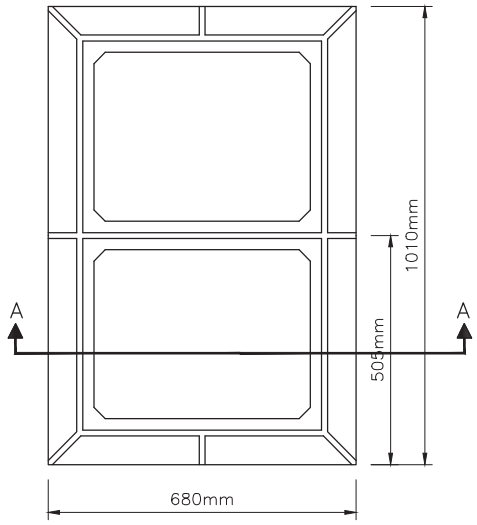
(4) CAST ON PIECES SUCH AS RUNNERS AND FINS SHALL BE REMOVED.

(5) CASTING SHALL NOT ROCK WHEN INSTALLED.

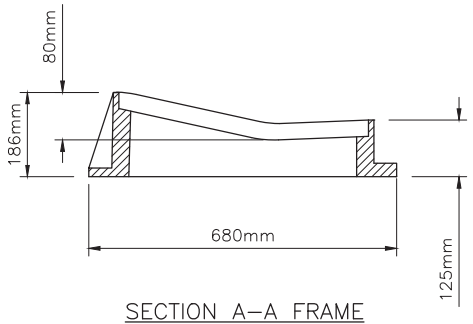
REGIONAL MUNICIPALITY OF WOOD BUFFALO

ROUND CATCH BASIN/ C.B. MANHOLE FRAME AND TOP

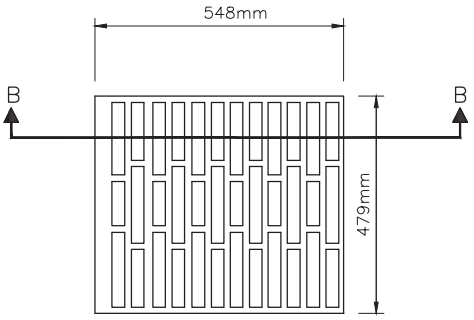
STANDARD DETAIL:	6-204
DATE: OCT 2016	REV: 3



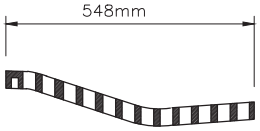
PLAN – FRAME



SECTION A–A FRAME



PLAN – GRATING



SECTION B–B GRATING

NOTES:

MATERIAL:

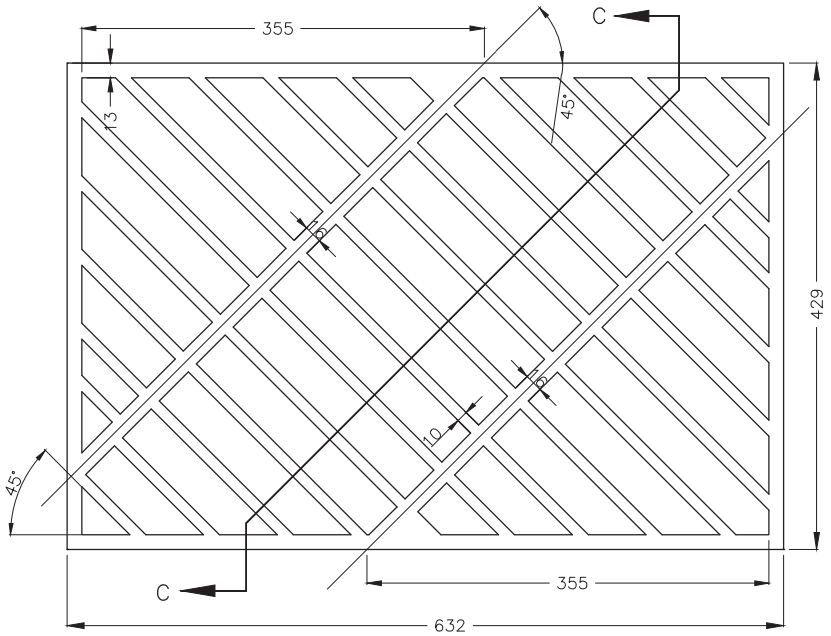
(1) FRAME: GREY IRON CLASS 30B.

(2) GRATE: DUCTILE IRON GRADE 80–55–06.

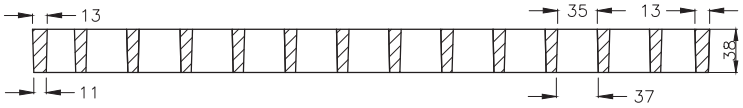
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPE K-2 CATCH BASIN FRAME AND COVER

STANDARD DETAIL:	6-205
DATE: OCT 2016	REV: 3



PLAN



SECTION C–C

NOTES:

MATERIAL SPECIFICATION:

(1) *DUCTILE IRON TO CONFORM YO A.S.T.M. A536 GRADE 60–40–18.

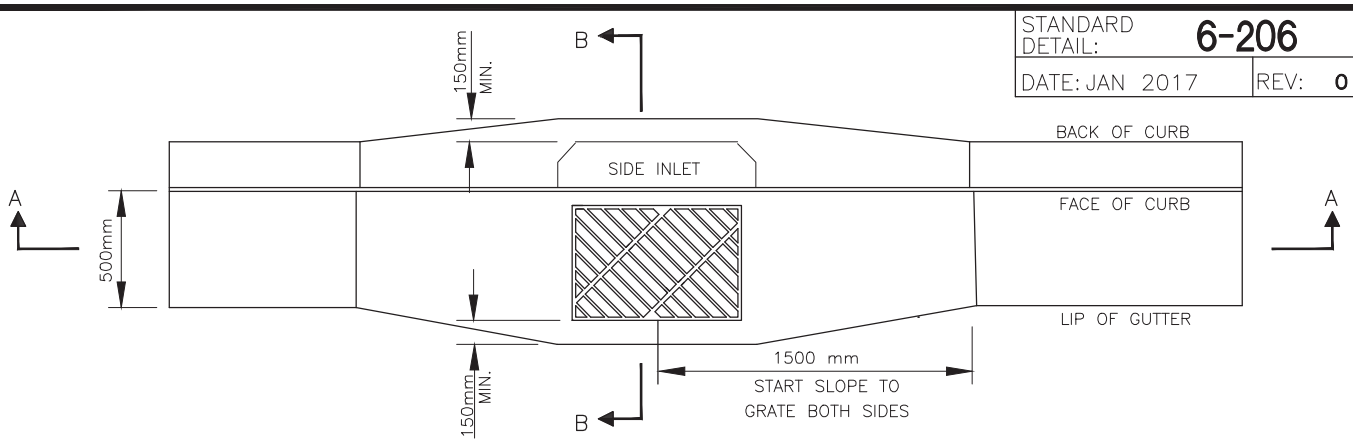
(2) *MASS=24KG.

(3) MEASUREMENTS IN MILLIMETERS.

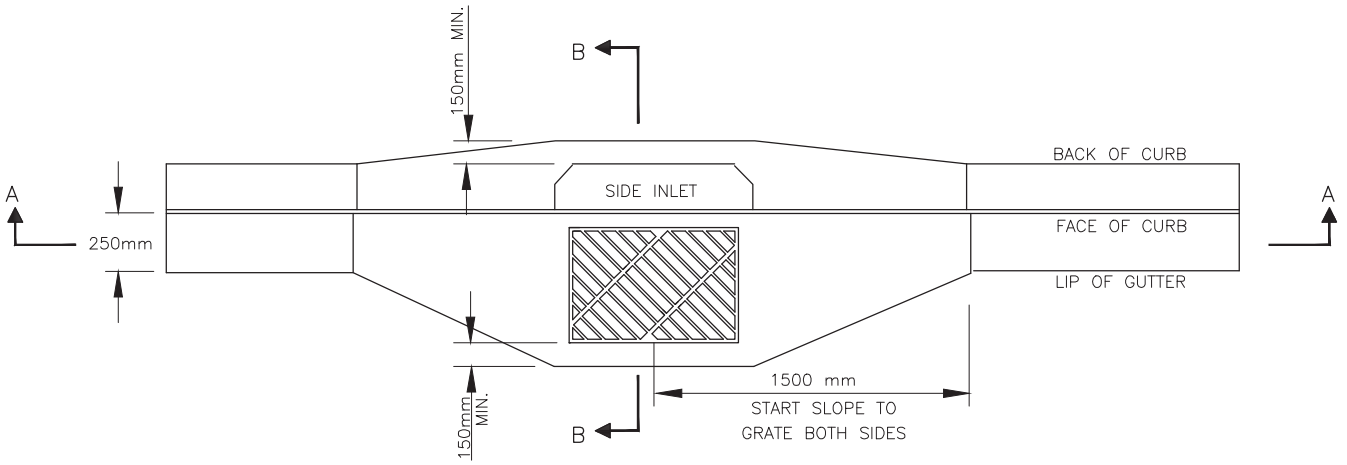
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPE F-51 GRATE (ANGLED)

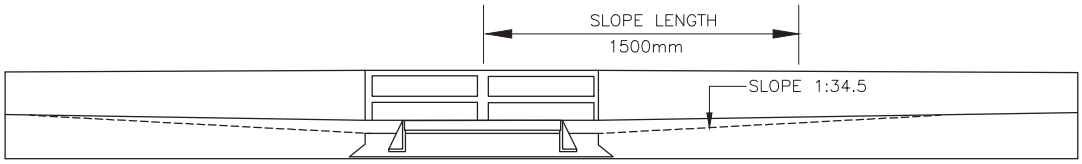
STANDARD DETAIL:	6-206
DATE: JAN 2017	REV: 0



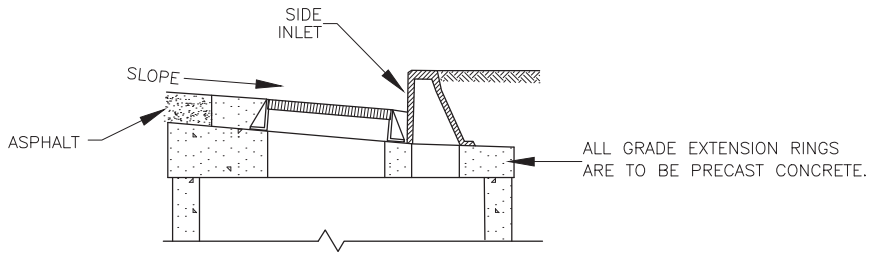
PLAN – F–51 SIDE INLET, FRAME AND COVER SET IN 200mm CURB WITH 500mm GUTTER



PLAN – F–51 SIDE INLET, FRAME AND COVER SET IN 200mm CURB WITH 250mm GUTTER



SECTION A–A

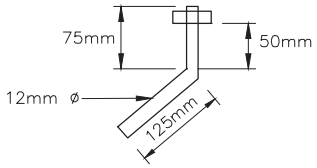


SECTION B–B

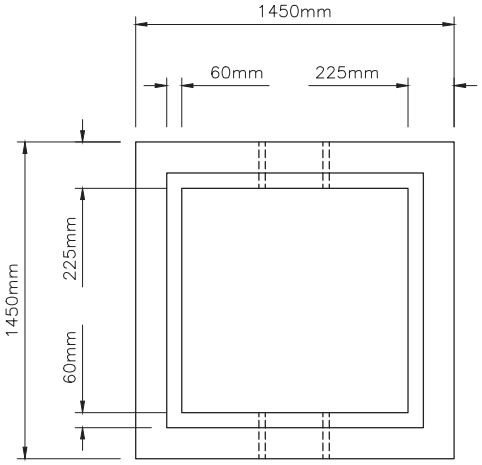
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPE K1 CATCH BASIN CURB FINISHING DETAIL

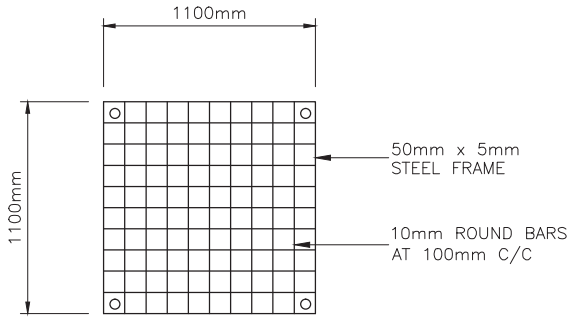
STANDARD DETAIL:	6-300
DATE: OCT 2016	REV: 3



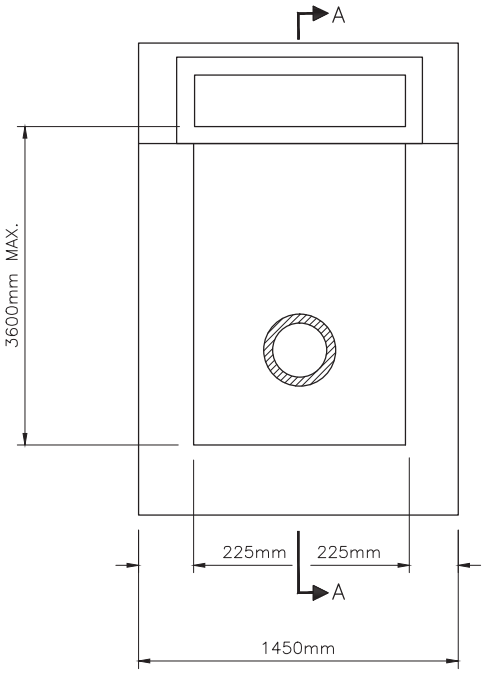
GRATE FASTENER



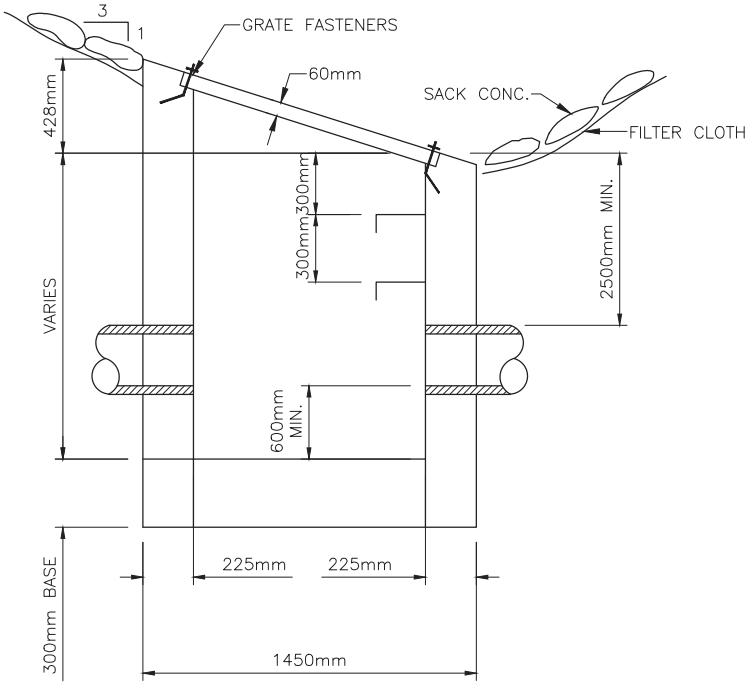
PLAN VIEW



GRATE DETAIL



FRONT VIEW



SECTION A–A

NOTES:

(1) COMPRESSIVE STRENGTH OF TYPE HS CONCRETE AT 28 DAYS SHALL BE 30 MPa.

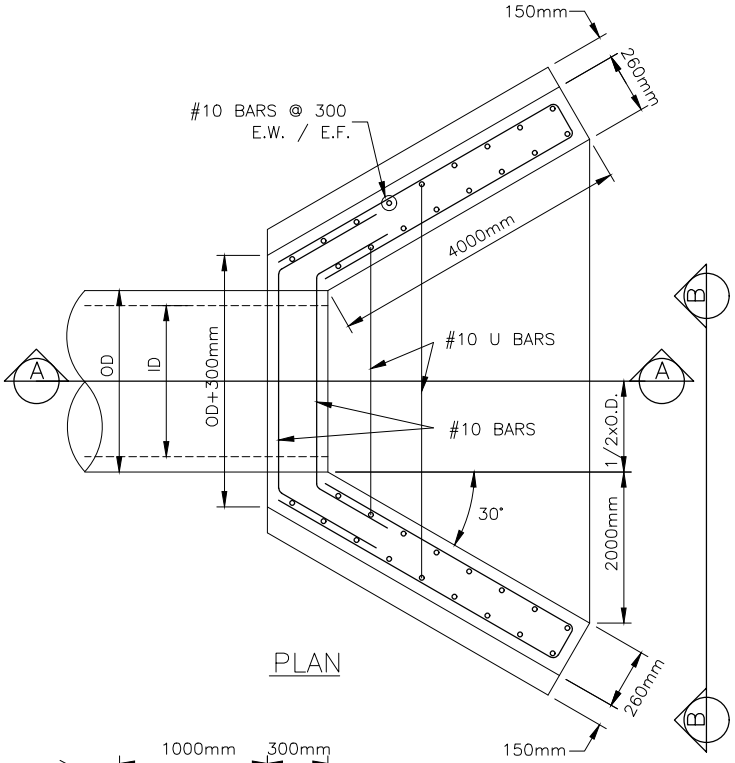
(2) LADDER RUNGS AS SPECIFIED.

(3) RIP–RAP AS SPECIFIED.

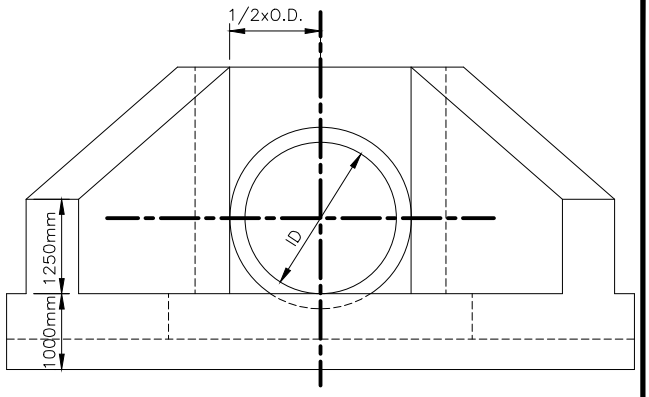
REGIONAL MUNICIPALITY OF WOOD BUFFALO

DITCH INLET WITH SUMP

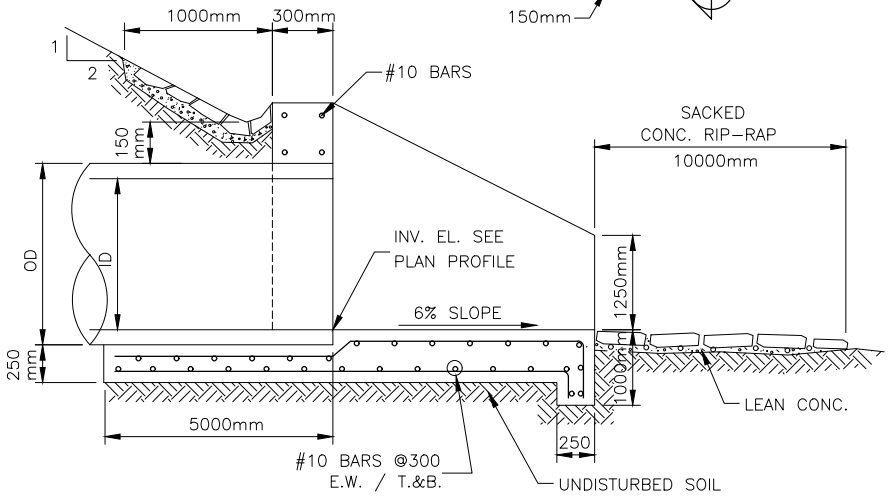
STANDARD DETAIL:	6-400
DATE.: JAN. 2021	REV: 4



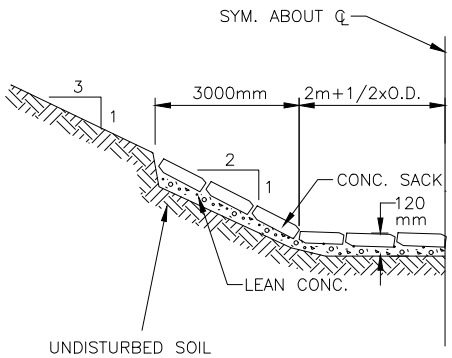
PLAN



END VIEW



SECTION A-A



SECTION B-B

NOTES:

(1) COMPRESSIVE STRENGTH OF STRUCTURE CONCRETE AT 28 DAYS SHALL BE 30 MPa, TYPE HS.

(2) CLEAR COVER FOR RE-BAR ON EARTH FACE SHALL BE 75mm AND 50mm ELSEWHERE.

(3) SACK SHALL BE FILLED TWO-THIRD FULL WITH CONCRETE (20MPa MIN.) AND SECURELY SEWN OR STAPLED TO FORM A STRAIGHT-EDGE CLOSURE. THE PREPARED SACKS SHALL BE IMMEDIATELY PLACED ON THE SURFACE AND SHALL BE RAMMED AND PACKED AGAINST EACH OTHER TO FORM A CLOSE MOLDED AND UNIFORM SURFACE AVERAGING 125mm IN THICKNESS. JOINTS BETWEEN ROWS SHALL BE STAGGERED.

(4) SACKS TO OVERLAP IN DIRECTION OF FLOW OF WATER.

(5) SEE STD. DWG. NO 6-401 FOR BAR SCREEN.

(6) SEE STD. DWG. NO. 6-500 FOR ROCK RIR-RAP ALTERNATIVE.

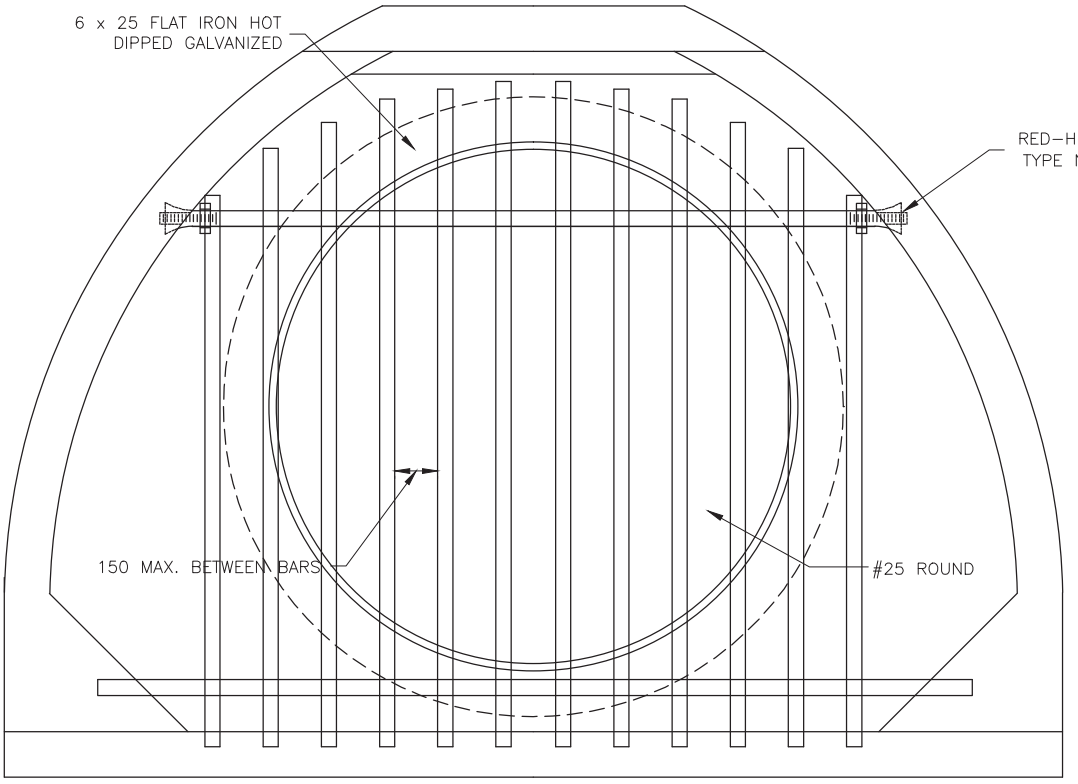
(7) OUTFALL STRUCTURE SUBJECT TO APPROVAL FROM MUNICIPALITY.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

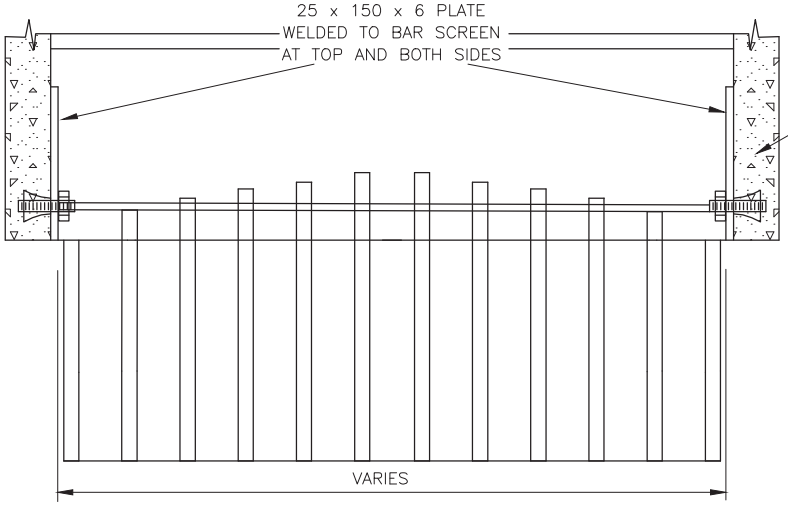
POURED CONCRETE OUTFALL STRUCTURE

Time: 2:51pm
Date: Feb 02, 2021
File: \\Cd1044-f06\work_group\1161\active\116110892O\drawing\sheet_files\figures\Section 6\3658-6-400s.dwg by
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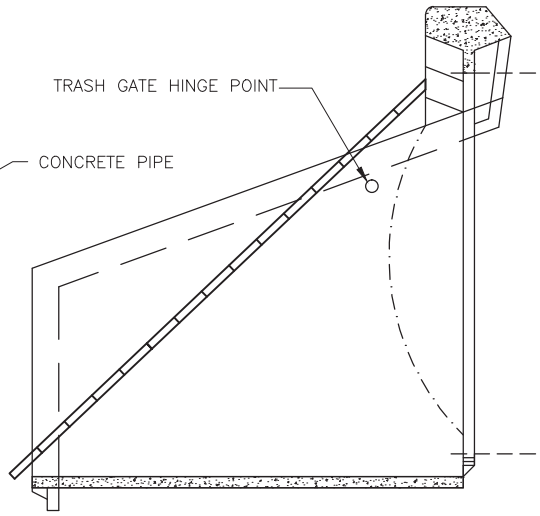
STANDARD DETAIL:	6-401
DATE: OCT 2016	REV: 3



FRONT VIEW



TOP VIEW



SIDE VIEW

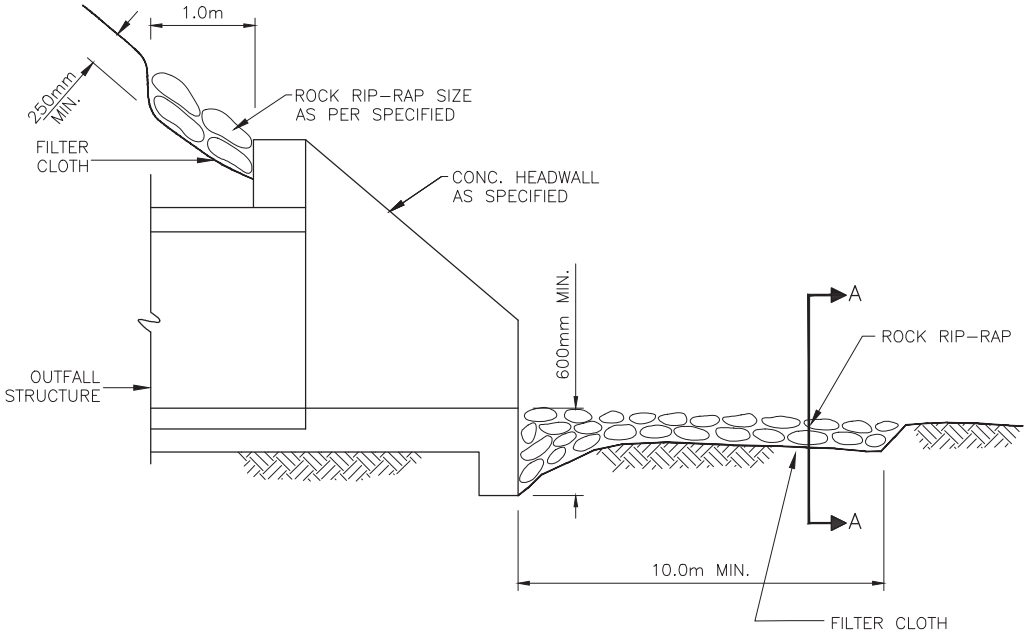
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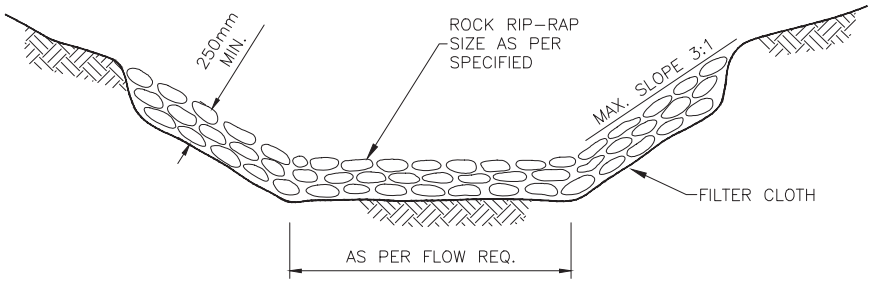
(1) BARS TO BE VERTICAL ON THE UPSTREAM SIDE AND HORIZONTAL ON THE DOWNSTREAM SIDE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BAR SCREEN FOR CULVERT

STANDARD DETAIL:	6-500
DATE: OCT 2016	REV: 3





SECTION A–A

NOTES:

(1) STILLING BASIN SHALL BE REQ'D FOR HIGH VELOCITY FLOWS.

(2) ALL FILTER CLOTH PANEL JOINTS TO OVERLAP 100mm AND BE HEAT SEALED.

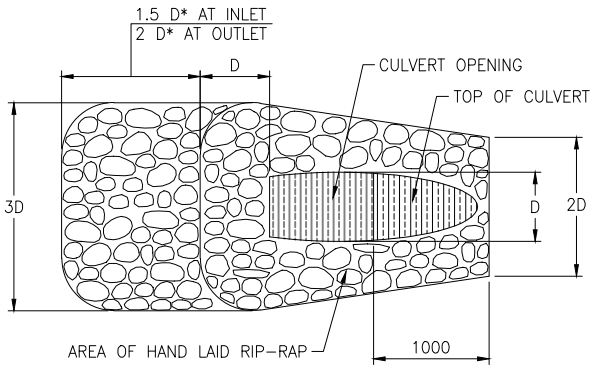
(3) FILTER CLOTH TYPE TO BE AS PER SPECIFIED.

(4) FOR BAGGED CONCRETE RIP–RAP SEE STANDARD. DWG NO. 6–400.

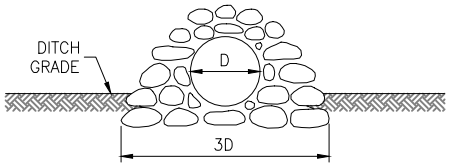
REGIONAL MUNICIPALITY OF WOOD BUFFALO

ROCK RIP-RAP DETAIL FOR OUTFALL OR OPEN CHANNELS

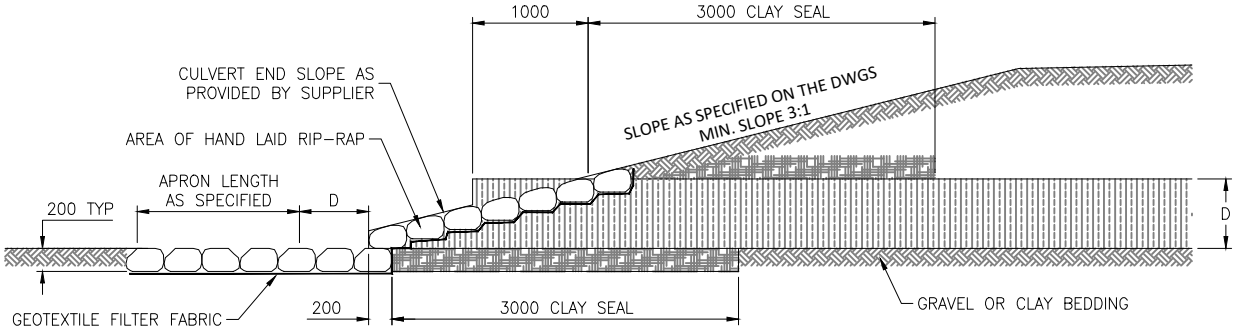
STANDARD DETAIL:	6-501
DATE.: JAN. 2021	REV: 6



PLAN VIEW



ELEVATION



SECTION

NOTES:
(1) A CLAY SEAL IS TO BE PLACED AT BOTH ENDS OF THE CULVERT FOR A LENGTH OF 3.0m TO CUT OFF SEEPAGE.
(2) THE CLAY SEAL SHALL EXTEND FROM THE BOTTOM OF THE EXCAVATION TO 300mm ABOVE THE CROWN OF THE PIPE AND FOR THE FULL WIDTH OF THE EXCAVATION.
(3) WHERE APRONS ARE REQUIRED DUE TO HIGH VELOCITY FLOW OR EROSION PRONE SOIL, TYPICALLY THE MINIMUM INLET APRON IS 1.5 X DIAMETER LONG AND OUTLET APRON IS 2.0m LONG.

ESTIMATED RIP RAP SURFACE AREAS (BASED ON 3:1 SIDESLOPE)

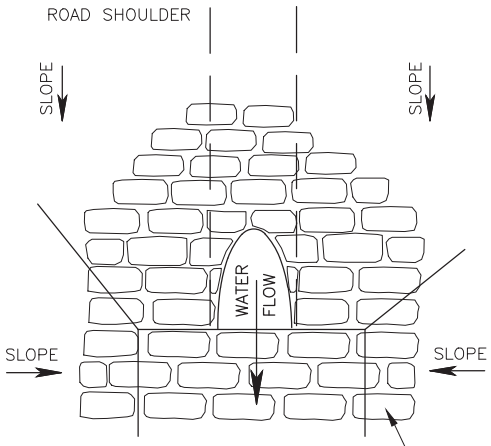
PIPE DIAMETER (mm)	AREA OF ONE END EXCLUDING APRON (sq.m.)	AREA OF ONE END INCLUDING INLET APRON (sq.m.)	AREA OF ONE END INCLUDING OUTLET APRON (sq.m.)
400	1	1	2
500	2	3	4
600	3	5	6
700	4	6	7
800	5	8	9
900	6	10	11
1000	7	12	13
1100	9	14	16
1200	10	16	19
1400	13	22	25

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL ROCK RIP RAP FOR CULVERTS

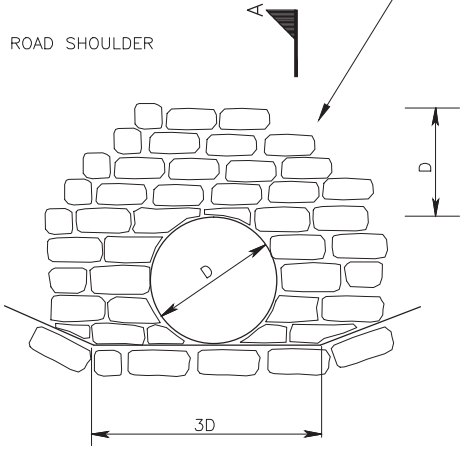
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Date: Feb 01, 2021
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Xrefs:

STANDARD DETAIL:	6-502
DATE: OCT 2016	REV: 5

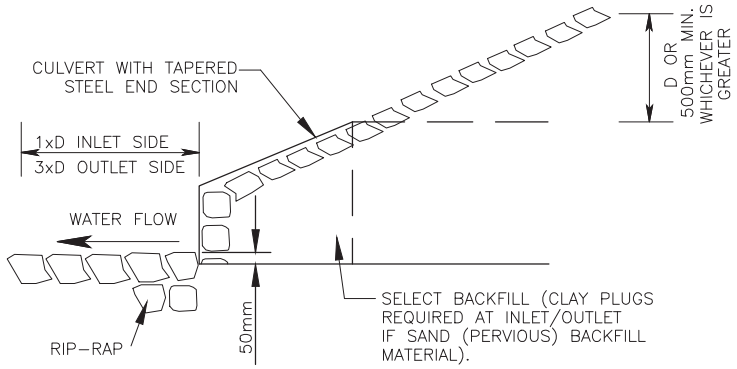


PLAN VIEW

RIP–RAP SLOPE AND END PROTECTION



FRONT VIEW



SIDE SECTION A–A

NOTES:

(1) SACK SHALL BE FILLED 2/3 FULL WITH CONCRETE (20 MPa) AND SECURELY SEWN OR STAPLED TO FORM A STRAIGHT–EDGE CLOSURE.

(2) THE PREPARED SACKS SHALL BE IMMEDIATELY PLACED ON THE PREPARED SURFACE AND SHALL BE RAMMED AND PACKED AGAINST EACH OTHER TO FORM A CLOSE MOULDED AND UNIFORM SURFACE AVERAGING 125mm IN THICKNESS.

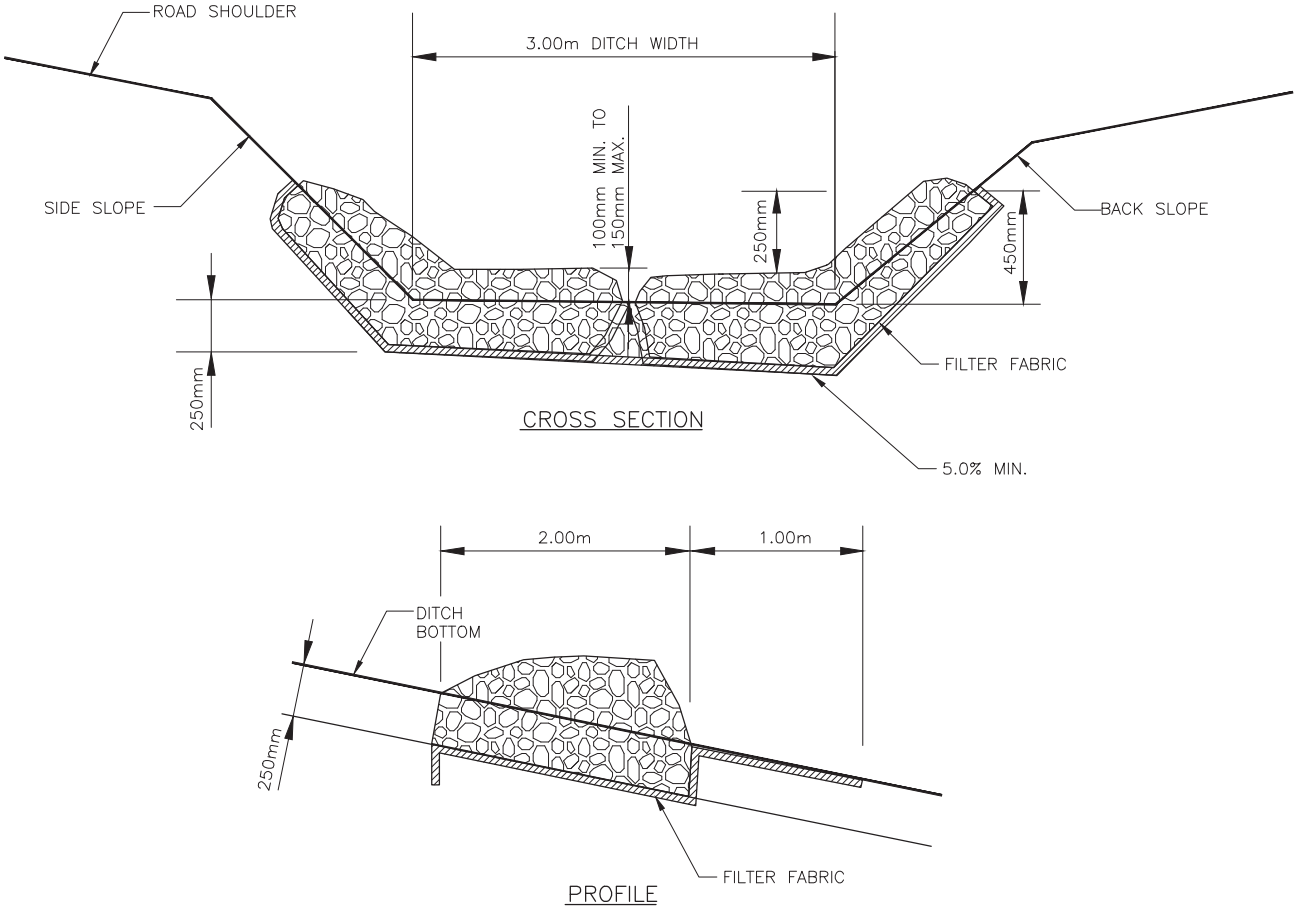
(3) JOINTS BETWEEN ROWS SHALL BE STAGGERED.

(4) SACKS TO OVERLAP IN DIRECTION OF FLOW OF WATER APRONS TO BE CONSTRUCTED AT INLET AND OUTLET ENDS OF CULVERT WHEN NECESSARY.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL BAGGED RIP RAP FOR CULVERTS

STANDARD DETAIL:	6-503
DATE: OCT 2016	REV: 5



NOTES:

(1) ROCK SHALL BE TRENCHED INTO THE SIDESLOPE AND BACKSLOPE AT A POINT AT LEAST 450mm ABOVE THE DITCH BOTTOM AND AT LEAST 250mm ABOVE THE LOW POINT OF THE SURFACE OF ROCK IN THE DITCH.

(2) THE ROCK SHALL BE TRENCHED INTO THE DITCH BOTTOM AND SLOPES A MIN. 250mm. THE LOWEST POINT OF THE DITCH CHECK MUST BE A MIN. OF 100mm TO A MAX. OF 150mm ABOVE THE DITCH BOTTOM.

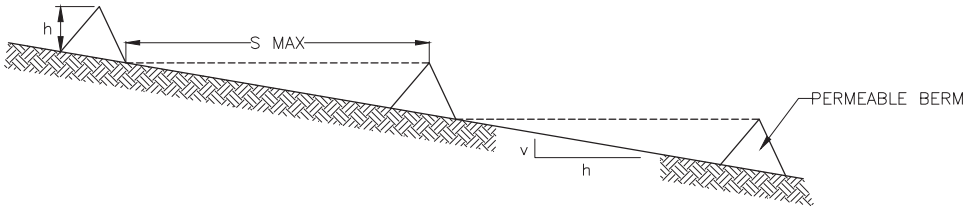
(3) ROCKS TO BE USED SHALL BE AS NEARLY CUBICAL IN FORM AS POSSIBLE AND MUST NOT BE SMALLER THAN 150mm.

(4) FILTER FABRIC SHALL BE PLACED IN THE BOTTOM OF THE TRENCH.

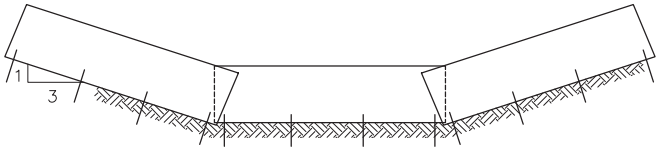
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL RURAL ROCK DITCH CHECKS

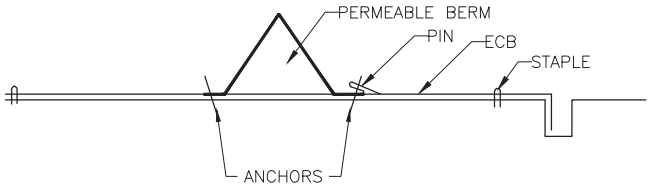
STANDARD DETAIL:	6-504
DATE: OCT 2016	REV: 5



MAXIMUM SPACING



TYPICAL DITCH CROSS–SECTION



CROSS SECTION

NOTES:

(1) TO BE PLACED ACROSS THE ENTIRE WIDTH OF THE DITCH.

(2) THE LOCATION AND SPACING OF DITCH CHECKS ARE TO BE DETERMINED BY THE ENGINEER BASED ON MANUFACTURER'S RECOMMENDED PROCEDURES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PERMEABLE DITCH CHECK

STANDARD DETAIL:	6-505
DATE.: JAN. 2021	REV: 1



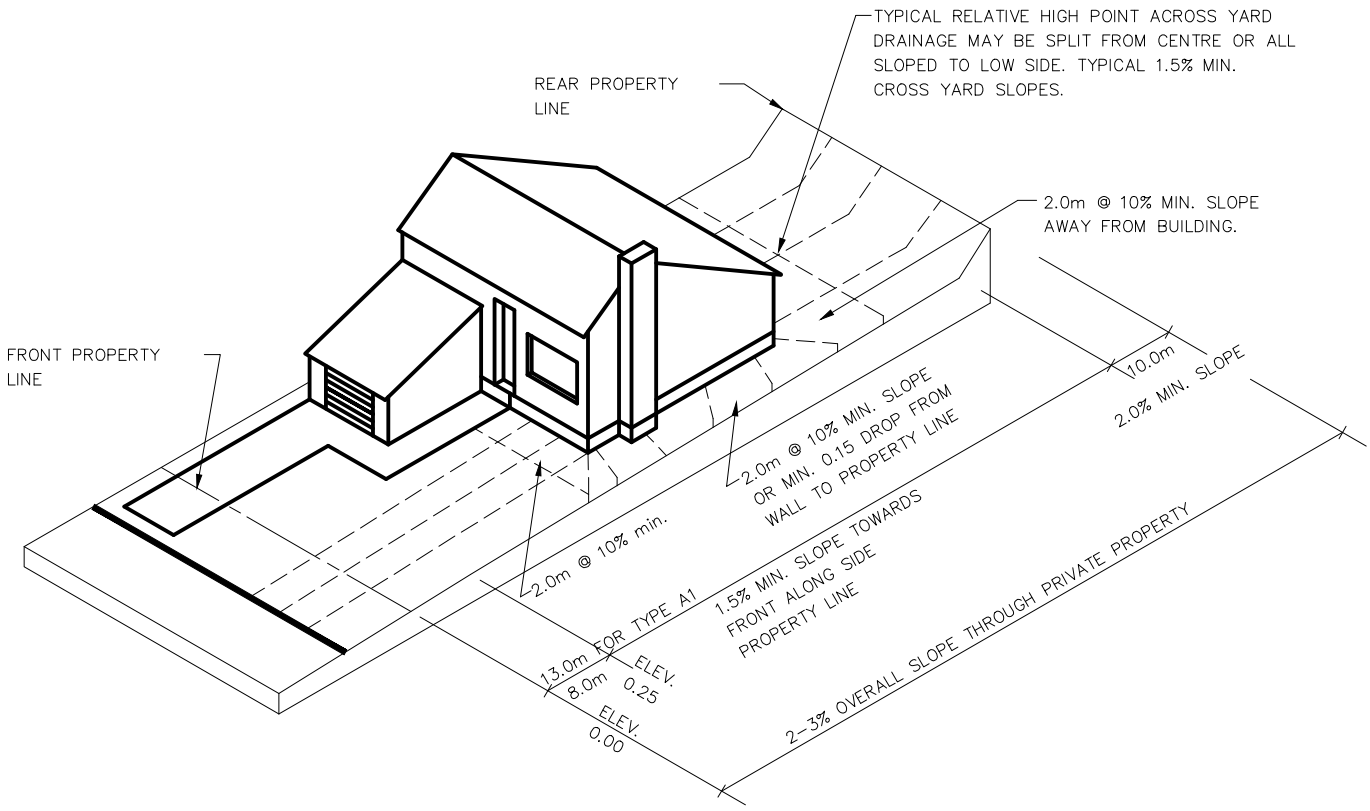
NOTE:

(1) ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

STORMWATER MANAGEMENT POND SIGN

STANDARD DETAIL:	6-550
DATE.: JAN. 2021	REV: 4

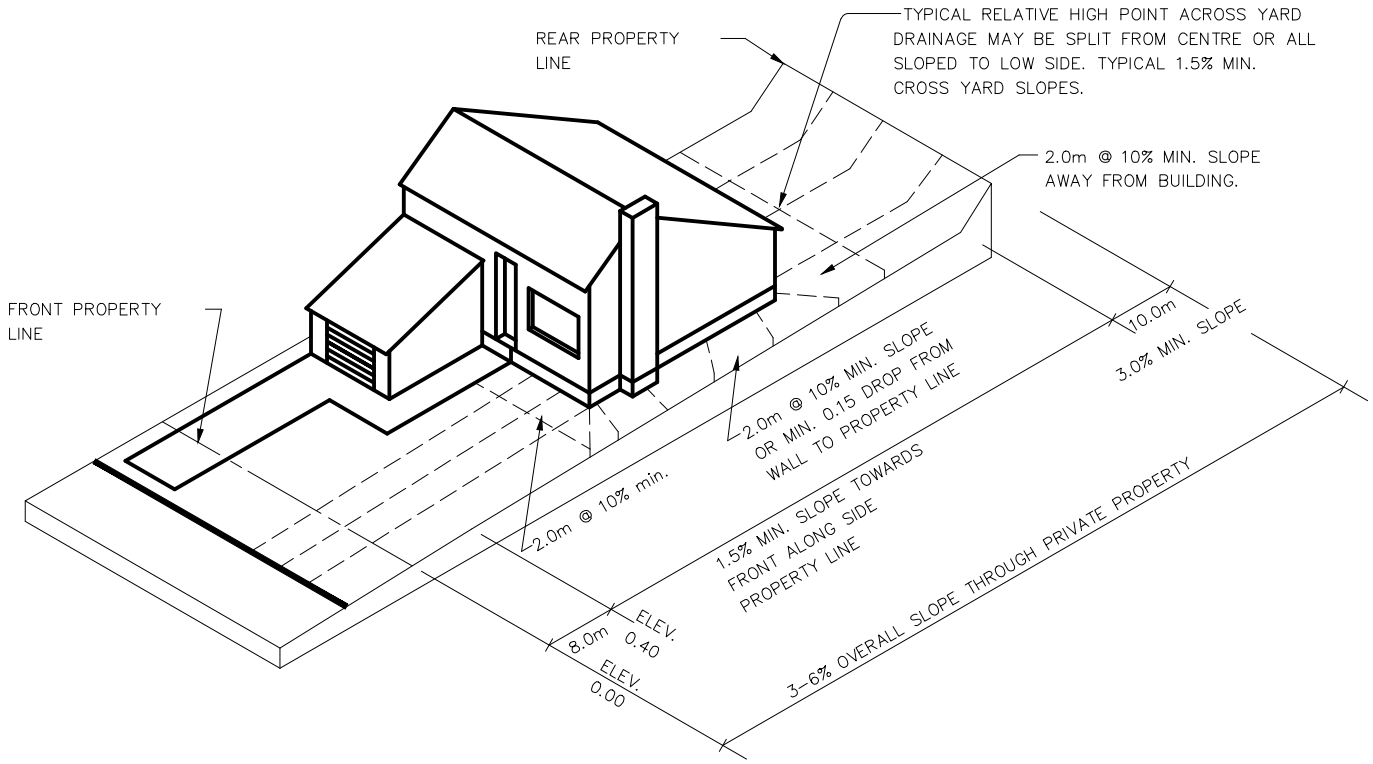


REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPE A AND TYPE A1
REAR TO FRONT DRAINAGE

Time: 2:40pm
Date: Jan 28, 2021
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Xrefs:

STANDARD DETAIL:	6-551
DATE.: JAN. 2021	REV: 4

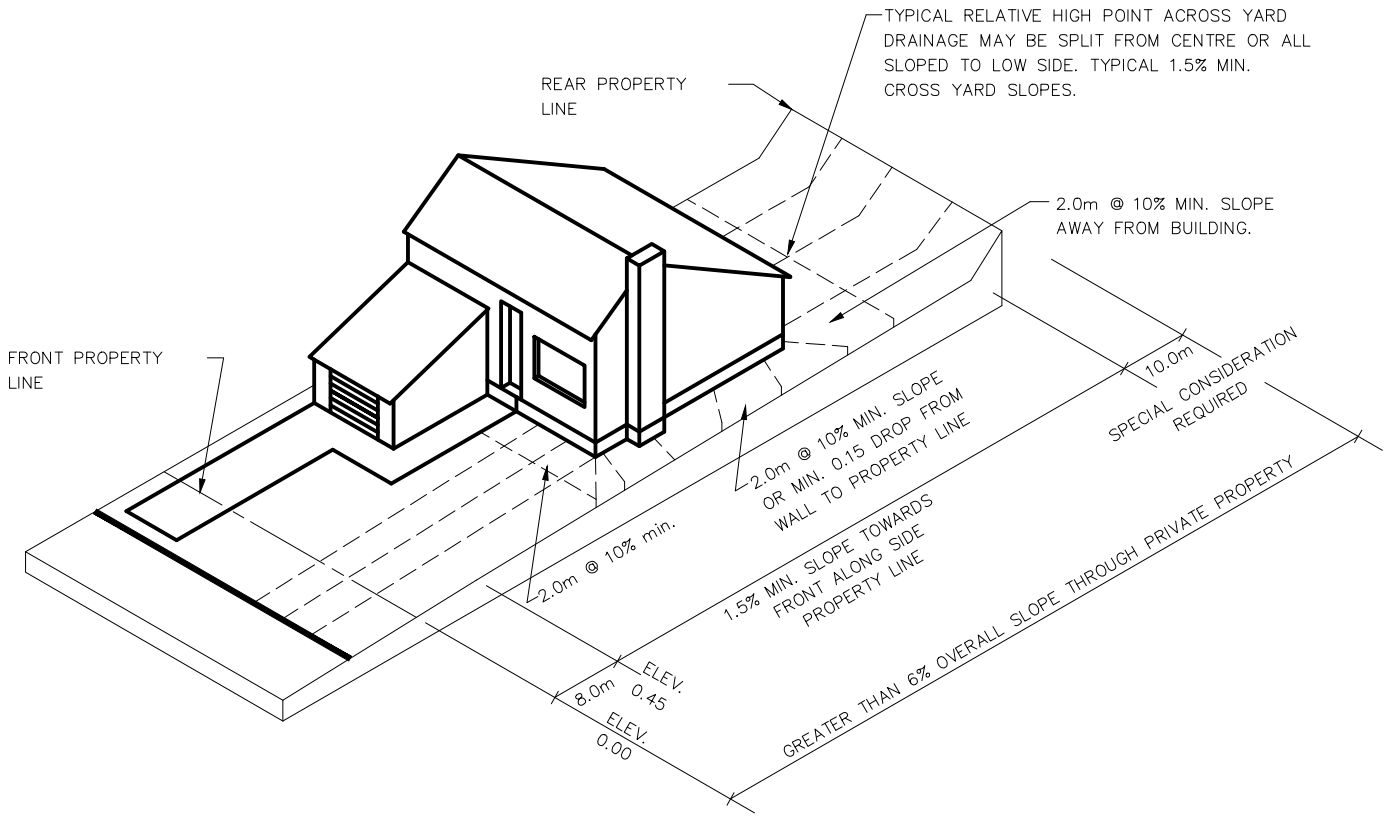


REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPE B
REAR TO FRONT DRAINAGE

Time: 2:40pm
Date: Jan 28, 2021
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Xrefs:

STANDARD DETAIL:	6-552
DATE.: JAN. 2021	REV: 0

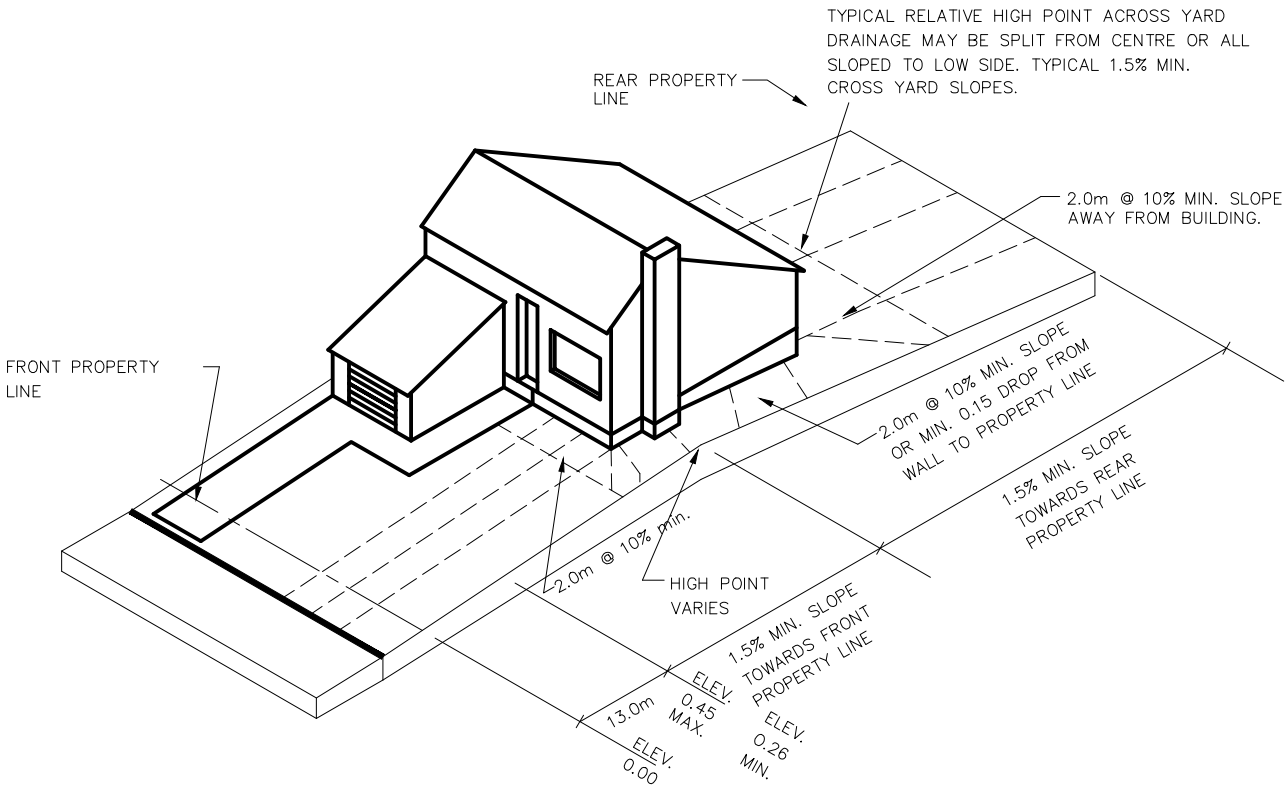


REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPE C
REAR TO FRONT DRAINAGE ( )6% SLOPE)

Time: 12:44pm
Date: Feb 03, 2021
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Xrefs:

STANDARD DETAIL:	6-553
DATE.: JAN. 2021	REV: 4

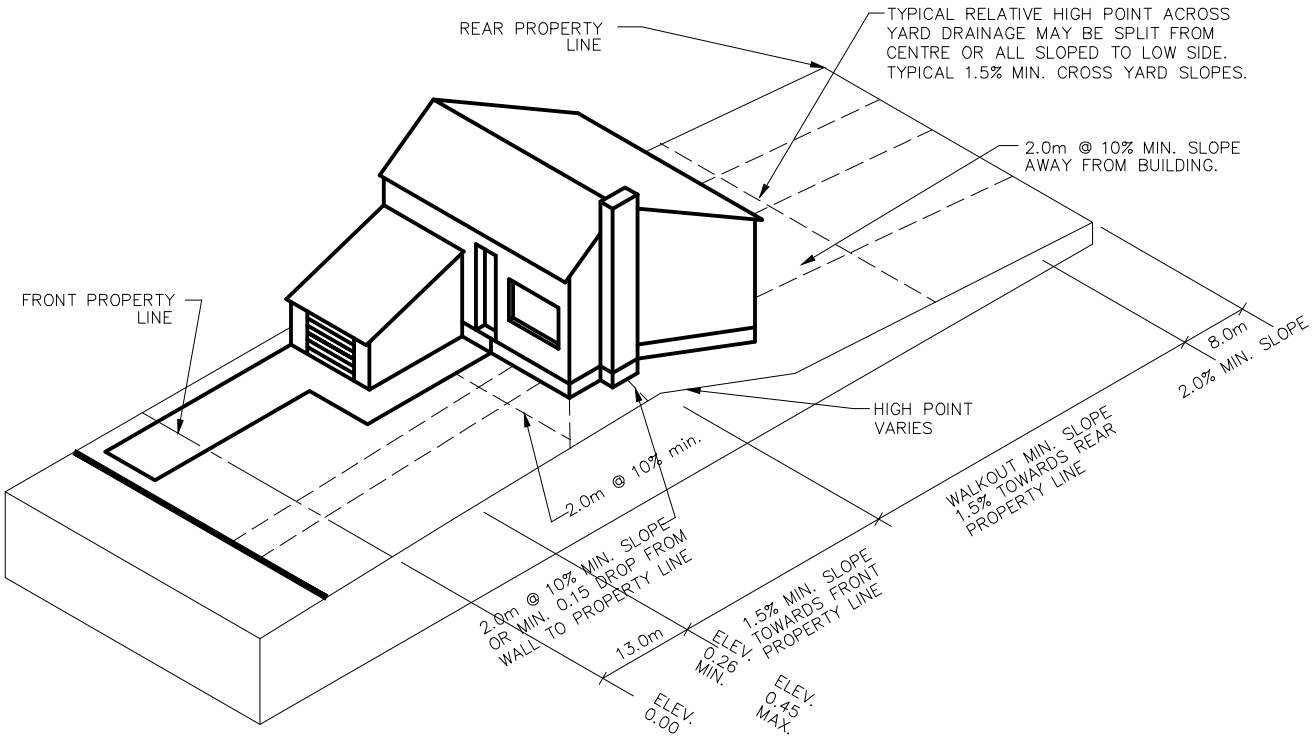


REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPE D
STANDARD SPLIT DRAINAGE

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Date: Jan 28, 2021
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STANDARD DETAIL:	6-554
DATE.: JAN. 2021	REV: 4

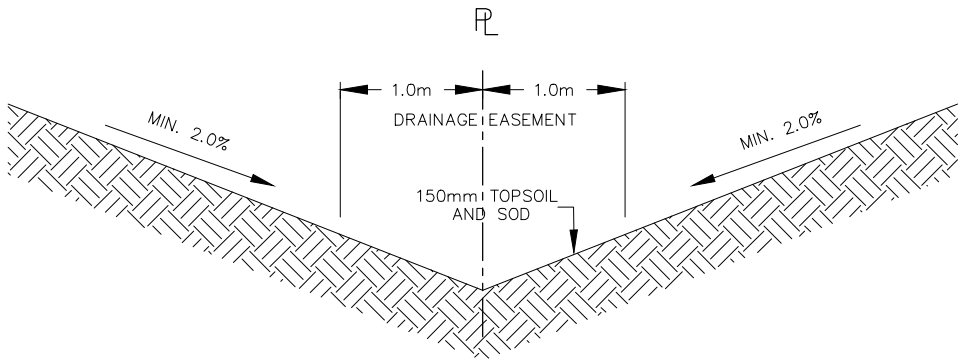


REGIONAL MUNICIPALITY OF WOOD BUFFALO

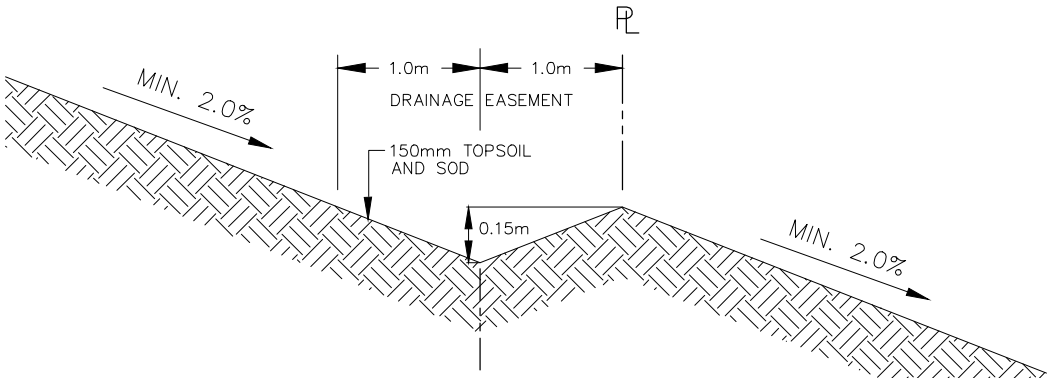
TYPE W WALKOUT BASEMENT SPLIT DRAINAGE

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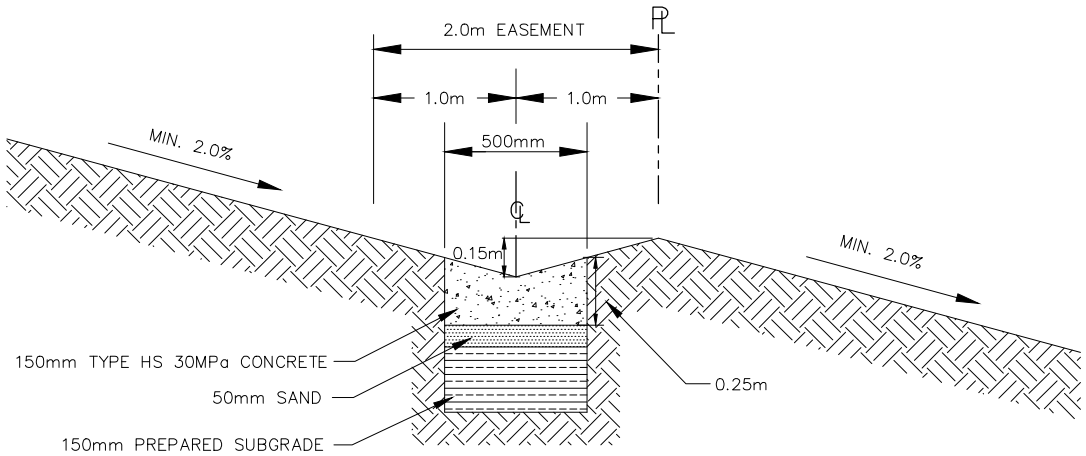
STANDARD DETAIL:	6-556
DATE.: JAN. 2021	REV: 5



TYPE 1 GRASS SWALE
MINIMUM 1.5% GRADE



TYPE 2 GRASS SWALE
MINIMUM 1.5% GRADE



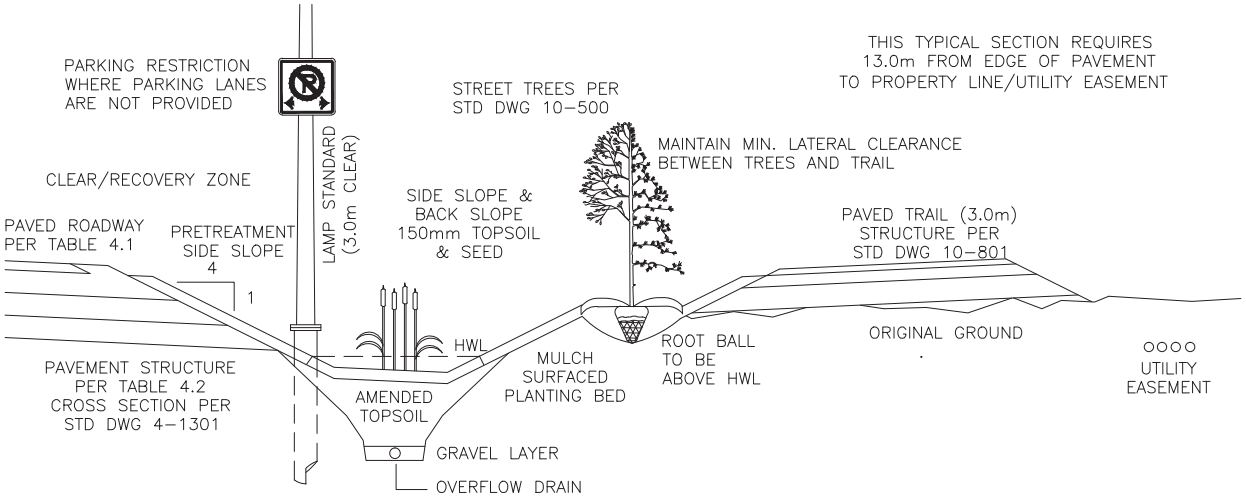
CONCRETE SWALE
0.5% MINIMUM LONGITUDINAL GRADE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL DRAINAGE SWALES

Time: 2:42pm
Date: Jan 28, 2021
File: V:\1161\active\116110892O\drawing\sheet_files\figures\Section 6\3658-6-500s.dwg by
Xrefs:

STANDARD DETAIL:	6-557
DATE: OCT 2016	REV: 0



DESIGN MINIMUMS:

(1) WHERE BIOSWALES ARE USED, ROAD SHOULDER SIDE SLOPE TO BE NO STEEPER THAN 4 HORZ. TO 1 VERT. FOR BIOSWALE PRE-TREAMENT PURPOSES; OTHERWISE ROAD SHOULDER SIDE SLOPE MAY VARY DEPENDANT ON HEIGHT OF EMBANKMENT.

(2) BIOSWALE OVERFLOW DURING PEAK FLOW TO BE CONTROLLED BY CHECK DAMS & OVERFLOW DRAINS. HIGH WATER LEVEL (HWL) TO BE 0.3m DEEP MAXIMUM WITH HWL AT A MINIMUM OF 0.1m BELOW THE BOTTOM OF THE BASE OF ROAD STRUCTURE, STABILIZED BASE.

(3) MINIMUM 3.0m TRAFFIC CLEAR ZONE/RECOVERY ZONE TO BE MAINTAINED. THIS AREA ALSO RESERVED FOR WINTER SNOW STORAGE & RESULTING "KILL ZONE", THEREFORE NO PLANT MATERIALS EXCEPT GRASS. MORE WIDTH MAY BE ALLOTED FOR EFFECTIVE PRE-TREATMENT.

(4) ALL MUNICIPAL CROSS SECTION ELEMENTS TO BE ACCOMMODATED WITHIN THE DESIGN RIGHT-OF-WAY.

(5) MUNICIPAL UTILITIES TO HAVE FULL DEPTH OF COVER AT BIO-SWALE BOTTOM.

CONSULTANT SUBMISSIONS:

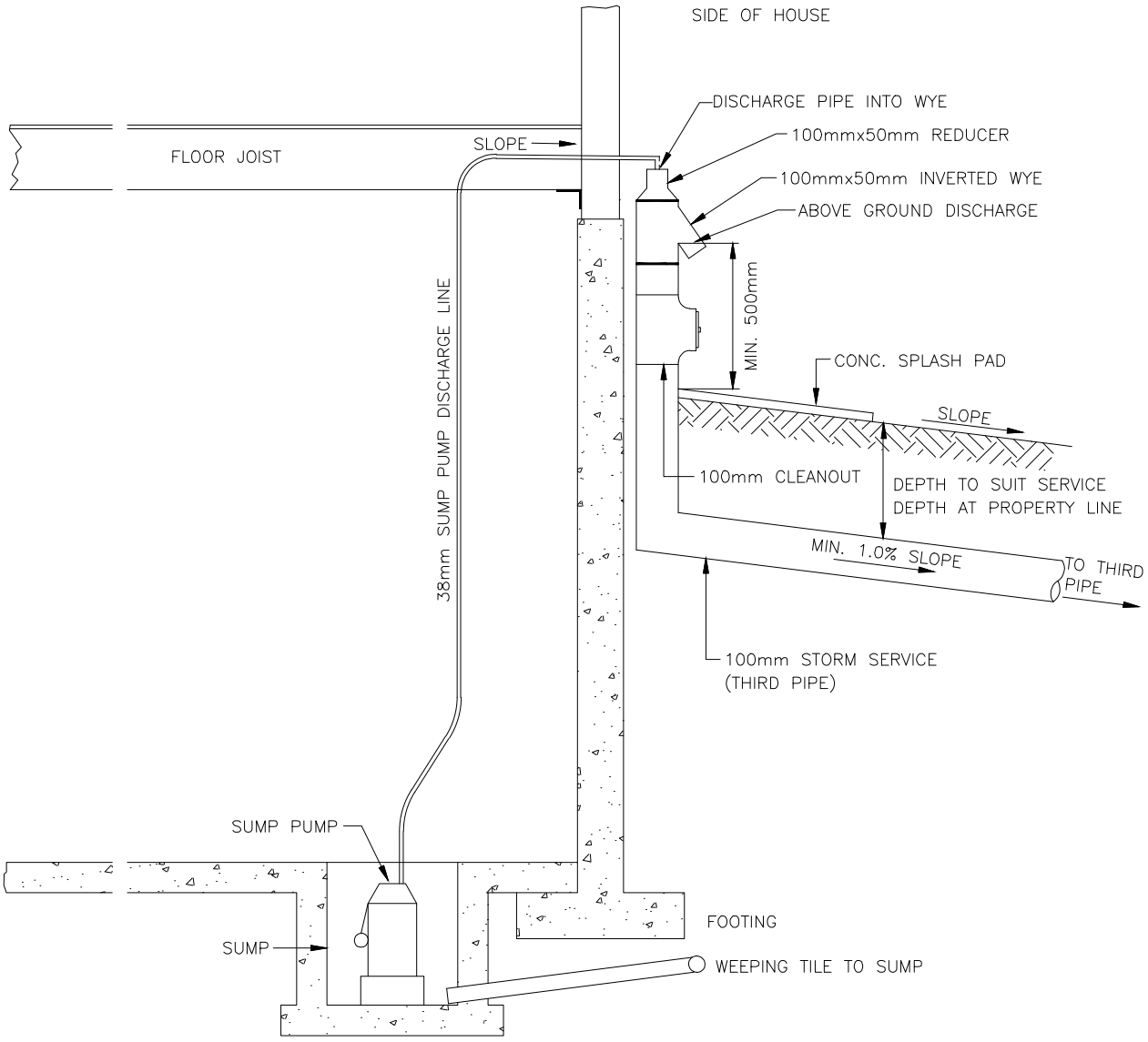
ENGINEERS DETAILED DESIGN TO:

- DESCRIBE THE SHAPE OF THE SWALE/CHANNEL CROSS SECTION;
- CONVEY 1:2 YEAR STORM EVENT;
- BIOSWALE CATCHMENT AREA TO BE BASED ON PROPOSED SOIL TYPE;
- DESCRIBE DESIGN CHANNEL ROUGHNESS, SURFACE FLOW VELOCITY, SLOPE & EFFECTIVE SLOPE, & PROPOSED MATERIALS STRUCTURAL ABILITY AGAINST EROSION;
- DESCRIBE DRAW DOWN TIME AND MAXIMUM PONDING DEPTH;
- IMPACT OF WINDROWED SNOW ON TOPSOIL STRUCTURE COMPACTION;
- ASSESS IMPACT OF DEICING COMPOUNDS ON SOILS AND PLANT MATERIALS;
- ASSESS IMPACT OF CULVERTS AND ANY NON-BIOSWALE DITCHING;
- CONSIDER SPRING THAW VOLUMES & RURAL SNOW STORAGE ON SHOULDERS;
- PROVIDE DETAILED SPECIFICATIONS FOR BIOSWALE:
  - PROPOSED SALT TOLERANT GRASSES & PLANT MATERIALS;
  - MULCH OR ALTERNATE BIOSWALE SURFACE MATERIAL;
  - TOPSOIL AND AMENDMENT COMPONENTS (QTY'S OR %'S);
  - GRAVEL DRAINAGE LAYER MATERIALS & FILTER CLOTHS;
  - OVERFLOW DRAINAGE SYSTEM MATERIALS;
  - CHECK DAM MATERIALS
- AND ALL RELATED INSTALLATION METHODOLOGIES, & UNDER SEPARATE COVER ALL EXPECTED OPERATION AND MAINTENANCE REQUIREMENTS FOR THAT DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BIOSWALE WITHIN RURAL ROADWAY

STANDARD DETAIL:	6-558
DATE.: JAN. 2021	REV: 5



NOTES:

(1) EVERY PART OF THE PLUMBING SYSTEM SHALL BE PROTECTED FROM FREEZING THROUGH THE USE OF AN APPROVED METHOD.

(2) WEEPING TILES SHALL NOT BE CONNECTED TO THE SANITARY SYSTEM.

(3) BACKFLOW PREVENTORS SHALL BE INSTALLED BY LOT OWNERS ON ALL SANITARY SERVICES.

(4) ROOF LEADERS (DOWNSPOUTS) OR ANY OTHER STORM WATER SOURCE MUST NOT BE CONNECTED TO SUMP DISCHARGE COLLECTION SERVICE LINE.

(5) THE AUXILIARY SURFACE DISCHARGE MUST BE INSTALLED TO PROVIDE AN OVERFLOW IN THE EVENT THAT THE STORM DRAINAGE SYSTEM CANNOT ACCOMMODATE FLOWS DUE TO CAPACITY, FREEZING OR OTHER PROBLEMS.

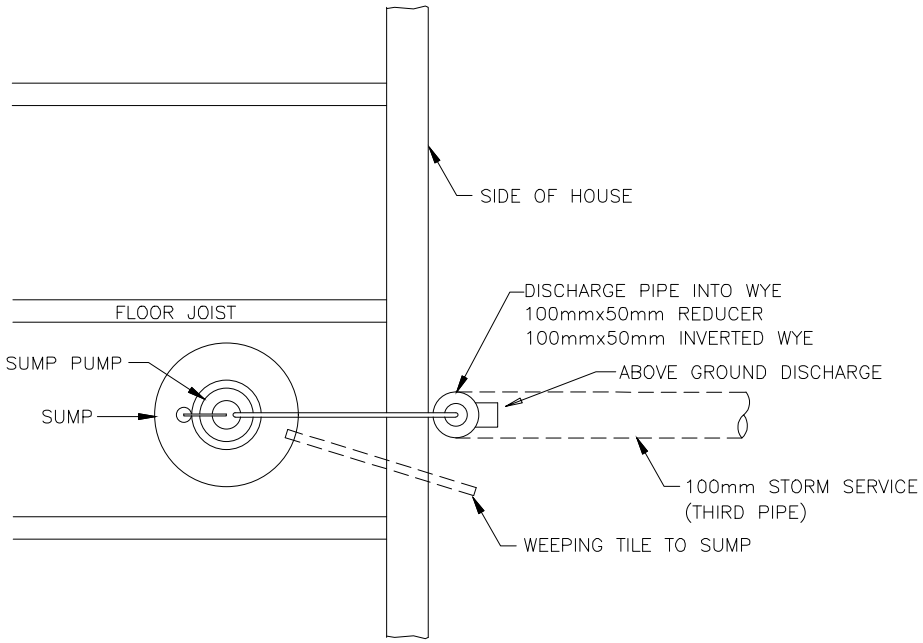
(6) 100mm CLEANOUT NEEDS TO BE FULLY ACCESSIBLE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL WEEPING TILE AND SUMP PUMP DISCHARGE

Time: 2:43pm
Date: Jan 28, 2021
File: V:\161\active\116110892O\drawing\sheet_files\figures\Section 6\3658-6-500s.dwg by
Xrefs:

STANDARD DETAIL:	6-559
DATE.: JAN. 2021	REV: 0



NOTES:

(1) EVERY PART OF THE PLUMBING SYSTEM SHALL BE PROTECTED FROM FREEZING THROUGH THE USE OF AN APPROVED METHOD.

(2) WEEPING TILES SHALL NOT BE CONNECTED TO THE SANITARY SYSTEM.

(3) BACKFLOW PREVENTORS SHALL BE INSTALLED BY LOT OWNERS ON ALL SANITARY SERVICES.

(4) ROOF LEADERS (DOWNSPOUTS) OR ANY OTHER STORM WATER SOURCE MUST NOT BE CONNECTED TO SUMP DISCHARGE COLLECTION SERVICE LINE.

(5) THE AUXILIARY SURFACE DISCHARGE MUST BE INSTALLED TO PROVIDE AN OVERFLOW IN THE EVENT THAT THE STORM DRAINAGE SYSTEM CANNOT ACCOMMODATE FLOWS DUE TO CAPACITY, FREEZING OR OTHER PROBLEMS.

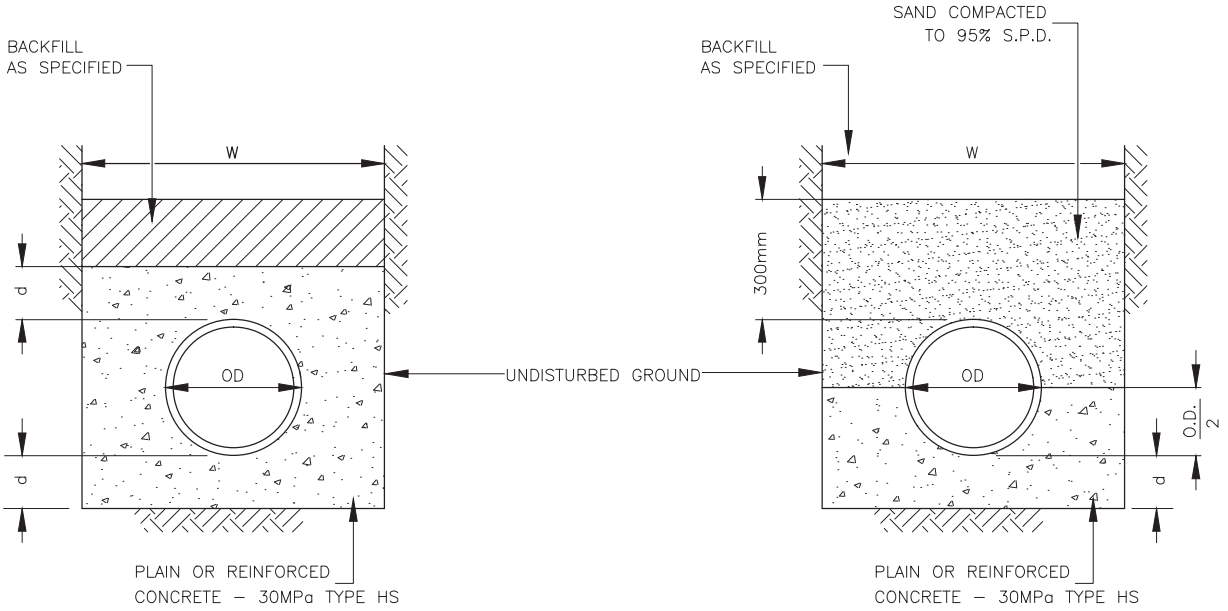
(6) 100mm CLEANOUT NEEDS TO BE FULLY ACCESSIBLE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL WEEPING TILE AND SUMP PUMP DISCHARGE PLAN VIEW

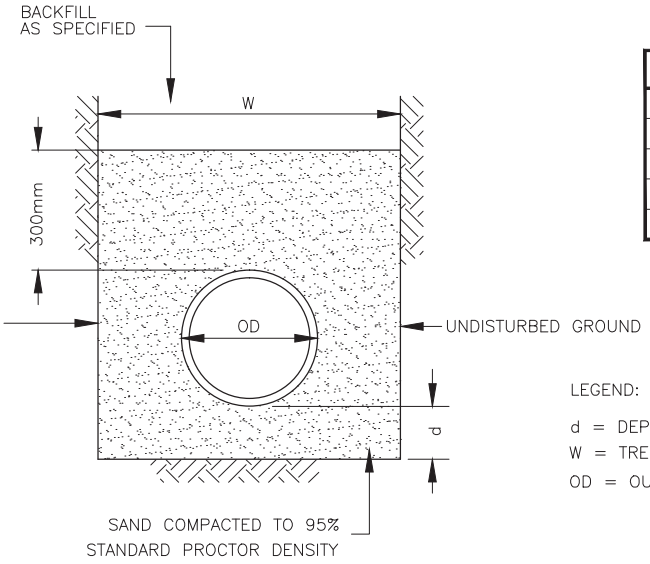
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Xrefs:

STANDARD DETAIL:	6-600
DATE: OCT 2016	REV: 3



CLASS A

CLASS A–1



CLASS B

PIPE SIZE	d MIN.(mm)
675mm OR SMALLER	75
750mm TO 1500mm	100
1650mm AND LARGER	150
W MIN.	2 X OD

LEGEND:

d = DEPTH OF BEDDING MATERIAL BELOW PIPE
W = TRENCH WIDTH.
OD = OUTSIDE DIAMETER OF PIPE

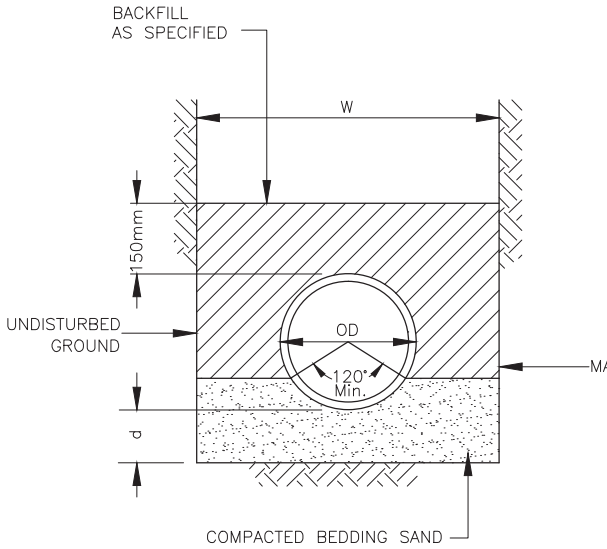
NOTES:

(1) ADD 100mm TO d IN ROCK EXCAVATION.

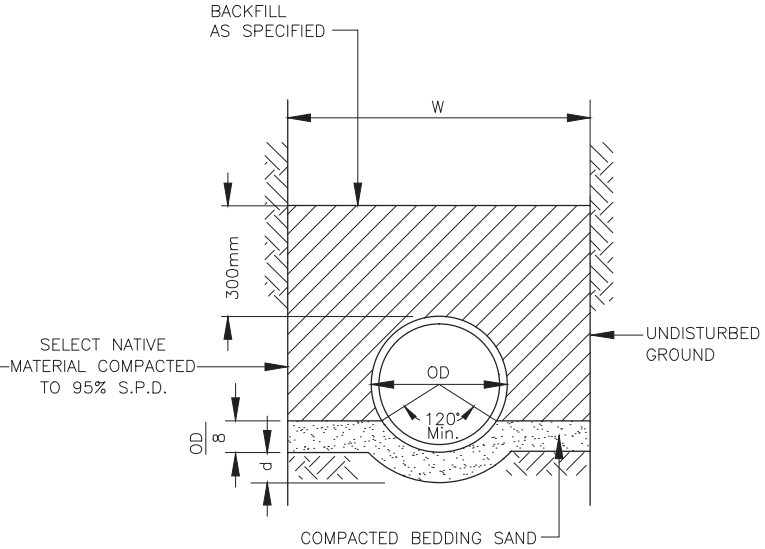
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE ZONE BEDDING DETAILS (CLASS A, A-1, B)

STANDARD DETAIL:	6-601
DATE: OCT 2016	REV: 3

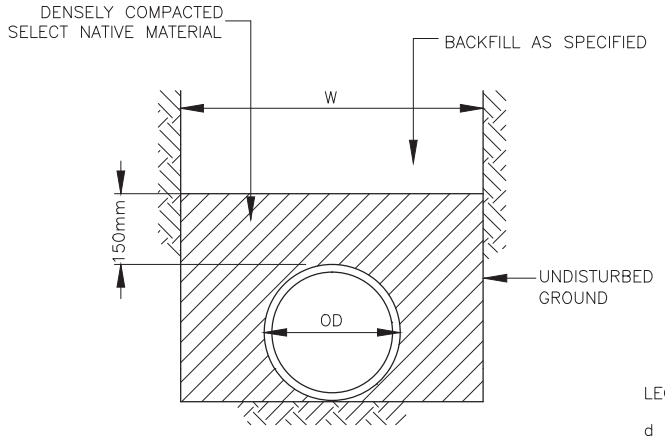


CLASS C



CLASS C-1

ALTERNATE- 375mm I.D. OR SMALLER



CLASS D

PIPE SIZE	d MIN.(mm)
675mm OR SMALLER	75
750mm TO 1500mm	100
1650mm AND LARGER	150
W MIN.	2 x OD

LEGEND:

d = DEPTH OF BEDDING MATERIAL BELOW PIPE
W = TRENCH WIDTH.
OD = OUTSIDE DIAMETER OF PIPE

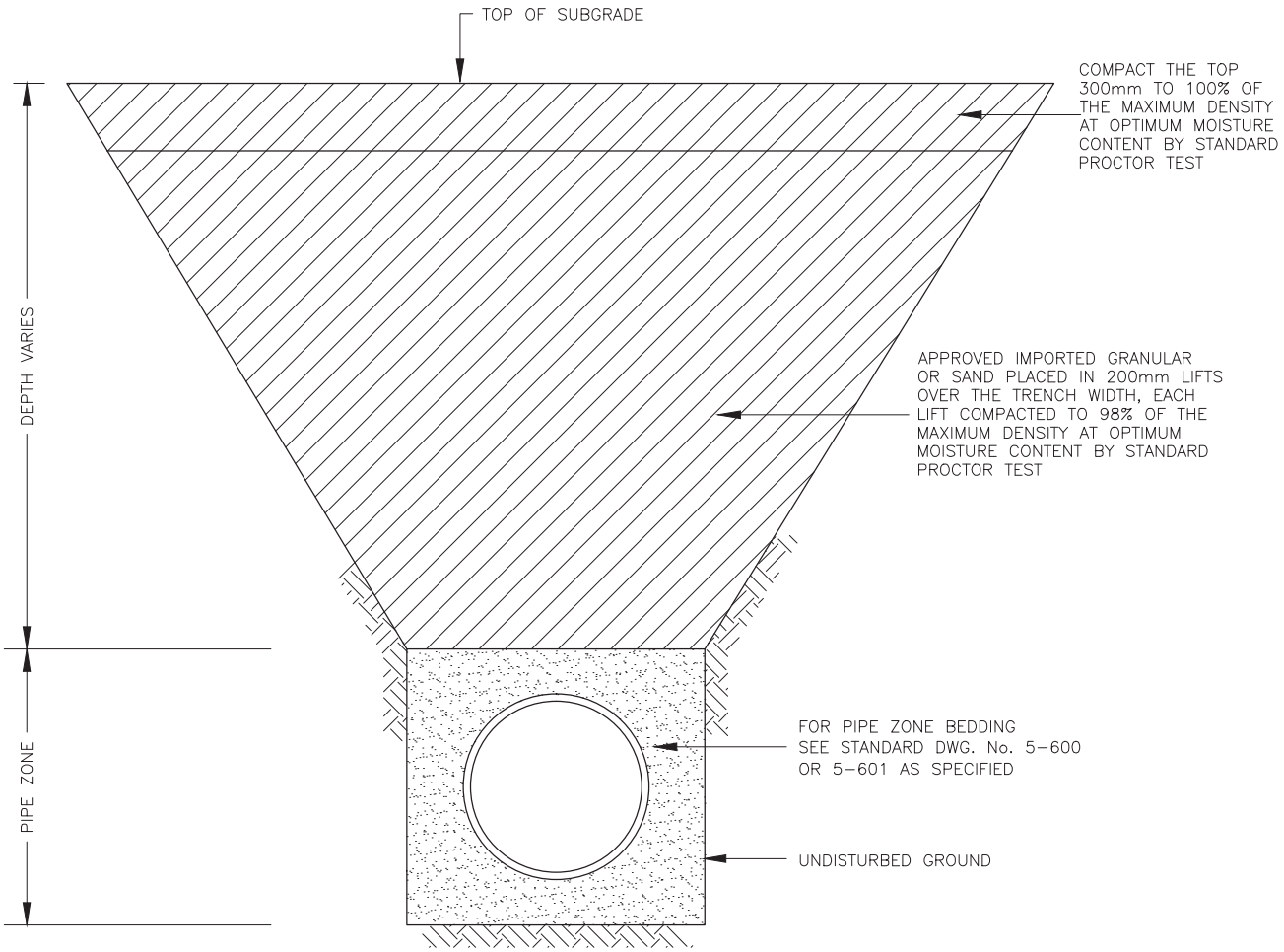
NOTES:

(1) ADD 100mm TO d IN ROCK EXCAVATION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE ZONE BEDDING DETAILS (CLASS C, C-1, D)

STANDARD DETAIL:	6-700
DATE: OCT 2016	REV: 3



NOTES:

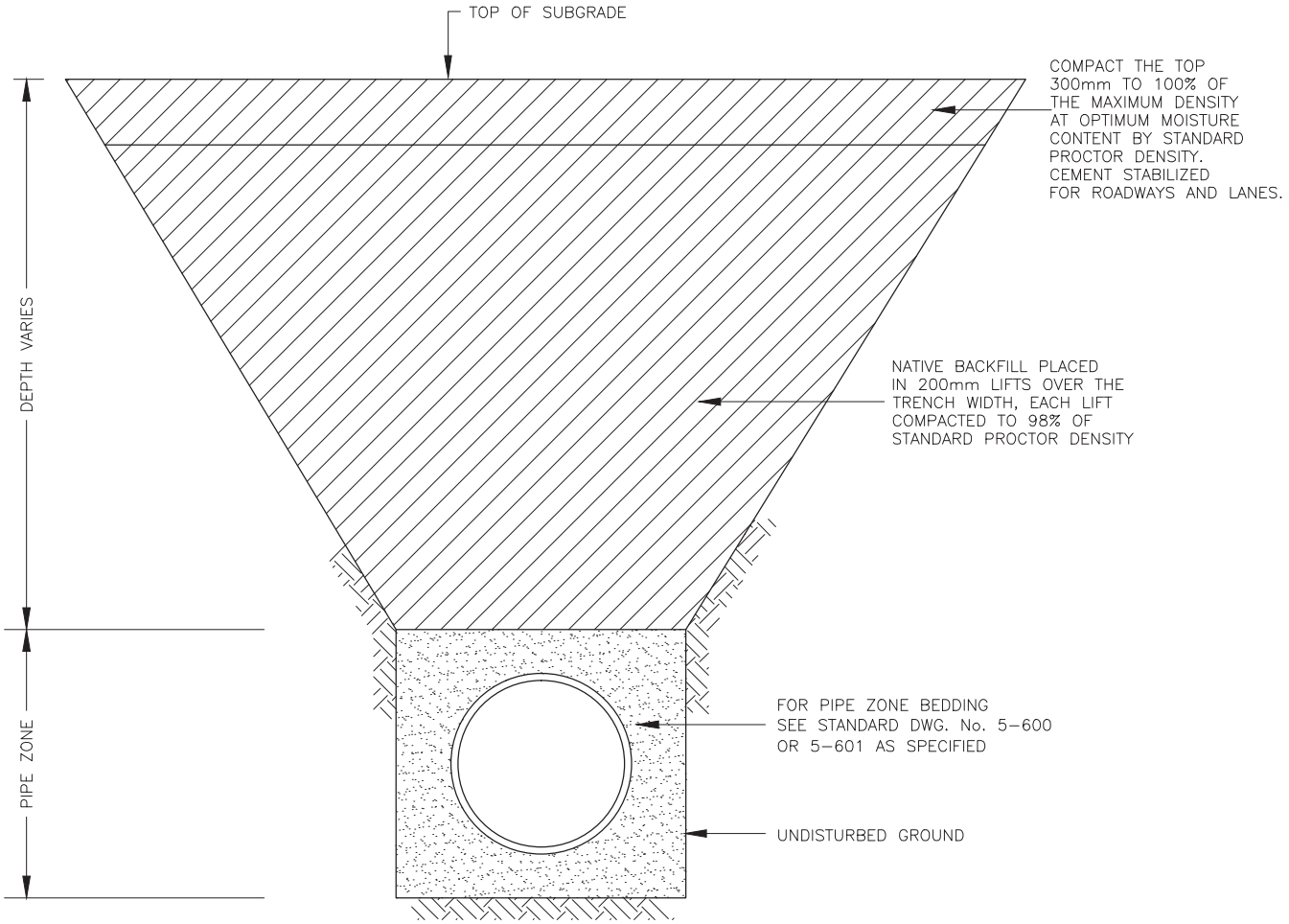
(1) ALL TRENCH WALLS SHALL BE SLOPED

(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE OR SHORED IN CONFORMANCE WITH THE ROADWAY STRUCTURE DESIGN. OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS I TRENCH BACKFILL

STANDARD DETAIL:	6-701
DATE: OCT 2016	REV: 3



NOTES:

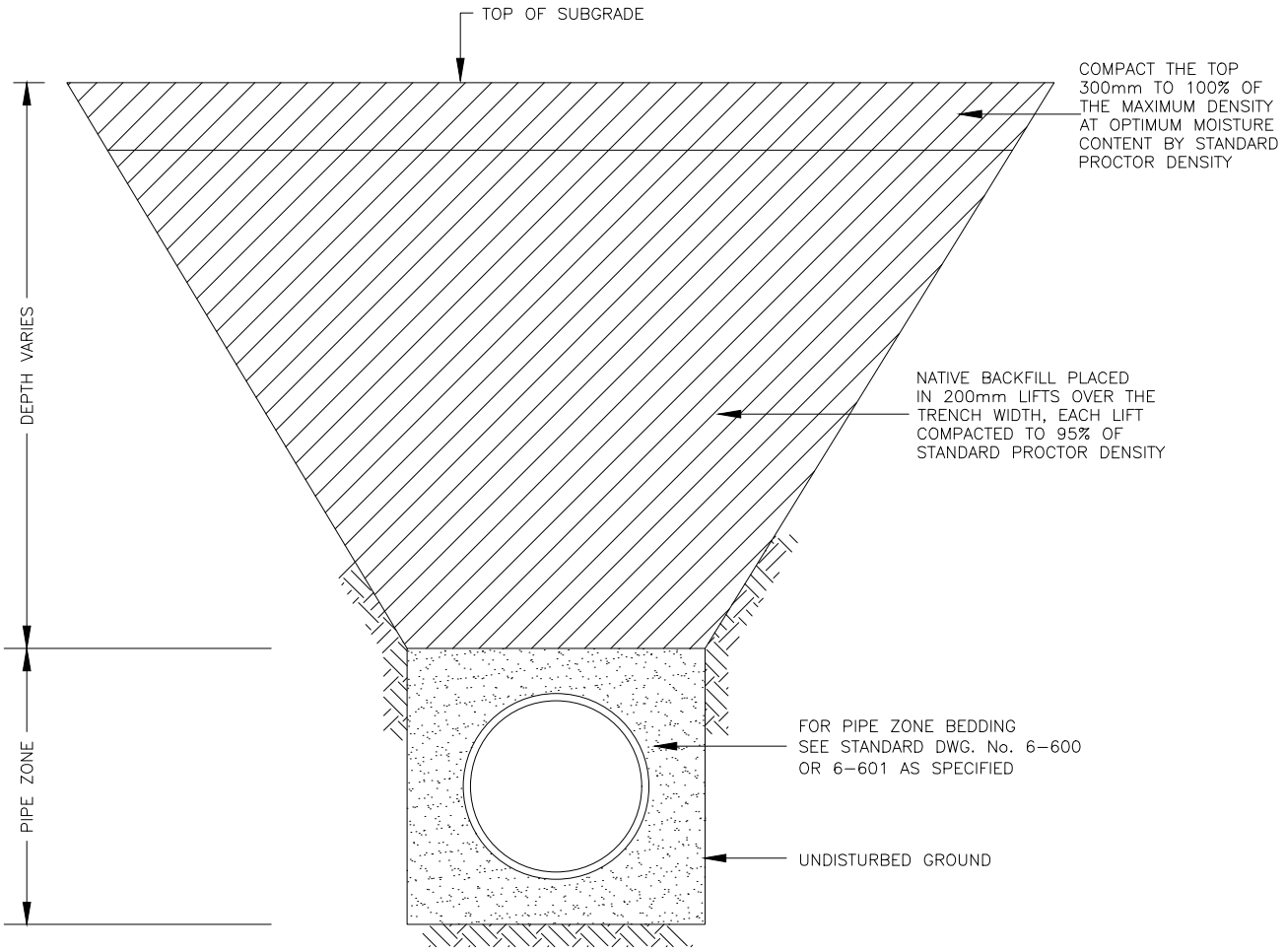
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS II TRENCH BACKFILL

STANDARD DETAIL:	6-702
DATE.: JAN. 2021	REV: 5



NOTES:

(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

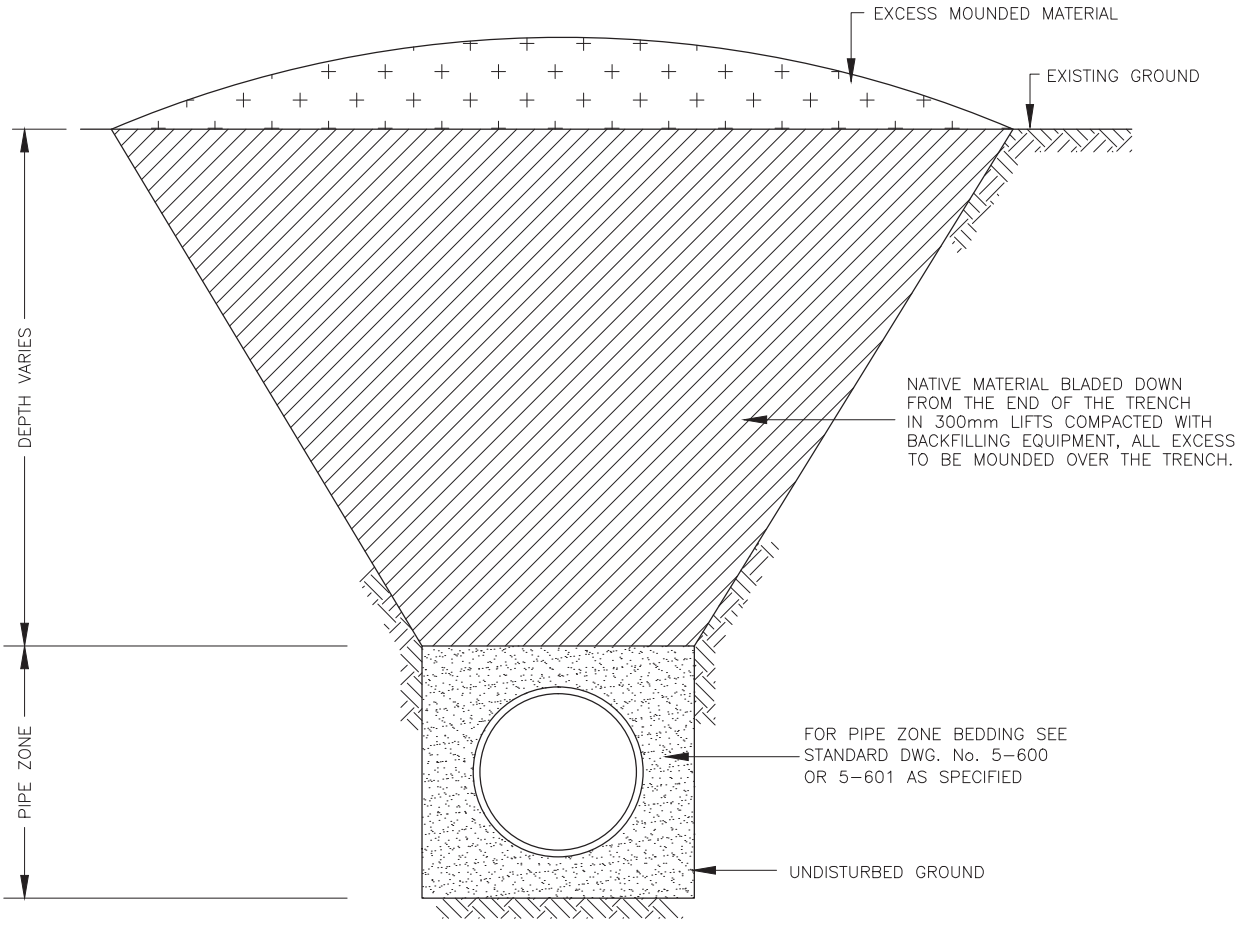
(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS III TRENCH BACKFILL

Time: 2:54pm
Date: Feb 02, 2021
File: \\Cd1044-f06\work_group\1161\active\1161108920\drawing\sheet_files\figures\Section 6\3658-6-700s.dwg by
Xrefs:

STANDARD DETAIL:	6-703
DATE: OCT 2016	REV: 3



NOTES:

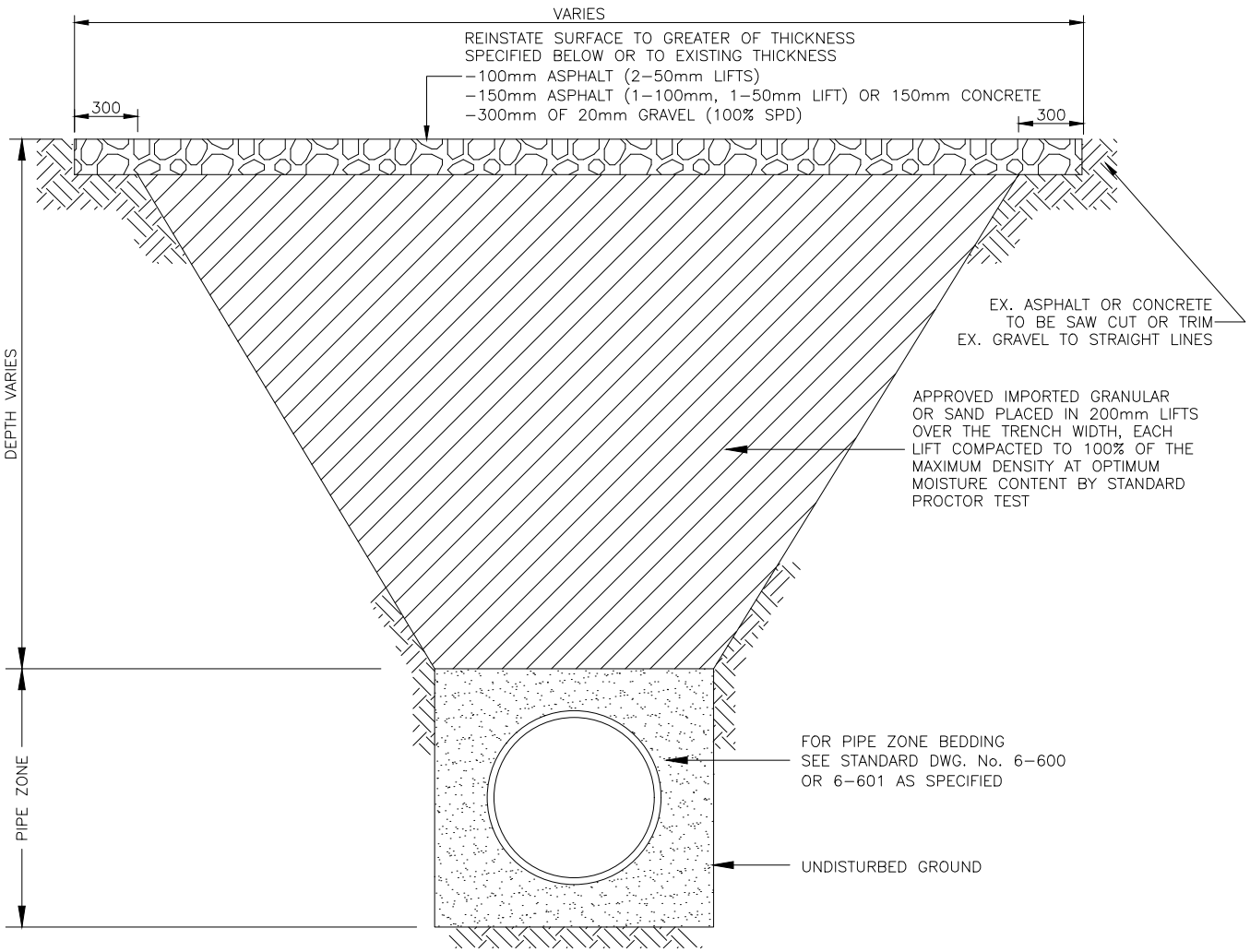
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SURFACE DRAINAGE TO BE RECTIFIED FOR IMMEDIATE AREA IF CLASS IV BACKFILL IS USED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS IV TRENCH BACKFILL

STANDARD DETAIL:	6-704
DATE.: JAN. 2021	REV: 5



NOTES:

(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

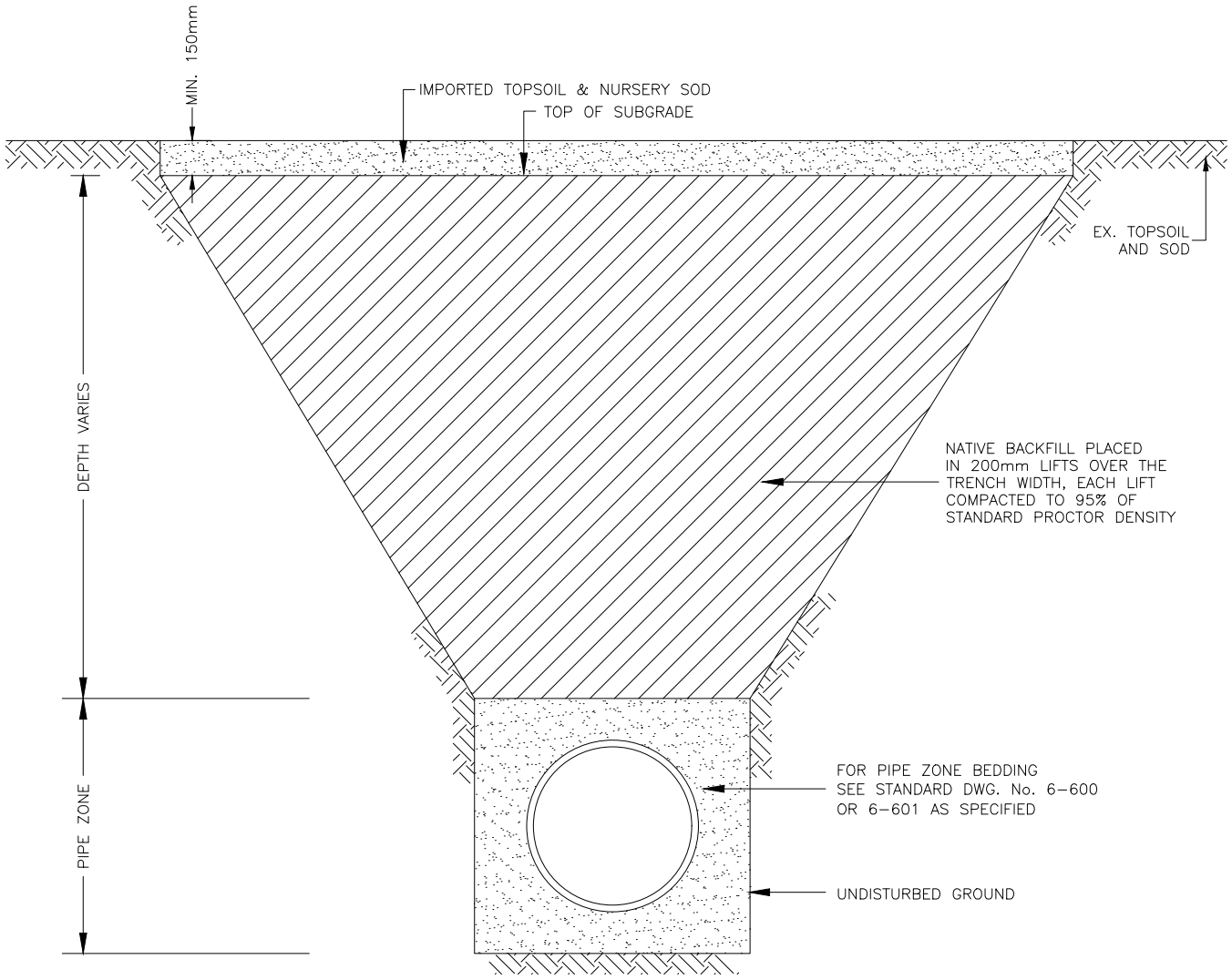
(2) PAVEMENT STRUCTURE DESIGN REQUIRED FOR ASPHALT AND CONCRETE SURFACES

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRENCH BACKFILL FOR EMERGENCY REPAIRS IN PAVED AREAS

Time: 2:54pm
Date: Feb 02, 2021
File: \\cd1044-fs6\work_group\1161\active\1161108920\drawing\sheet_files\figures\Section 6\3658-6-700s.dwg by
Xrefs:

STANDARD DETAIL:	6-705
DATE.: JAN. 2021	REV: 4



NOTES:

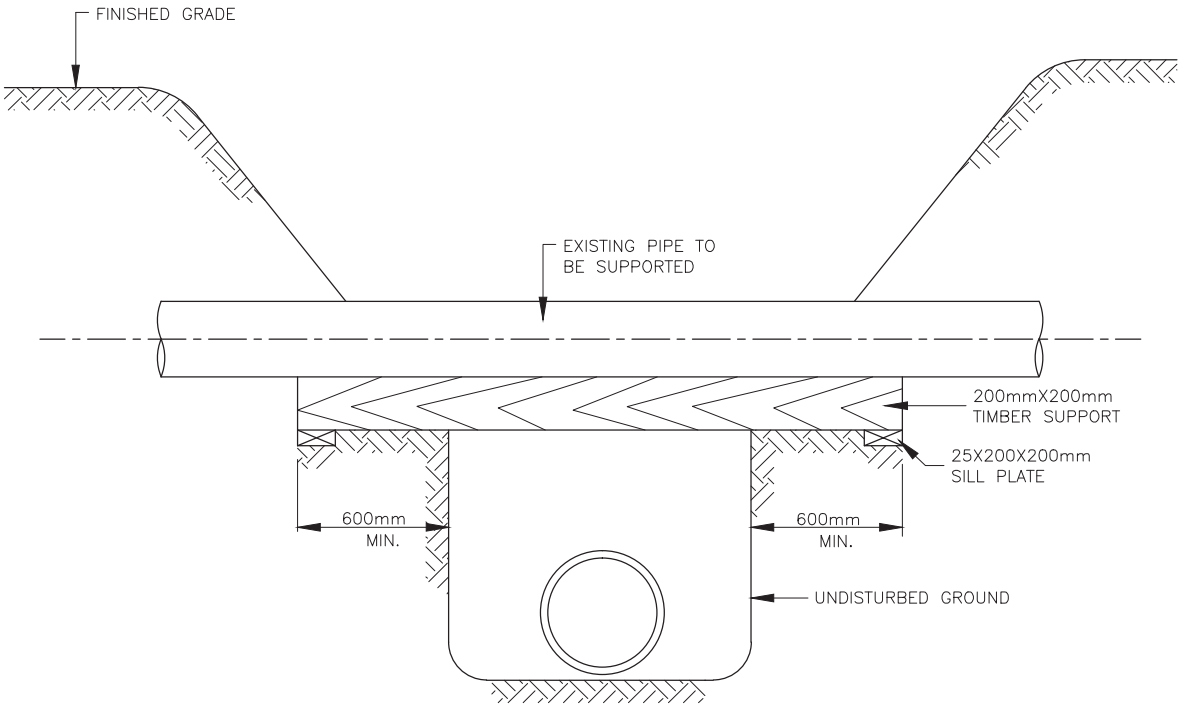
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRENCH BACKFILL FOR EMERGENCY REPAIRS IN GRASSED OR SODDED AREAS

Time: 2:55pm
Date: Feb 02, 2021
File: \\cd1044-f06\work_group\1161\active\1161108920\drawing\sheet_files\figures\Section 6\3658-6-700s.dwg by
Xrefs:

STANDARD DETAIL:	6-800
DATE: OCT 2016	REV: 3



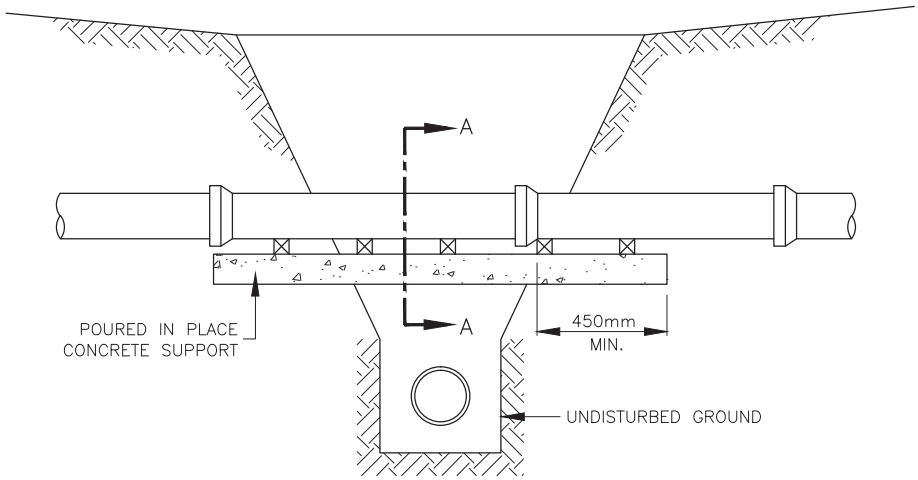
NOTE:

(1) ALL LUMBER TO BE PRESSURE TREATED.

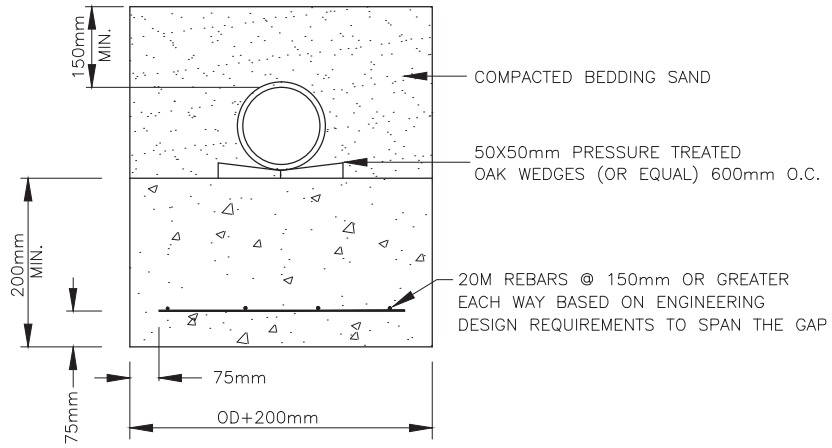
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE SUPPORT - TYPE I

STANDARD DETAIL:	6-801
DATE: OCT 2016	REV: 3



SECTION



SECTION A–A

NOTES:

(1) CONCRETE 28 DAYS COMPRESSIVE STRENGTH SHALL BE 30MPa, TYPE HS.

(2) MAXIMUM LENGTH BETWEEN JOINTS ON SUPPORT 2m.

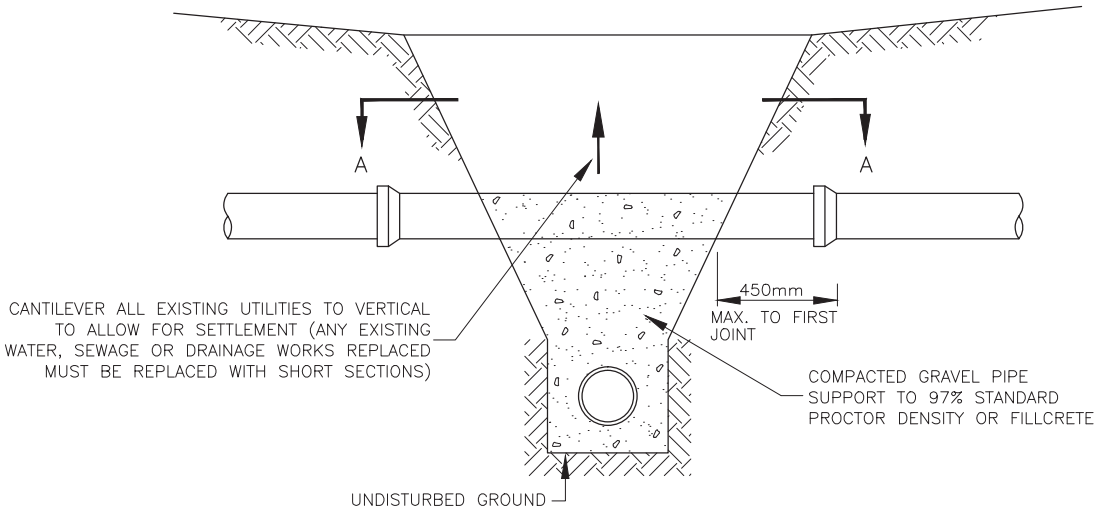
(3) ALL REINFORCEMENT BARS TO HAVE 75mm EDGE CLEARANCE.

(2) WHERE SPAN EXCEEDS 4.5m CONSTRUCT 300mm DIA. CONCRETE COLUMNS (SONO TUBES) SUPPORTS AT 3.5m O.C.

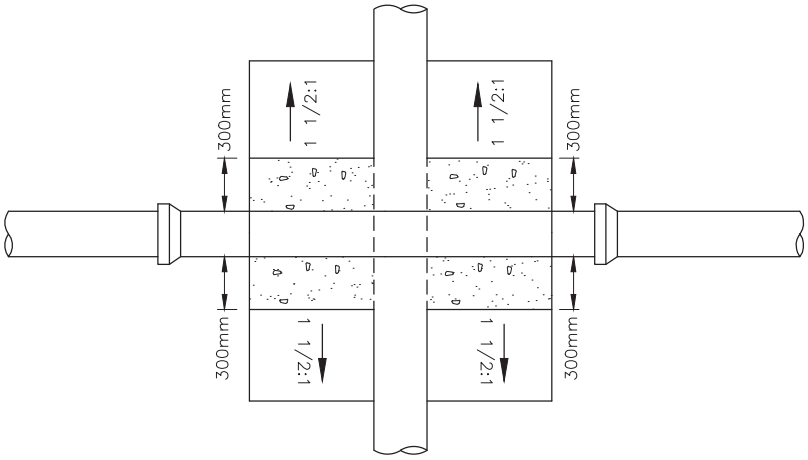
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE SUPPORT - TYPE II

STANDARD DETAIL:	6-802
DATE: OCT 2016	REV: 3



SECTION



SECTION A–A

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE SUPPORT - TYPE III

7 Water Distribution Systems

7.1 GENERAL

This section covers the design and construction of potable water distribution systems including watermains and appurtenances to be installed or rehabilitated in the Regional Municipality of Wood Buffalo (Municipality).

Further, these standards shall also generally apply to any pressurized low temperature piped water system, including the conveyance of reclaimed treated wastewater effluent (i.e. “purple pipe”), where appropriate.

These standards provide the minimum design criteria, general construction requirements, and construction materials for Consulting Engineers to use in the preparation of drawings and specifications. These standards may be exceeded wherever appropriate. Good engineering practices and designs must prevail on all projects. Refer to the Standard Drawings at the end of this section for details relating to the construction and installation.

The design of the water system shall conform to the Standards and Guidelines for Municipal Waterworks, Wastewater, and Storm Drainage Systems, as published by Alberta Environment and Parks and as amended by these guidelines.

7.2 DESIGN FACTORS

The water system shall be capable of delivering the maximum day demand plus fire flow, or the peak hour flow - whichever is greater.

7.2.1 Water Demand

The rate of water demand shall be determined by the land use density basis of either the ultimate subdivision design population in the Area Structure Plan, or the Land Use Bylaw as follows:

Land Use	Design Density	Minimum Design Population
Single Family (including rural Hamlet Residential)	18 units/net ha @ 3.5 people/unit	63 people / net ha
Low Density Multifamily	44 units/net ha @ 3.5 people/unit	154 people / net ha
Medium Density Multifamily	148 units/net ha @ 2.5 people/unit	370 people / net ha
High Density Multifamily	296 units/net ha @ 2.5 people/unit	740 people / net ha
Rural low-Density (including Country Residential)	1.0 units/net ha @ 3.5 people/unit	3.5 people / net ha

If design populations are unknown and outside the current Area Structure Plan, use 50 persons per gross developable hectare utilizing 3.5 people/residence for conceptual design.

Minimum per capita water demands for the Municipality (Urban and Rural)	
Average Day Demand	360 litres/capita/day (L/c/d)
Maximum Day Demand	2.0 times average day demand
Peak Hour Demand	3.0 times average day demand 4.0 times average day demand for small rural communities (i.e. Rural Hamlets)

Non-residential consumption rates:

For non-residential developments, the minimum water consumption rate shall be equal to 0.15 litres per second per hectare. The applied peaking factor shall be $P_F = 10Q^{-0.45}$ to a maximum of 25 and a minimum of 2.5 where Q is in litres per second. In addition, water demand for large developments should be evaluated based on site specific service requirements as well as fire flow requirements.

7.2.2 Fire Flow Requirements (Urban)

Fire flow requirements shall be in accordance with the Fire Underwriters Survey, “Water Supply for Public Fire Protection” for the type of development being considered. General guidelines are as follows:

Structure Type	Size	Required Fire Flow
Single -family residential wood frame construction two stories or less:	100m^2 to 150m^2	5,000L/min
	150m^2 to 275m^2	6,000L/min
Multi-family residential wood frame construction with a fire separation:	four units up to 100m^2 each	8,000L/min
Walk-up Apartments ordinary construction	up to 3,200m^2 (with a 10-20m separation)	12,000L/min
Schools non-combustible construction	up to 3,300m^2	10,000L/min
	up to 4,000m^2	11,000L/min
	up to 12,000m^2	19,000L/min
Institutional, Churches ordinary construction (15% exposure)	up to 850m^2	6,000L/min
Commercial non-combustible construction (50% exposure)	up to 2,900m^2	11,000L/min
	up to 4,200m^2	14,000L/min
Light Industry non-combustible construction	up to 2,900m^2 (25% exposure)	9,000L/min
	up to 2,900m^2 (50% exposure)	11,000L/min

In instances where automatic sprinkler systems are to be installed in residences, the distribution and/or storage systems must consider the demand resulting from these fixtures.

7.2.3 Fire Flow Requirements (Rural)

1. All rural residential developments and in particular multi-family developments in rural communities must consider the latest requirements of the Alberta Building and Fire Codes regarding High Intensity Residential Fire (HIRF).
2. If the Municipality designates that a rural area will receive fire protection, the more conservative of the following standards shall be applied:
    a. Fire Underwriters Survey (FUS) Water Supply for Public Fire Protection.
    b. National Fire Protection Association Water Supplies for Suburban and Rural Fire Fighting (NFPA 1142)
    c. Alberta Building Codes.
3. Minimum flow rates for rural residential development with a maximum of 2 stories are as follows:

Low Density Rural Residential with over 30m separation	2,000L/min
Medium Density Rural Residential with 10.1m to 30m separation	3,000L/min
High Density Rural Residential with 3m to 10m separation	4,000L/min

4. For other land uses including commercial and industrial, the applicant shall consult and apply the more conservative of the formulas for fire flow from the FUS, NFPA 1142 and the Alberta Building Codes.
5. The water supply source for rural firefighting shall be accessible for the designated design fire truck on a year-round basis. Consideration shall be given to road geometry and lane widths, turnarounds and turning-radius, snow removal, and road structure and drainage.
6. If a piped water distribution system is existing or proposed within the vicinity of the proposed development, the Developer shall be expected to design for the full pressurized fire flow requirements.
7. If a piped distribution system is not provided, minimum water supplies shall be established in, or transportable to, the target firefighting location within five minutes of the arrival of the first firefighting response unit at the incident.
8. All non-pressurized water supply sources shall be accessible using Dry Hydrants, as per the standard detail drawings. Dry hydrants shall be designed and constructed to provide a minimum flow of 3800 L / min (1000 gpm) at draft. Dry hydrant locations shall be made visible from the nearest public roadway by reflective marking and signage.

9. Storm ponds and other surface water bodies may be considered as the source of water for non-pressurized systems, provided that the minimum capacity and delivery requirements can be met on a year-round basis, considering the 50-year drought for the water source and winter ice thickness.
10. Interconnection between potable water systems and non-potable / surface water systems is prohibited.
11. Where Water Usage Agreements or environmental approvals are required, these shall be obtained by the Developer at the Developer's cost, in the name of the Municipality, with no future annual or usage costs to be borne by the Municipality.
12. Refer to NFPA 1142 for additional requirements, including a sample Water Usage Agreement.
13. Where a rural Area Structure Plan calls for the re-development or densification of a rural area, consideration shall be given to applying the urban standard for fire protection.

7.3 DESIGN COMPUTATIONS

The Engineering Consultant shall consult the most up-to-date version of the Water Master Plan to verify how the proposed water network will interface with the existing water distribution system.

A Water Network Analysis (WNA) shall be undertaken using a suitable computer program acceptable to the Engineering Department. The WNA will demonstrate that the proposed network of pipes, valves and pumps is capable of meeting the flow demands, minimum pressure requirements and maximum velocities for the design conditions. The WNA shall be based on the Hazen-Williams formula:

$$Q = C\, D^{2.63}\, S^{0.54}\, 278.5$$

Hazen-Williams formula where Q = Rate of flow in L/s	
C	= Roughness coefficient = 125 for all mains, unless otherwise approved by the Engineering Department.
D	= Internal pipe diameter in meters
S	= Slope of hydraulic grade line in m/m

Minimum and Maximum Pressures			
Minimum pressure during all peak demand conditions	= 280 kPa (40 psi)	Minimum pressure with automatic sprinklers	= 350 kPa (51 psi)
Minimum pressure at main during fire flow	= 150 kPa (22 psi)	Maximum allowable pressure	= 620 kPa (90 psi)

The maximum velocities during normal system operation shall not exceed 1.5 m/s. Higher velocities of up to 3.0 m/s during fire flow conditions are permitted, provided that consideration is given to the effect that flow velocity will have on overall performance in light of valve, pump and system operation. Particular attention should be given to possible effects of abrasion on pipes and fittings, and pressure surges that may be generated by sudden or rapid changes in flow velocity.

Evaluation of an existing system for fire protection shall be solely based on the ability to provide fire flows while maintaining the minimum pressure at the main and/or meeting sprinkler system demands. In no case will fire flow velocity in the main alone be used as the criteria for rehabilitating or upsizing existing watermains.

7.4 MINIMUM MAIN PIPE DIAMETER

The minimum watermain sizes are as follows:

- Single Family Residential = 200mm
- Multi-Family Development = 250mm
- Industrial/Commercial = 300mm

Watermain sizes may be increased as considered necessary by the Engineering Department to accommodate future development.

7.5 LOOPING AND DEAD ENDS

The water distribution network is to include appropriate watermain looping so as to meet the demands as determined by the Water Network Analysis, and to maintain water quality requirements. In cul-de-sac's and other dead-end roads, consideration should be given to connecting to other watermains via connections through Public Utility Lots (PULs). Where looping to adjacent streets is not practical, consideration should be given to installing twin watermains within the single road, with interconnection at the end.

No more than 30 dwelling units shall be permitted service on an un-looped (dead-end) section of watermain.

On private multi-family, commercial and industrial sites, multiple watermain connections to the public main may be considered to support on-site looping, provided that there is more than one self-contained building, and each building is individually metered.

Where Dead-End watermains are installed, either as a temporary measure in anticipation of future development, or as a permanent solution, a fire hydrant must be installed within 10 m from the end, to facilitate regular flushing. The use of standpipes or blow-offs will not be accepted.

Bleeders installed as part of the water distribution system may only be installed subject to approval from the Municipality.

7.6 PIPE ALIGNMENT AND TRACER WIRE

Minimum horizontal separation of watermains from sanitary or storm sewers and from power, telephone, or gas services shall be 3.0m; The only exception, with Municipal Approval, is in laneways with three utilities. The minimum vertical separation shall be 0.5m from all sewer mains.

To facilitate locating watermains in the future, tracer wire is to be installed in the trench on top of all watermains. Tracer wire to be 12-gauge copper clad steel, HDPE insulated rated for direct bury, white in colour. Tracer wire is to be terminated in valve casings, or in flush mounted Tracer Wire Access Box, with minimum 500 mm excess wire inside the box. All termination points must be properly grounded by use of a drive-in magnesium grounding anode rod.

7.7 MINIMUM DEPTH OF COVER

Minimum cover to be 3.5m below finished grade to obvert of pipe and shall be of sufficient depth to:

- Prevent freezing
- Clear other underground utilities

The alternate use of insulated systems and recirculation systems in areas of predominantly rock may be approved on submission of an engineering design.

7.8 VALVES

7.8.1 Valve Locations

In general, valves shall be located as follows (refer to Standard Drawing details):

1. At intersections of projected property lines:
    a. 3 valves at cross intersection
    b. 2 valves at tee intersection
2. Not more than 2 hydrants isolated.
3. A maximum of 4 valves will be closed to isolate any one section.
4. A range of 30 to 40 lots cut off from the water supply in cul-de-sacs and a maximum of 30 lots cut off from the water supply in all other areas.

7.8.2 Valve Types

1. Gate valves are the preferred valve type for watermain applications.
2. Butterfly valves or other types of valves will only be considered at the approval of the Municipality, where consideration for flushing, pigging / swabbing, and commissioning are incorporated into the design.

7.8.3 Valve Installation

Gate valves shall be in accordance with AWWA C509 or AWWA C515 and the following supplementary data:

1. Gate valves shall have an iron body, bronze or stainless steel mounted, epoxy coated to AWWA C-550 and cathodically protected. See Standard Drawings.
2. Valves shall be resilient seat gates with non-rising stem, to open by turning in a counter-clockwise direction.
3. Valve ends shall be provided to fit the pipe. Where flanged valves are used, they must be accompanied by flexible couplings.
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 nut, complete with rock-catcher are required on all valves.
7. All bolts and nuts will be stainless steel, type 304, and wrapped with Petrolatum tape.
8. All gate valves 400mm and larger shall have a bypass valve built into the body of the valve or piped around the valve with standard 50 mm diameter municipal fittings. Large-diameter valves can be direct-buried with both the mainline valve set to finished grade and bypass valve boxes set 100mm to 150mm below finished grade and housed inside of a valve top box set to finished grade. See Standard Drawing details.

7.9 FIRE HYDRANTS

7.9.1 Hydrant Locations

Fire hydrants locations shall conform to the following:

1. In accordance with Water Supply for Public Fire Protection, A Guide to Recommended Practice, Fire Underwriters Survey, latest edition.
2. In urban single-family residential areas: not more than 150m apart nor 100m from any dwelling.
3. In urban multi-family residential, commercial, industrial, and institutional areas: not more than 90 m apart. Private hydrants on these lots shall be located in accordance with the Alberta Building Codes.
4. In low density rural residential areas, i.e. where density does not exceed 1.0 units per ha, or land use is designated “Country Residential”, hydrant spacing may be increased to 180 m apart where piped fire protection service is provided.
5. The fire hydrant shall typically be located 2m back from curb, 0.5m from the edge of the road ROW, no closer than 0.5m to back of walk, and 3m from franchise utility street furniture (pedestals, transformers, streetlights, and so on).
6. Hydrant valves (branch valves) shall be located 1 m from the hydrant, preferably within a landscaped area.
7. Hydrants shall be installed at dead ends for flushing (do not install permanent standpipes for flushing).

7.9.2 Hydrant Installation

1. All Hydrants are to be complete with a breakaway flange and a 600mm spool piece. See standard drawings.
2. The minimum hydrant connection size shall be a 150mm hub end.
3. The minimum cover shall be 3.5m.
4. Municipal Hydrant drain holes are to be plugged.
5. All Hydrants shall have two 63.5mm hose connections and one 114mm pumper connection as presently used in the community.
6. All Hydrant main spindles shall turn to the left (counter-clockwise) to open.
7. A gate valve shall be provided on each connection between a hydrant and main (located 1.0m from hydrant).
8. All Hydrants shall be alkyd exterior glass enamel painted to CAN/CGSB-1.59. Municipal hydrants are to be red in colour, and private hydrants yellow in colour. Top and nozzle caps are to be painted according to the Hydrant class, refer to table in Section 7.9.3.

9. All buried bolts and nuts must be stainless steel - type 304 and wrapped with Petrolatum tape.
10. All Hydrants shall be cathodically protected. See Standard Drawing.

7.9.3 Hydrant Testing and Marking

Hydrant Fire Flow Test

All new hydrants installed in the Municipality of Wood Buffalo at to be fire flow tested to determine the rate of flow available for fire-fighting purposes and to determine the cap paint colour.

The Test Procedure shall be in accordance with NFPA 291. The results of the flow test are to be reported in the Hydrant Flow Test Report and submitted to the Environmental Services Department.

The top and nozzle caps of the Fire Hydrant shall be painted in accordance with the following table. Paint shall be of a permanent, reflective type, suitable for the body material of the hydrant. Refer to Section 7.9.2 for paint specifications.

Hydrant Class	Flow Rate (at 20 psi Residual)		Top and Cap Painted Colour
	GPM	L/min	
AA	1500 +	5680 +	Blue
B	1000 – 1499	3785 – 5675	Green
C	500 – 999	1900 - 3780	Orange
D	< 500	< 1900	Red

Water discharged from hydrants must be de-chlorinated prior to discharged to the storm sewers or the environment. For private land development projects, the Developer must pay for water usage, based on the measured flow rate times the duration of the test. Contact the Underground Services Department prior to performing the test.

Static Hydrant Pressure Test

All new hydrants installed to be pressure tested using the static system pressure. This test is conducted to ensure hydrants are not leaking prior to being put into operation. The procedure is as follows:

1. Install pressure gauge and bleeder valve on hydrant port
2. With bleeder valve open, slowly open hydrant to drain off air, and expose pressure gauge to system pressure. Close the bleeder valve.
3. Close Hydrant branch valve.
4. Monitor pressure gauge to ensure no pressure loss over a five-minute period
5. Close hydrant and re-open branch valve

A static hydrant pressure test will be conducted with a member of the Underground Services Department in conjunction with the CCC inspection and again at the FAC inspection.

If the Static Pressure Test fails for private land development projects the Developer shall be responsible for repairs as required.

7.9.4 Private Hydrants

1. Private hydrants shall be designed and installed in accordance with the above standards.
2. All private hydrants are to be painted yellow.
3. Annual maintenance is required to be undertaken by the owner of the private hydrant. Submit maintenance records to the Environmental Services department of the Municipality.
4. It is the responsibility of the private hydrant owner to ensure the hydrant is accessible and operational, and that there is sufficient firefighting capacity in the event of an emergency.
5. Any off-site upgrades to the water distribution network that are required to meet on-site fire demands are to be determined during the design phase through Water Network Analysis. Such off-site upgrades will be the responsibility of the Developer, or as stipulated in the Development Agreement.

7.10 SERVICE CONNECTION

See Standard Detail Drawings for water service connection installation details.

Each residential lot and multi-family unit shall have its own individual water service connection complete with an individual shut off valve (curb stop or gate valve) and individual water meter.

For a multi-building commercial retail unit (CRU) development or an industrial lot with multiple buildings, one service connection with shut off valve and meter vault chamber at the property line is required. Alternatively, individual water meters on the private service connections within a commercial/industrial lot complete with individual shut off valves may be constructed with Municipal approval.

7.10.1 Service Sizes

Minimum service sizes are as follows.

Minimum Pipe Size	
Unsprinklered dwelling single family	19mm
Rural unsprinklered dwelling single family	25mm
Sprinklered dwelling single family	38mm
Commercial, and Industrial (sized accordingly)	100mm

Some residential dwellings like duplex, triplex and four-plex may require different service connections size due to additional demands such as irrigation systems and a higher number of fixtures. Each system should be sized according to the expected demand and the distance from the main. It is incumbent on the Developer to analyze the equivalent fixture units according to the National Plumbing Code for special situations.

The instantaneous flow required is usually the sum of these and other demands divided by a factor of 3. This demand can be used to determine the size of water service required. However, this is approximate only and for specific applications, the service shall be sized accordingly.

In rural areas, or where a residential sprinkler system is to be installed, the calculation for the service size must consider the additional demand resulting from the sprinkler system.

The length of the service from the watermain will also affect the flow. Generally, the flow availability is as listed below.

General Flow Availability for Various Service Diameters and Distances from Main

Service Diameter	Distance from Watermain			
	30m	60m	90m	120m
	Available flow in Litres per Minute (L/min)			
19mm	36	27	14	7
25mm	73	45	41	36
38mm	159	118	100	82
50mm	273	205	159	136

Note:

- Based on 415 kPa at main
- No elevation difference from main to discharge
- Elevation difference due to grades and in 2 story homes will affect pressure/flow
- Number of elbows in the system will affect pressure/flow
- Adjust for sprinkler requirements

7.10.2 Service Connection Installation

1. Residential lot services to be from public water main in the front street or rear lane and not from an adjacent Public Utility Lot or Municipal Reserve lot.
2. Connections in a common service trench shall have the following minimum horizontal separation from other services:
    a. 50mm diameter or less = 0.3m
    b. greater than 50mm diameter = 2m
3. Water service connection pipes shall have minimum 3m cover, and shall be extended 3m past the property line, or 1m past the shallow utility easement.
4. Locate water service curb stops 0.3 m on the municipal side of the property line, away from paved areas and in landscaped areas wherever possible. If the service curb stop must be placed in a driveway or hard surface location, the valve must be placed within a PVC sleeve.
5. Water meter must be accessible with 1.8 m height clearance.
6. Locate water meter close to sump or spillage area in basement, or utility room. Room should not have carpet or drywall.
7. Owners must protect meter from heat or frost damage.
8. SERVICE CONNECTION REPORTS

    The Engineering Consultant shall provide detailed record drawings for all installed service connections with such drawings providing pipe diameter, elevation, and location relative to property line(s) and lot number.
9. ELECTRICAL GROUNDING

    Many older homes and buildings within the Municipality rely on metal service pipes for the grounding of their electrical systems. When undertaking rehabilitation work where service laterals are proposed to be replaced, an evaluation shall be conducted on the homes and buildings by a qualified electrician to determine if the existing water services are being used for grounding, and whether the replacement of service lines will compromise the electrical grounding. It is noted that as long as a minimum of 3m of the original copper pipe is retained in contact with the ground, there is generally not anticipated to be a problem. Problems may be encountered on older buildings with minimal setbacks from the property line, and/or where the entire service to the building is proposed to be replaced using plastic pipe materials.

7.10.3 Service Connection Materials

1. WATER SERVICE PIPE
    a. Approved Materials are listed in Section 7.14.
    b. Service connections shall be copper pipe, Type K, with thaw wires (No. 2 insulated). If 100mm and larger use same pipe type as the distribution system.
    c. Couplings shall be Standard Brass, compression type.
2. WATER SERVICE FITTINGS
    a. Approved materials are listed in Section 7.14.
    b. Curb stop will be copper to copper invert and key stop and drain.
    c. The curb stop will be seated on a “seating block” 200 mm x 180 mm x 38 mm with a friction top surface, composed of inert recycled plastics (EMCO “Curb Stop Block” or approved equal). The use of treated lumber or mortar blocks will not be permitted.

7.10.4 Water Meters

1. Contact the Municipality for current water meter requirements and costs. Sizing of the meter shall be reviewed and approved by the Municipality.
2. The installation of Water Meters up to 25 mm shall only be undertaken by Municipal Staff. Meters up to 100 mm shall be supplied by the Municipality but installed by the Developer at the Developer’s cost. All other meters are to be supplied and installed by the Developer, subject to selection review, approval, inspection and operation by the Municipality. Refer to the Standard Detail Drawings for installation requirements.
3. Fire suppression (sprinkler) lines are to be branched off the main service within the meter room / chamber, but upstream of (before) the meter.
4. For developments with an onsite fire hydrant, the hydrant shall be fed either directly from the main, or teed off the service lateral, upstream of (before) the meter and/or building. In special circumstances, a tattle-tale meter may be required on this line.
5. Any valve for fire suppression water shall be locked in the open position and supervised with a tamper switch connected to the fire alarm panel. A plaque is to be provided giving direction to notify the Fire Department before closing any of these valves.
6. Where a property with multiple self-contained buildings is serviced by multiple service connections, each service connection or self-contained building shall be metered separately. Each meter to have an individual shut-off valve outside of the building. On-site looping between multiple services may be permitted, subject to approval from the Municipality.

7.11 THRUST RESTRAINT

Pressure pipe thrust restraint is required at all fittings, including bends, tees, wyes, reducers, plugs, caps, hydrants (tee, valve and boot), and valves.

Concrete thrust blocks shall be used, as per the standard details. Wrap all cast iron fittings in polyethylene sheet to prevent direct contact between the concrete and the cast iron.

As an alternative to, or in conjunction with, concrete thrust blocks, all fittings can be mechanically restrained using pipe restraints. Restraints must be designed and installed in accordance with manufacturer's specifications, including consideration for the additional joints to be restrained to achieve the restrained length. Wrap all threaded rod, nuts and bolts in tape and paste.

7.12 CHAMBER DRAINAGE

Chambers or manholes containing valves, blow-offs, meters, or other appurtenances shall not be connected directly to a sanitary sewer. Such chambers or manholes shall be drained passively to below grade drain pits or actively by sump pump and storm sewer system as geotechnical conditions dictate.

To prevent surface water infiltration, chambers and manholes shall be designed and backfilled to slope away from the rim.

To minimize below grade infiltration the entire outer surface of all water chambers or manholes shall be coated with two (2) coats of an approved bitumastic coating. Coating shall be Koppers 300 M Epoxy, Pennsbury 32-B-4 Epoxy, Sealmastic 501 or approved equal.

In areas where high water table is known to be above the bottom of the structure based on the geotechnical report, the structure is to have both a concrete waterproofing admixture added to the mix design and a fully sealed exterior waterproofing membrane to cover the full exterior including under the base slab. Shop drawings are to be provided to the Municipality for review and approval prior to installation. Buoyancy proofing may also be required, as well as fastening the manhole/vault joints together to prevent lifting.

Chambers and manholes shall be insulated to prevent freezing where necessary. Refer to Standard Detail Drawings

7.13 PRESSURE REDUCING STATIONS

See Standard Detail Drawings 7-317 and 7-318 for minimum pressure reducing valve (PRV) station requirements.

1. Minimum chamber inside dimension size for pipes 200mm diameter or smaller:3.94m long x 3.048m wide x 1.98m height
2. Minimum electrical requirement is a 30 amp, 120V AC service. The developer is to apply for service power to the PRV site, including required permits.
3. For larger pipe diameter, the developer should consult with the Regional Municipality of Wood Buffalo and/or their engineering representative, to confirm the largest fire flow rate required.
4. All PRV chambers located in PUL's or other easements outside of road ROW's are to be protected with bollards. This standard shall apply to other underground vaults, chambers, at the discretion of the RMWB.
5. All PRV chambers to be outfitted with a universal davit base (complete with cap) to facilitate lifting for the removal and replacement of equipment.

7.14 MATERIALS

7.14.1 Pipe

The following table lists specifications for acceptable pipe materials.

Acceptable Water Pipe Materials		
Material	General Size Range	Specification
Polyvinyl Chloride (PVC)	150 to 900 mm	AWWA C900-81, DR 18
High Density Polyethylene (HDPE) (marked with continuous blue stripe)	150mm and larger (Hydraulic analysis must consider ID of pipe)	AWWA C906, DR11
Steel Pipe* * on a project specific basis only, with a cathodic protection system	150mm and larger	CSA 2245.1 CSA 2245.2 CSA 2245.3 AWWA C200-05

7.14.2 Fittings and Hardware

Acceptable Fittings and Hardware	
Valves	AWWA C509 or AWWA C515
Cast Iron Fittings	AWWA C110/A21.10-08 1.03 MPa working pressure
PVC Fittings	150-300mm CSA B137 (Class 235), AWWA C900
Flanged Joints	Class 125, ASME B16.1, B16.5 flat-faced
Bolts and Nuts	Stainless Steel, Type 304, wrapped with petrolatum tape
Petrolatum Tape	AWWA C217-09

Cathodic protection is required on all metal fittings including fire hydrants. Refer to 7.18 Cathodic Protection for more details.

The Municipality preference is for PVC fittings where possible.

7.14.3 Bedding Material

For bedding material gradation and specification refer the Standard Drawings & the Standard Construction Specifications.

7.14.4 Trench Cross-Section

Refer to Standard Drawings for trenching and bedding details.

7.15 WATER MAIN TIE-IN EXECUTION

The execution of the installation, testing and commissioning of watermains shall meet AWWA standards, in addition to the following requirements.

1. Refer to the current Bylaws for information regarding the execution of work related to Municipal Infrastructure.
2. Only Municipal staff shall operate in-service Municipal facilities, including valves and fire hydrants.
3. Contractor is to notify the Municipality two (2) weeks in advance of proposed work so that Municipal staff can identify and exercise all mainline valves required to be closed to isolate the proposed work zone.

4. The Contractor shall be responsible for providing temporary water connections to all parties that may be affected by the work. Temporary water connections must meet the anticipated water demands, including fire flow. The above ground water connections are to be CSA-200 municipal piping.
5. If an existing Municipal valve cannot be closed to maintain a seal, the contractor may be instructed to hot-tap in a new valve for the purpose of isolating their zone of work and may be instructed to replace or repair the original valve. At its discretion, the Municipality will reimburse reasonable costs for this work. At the direction of the Municipality, the original valve or the new valve may be left in the open position and direct buried after tie-ins are completed. Contact the Municipality for project-specific details and instructions.
6. The Contractor shall leave an air gap or backflow preventer between the existing and new infrastructure, until after pressure testing, flushing and bacterial testing is completed. The Contractor shall not pressure-test against an existing Municipal valve. Complete the tie-in with a spool piece that has been treated with a super-chlorinated solution.
7. Hydrants may be used to supply water for flushing and pressure-testing only at the approval of, and in cooperation with, the Municipality. Hydrant connections shall include a lock, a water meter, and a reduced pressure backflow preventer. Water used for this purpose shall be metered and paid for by the Contractor.
8. Where water mains are installed for future growth areas, the Developer shall be responsible for the development and implementation of a water quality testing and flushing program to prevent stagnation, to the satisfaction of the Municipality. The Municipality shall take over the flushing program as required upon first occupancy within the serviced area.
9. The execution requirements for isolation, pressure testing, flushing, bacterial testing and final tie-in shall be considered at the design stage, with allowance for temporary hydrants, temporary blow-offs and/or isolation chambers included in the detailed design drawings, as required.
10. The watermain installation, testing and commissioning plan shall be included as part of the detailed design, and shall be submitted to the Municipality for review prior to the start of construction.
11. Where required by the Municipality, appurtenances to accommodate pigging / swabbing of the watermain shall be included on transmission mains. Contact the Engineering Department for specific requirements to be included during the Design.

7.16 TEMPORARY WATER CONNECTIONS

In order to facilitate water main upgrading and rehabilitation projects, temporary water connections are mandatory. The Municipality must be contacted two weeks before construction to arrange for the disconnection of existing water meters on private lands.

Temporary above-ground water connections are to be CSA-200 Municipal piping.

To prevent leaking of the piping within old buildings a pressure reducer may be required to be installed on the service.

Where temporary above-ground water connections cross active travel lanes for longer than five days, the asphalt will be cut and the pipe embedded in the road structure below the surface. Backfill with granular material or asphalt milling flush to existing road or protect with steel plate.

7.17 ABANDONED SERVICES CONNECTIONS

If an existing service connection smaller than 50 mm is to be abandoned, the corporation stop shall be closed at the water main, cut and crimp the end of service and install “Abandoned Service Sleeve” Robar 6636AS (see Standard Drawing detail) or approved equivalent. Confirm that the abandoned service does not leak. The service pipe shall be removed from within the Municipality right-of-way, unless otherwise approved by the Municipality.

For services 50 mm or larger and/or services that are teed directly into the main, the service shall be abandoned at the main by one of the following methods. In either case, shutting down the mainline will likely be necessary, and must be considered in the notification and timing of the work.

- Where it is likely that a new service of the same size will be installed in the foreseeable future, install a closed valve followed by a blind flange immediately off of the tee.
- Where no service is anticipated within the foreseeable future, remove the tee completely and install a spool piece to bridge the gap in the main.

7.18 CATHODIC PROTECTION

7.18.1 Cathodic Protection for a Non-metallic Pipe System

All metallic elements in a PVC pipe distribution system shall be cathodically protected. A 2.3kg zinc sacrificial anode shall be connected (without a test point) to each valve, fitting and coupling and a 5.4 kg zinc sacrificial anode shall be connected (without a test point) to each hydrant. The contractor may at his option install and connect a single 5.4 kg zinc anode to one valve and one adjacent metal fitting. Where required, pipe and fittings shall be connected by thermite welding #6, RWU90, 7 strand bonding wire with copper sleeves between non-electrically continuous piping components. Sacrificial anode installations shall be inspected by the Municipality prior to backfill.

7.18.2 Cathodic Protection for an Existing Metallic Pipe System

Whenever an existing metallic water or sewer main is exposed for any purpose, the Contractor shall supply and install a 14.5 kg magnesium anode to protect the existing system unless otherwise directed by the Municipality. If the tie-in requires the replacement of more than 5 m of existing non-coated metallic pipe, then two (2) 14.5 kg magnesium anodes shall be installed to protect the existing system. If the tie-in is made to an existing coated pipe, then the number of anodes may be reduced to one 14.4 kg magnesium anode. Electrical continuity shall be maintained in an existing system. Test points are not required for these anode installations. Copper service pipe shall be cathodically protected with a 5.4 kg zinc anode. The lead wire of the anode shall be fastened to a wire connector located on the compression nut of a brass service fitting. When no service fitting is exposed, the anode may be connected with an Erico ground clamp, SWP1JU (to 25mm) or SWP2JU* (to 50mm) or approved equal.

7.18.3 Cathodic Protection for a New Metallic Pipe System

A distribution main system constructed of metallic pipe shall be cathodically protected with magnesium anodes. The Engineering Consultant shall provide a design for the cathodic protection required.

1. Determine the total coated surface area of the system.
2. Determine the equivalent bare area of the system. Assume 1.5% of the total coated surface area is bare.
3. Determine the current requirement to protect the bare metal. Assume 22 mA of current is required per m^2 of pipe.
4. Determine the total number of anodes to protect the system. Use a design life of 30 years.

Use the following table to compute the anode requirement. This table must appear in the engineering drawings.

Cathodic Protection						
Elements being protected	Size of Pipe (mm)					
	100	150	200	250	300	400
Pipe Length (m)						
Hydrant Lead Valve and Casing (4.7 m of 150mm Y.D.I per unit)						
Hydrant Barrels (3m of 150mm Y.D.I per unit)						
Total Length (m)						
Surface Area (m^2) (length x m^2 / m)						

Total Surface Area =_____m^2

Bare Metal (Multiply x 0.015) = _____m^2

Current (m^2 x 22 mA/m^2) = _____mA

Total Number of Anodes = _____ Anodes Required

Surface Area of Ductile Iron Pipe per Length Unit	
Pipe Size	m^2 / m
400 mm	1.388
300 mm	1.053
250 mm	0.886
200 mm	0.722
150 mm	0.551
100 mm	0.383

Expected Anode Life for Magnesium Anodes (years)			
	Anode Size		
Current	7.5 kg	9.1 kg	14.5 kg
25 mA	33.5	39.4	63.1
50 mA	16.8	19.7	31.6
75 mA	11.2	13.1	21.0
100 mA	8.4	9.9	15.8
125 mA	6.7	7.9	12.6
150 mA	5.6	6.6	10.5
175 mA	4.8	5.6	9.0
200 mA	4.2	4.9	7.9

A specialist's evaluation of cathodic protection required to be provided to the Municipality for all metal fittings proposed to be installed.

On repair and rehabilitation works, anodes shall be installed and/or replaced for all uncovered metal fittings.

7.19 TRUCK FILL WATER SYSTEMS

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:

- Clearances as required by Safety Codes Council and Alberta Environmental Protection.
- Fill points for tanks shall be easily accessible and kept clear of obstructions.
- Recommended tank size - 4,500 litres or larger.
- Protected from freezing.
- Protected from surface water entering. Provide adequate venting.
- Holding tank shall be complete with lockable cover and external fill gauge.
- Water meters with remote external readers are required as per the standard drawings.
- Access road to tank shall be designed to accommodate a loaded water truck's wheel loads. Refer to Section 4.0.

Where groundwater will be the source of water supply, it shall be in accordance with Alberta Environmental Protection Standards and more specifically, the Water Well Regulation.

7.20 TRICKLE FILL WATER SYSTEM

In a Trickle Fill water distribution system, a small-diameter distribution pipe supplies water to a private water storage facility (cistern) on each lot. The small-diameter pipe and the ability to operate at lower pressures than conventional systems make this an economical alternative of providing domestic water distribution without fire suppression. This system may be appropriate for retrofitting existing rural areas served by Truck Fill water systems, as the Trickle Fill can be plumbed into existing cisterns.

The implementation of a Trickle Fill water system will only be approved on a neighbourhood-wide basis, and only in agreement with the appropriate Area Structure Plans, Rural Servicing Standards, and at the discretion of the Engineering Department.

7.20.1 Distribution System

The Trickle Fill Distribution Pipeline system shall be designed by a Professional Engineer. As appropriate, the Standards outlined elsewhere in this Section shall apply.

7.20.2 Application and Drawing Review

Application for a Trickle Fill service connection must include detail design drawings of the service pipe, storage facility, and plumbing / mechanical details.

7.20.3 Service Connections

Refer to the Rural Water and Sanitary (RWSS) Servicing Guideline (https://www.rmwb.ca/en/utilities-and-water/rural-water-sewer-service.aspx) for service connection details to a trickle fill water system. These details are provided as a guideline for property owners to complete the on-property installation of a trickle fill water system. Any work completed on private property by the Owner is the sole responsibility of the Property Owner.

7.21 RESIDENTIAL SPRINKLERS

The Municipality strongly encourages automatic sprinkler systems to be installed in single family dwellings within specific subdivisions of the Municipality where acreage lot sizes are less than 1 acre and where a municipal water system was required as a condition of subdivision approval. The homeowners will be responsible for all aspects and costs of the design, installation, and maintenance of an automatic sprinkler system in accordance with these Standards.

This guideline deals with design and installation of automatic sprinkler systems for protection against the fire hazards in single family dwellings. The basis of this guideline is the National Fire Protection Association (NFPA), which is the organization that sets the Standards for fire protection systems in Canada "Standard of Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes", NFPA 13D, is the latest edition. NFPA 13D is to be followed with the following clarifications that are applicable to the Municipality.

The Municipality approves and may or may not inspect any installations, procedures, equipment, or materials. In determining the acceptability of installations, procedures, equipment, or materials, the Municipality requires evidence of proper design installation, procedure, use of equipment, or material that is in compliance with NFPA 13D. Only equipment or material listed by ULC or UL may be utilized in the installation of any sprinkler system. All designers and installers must be knowledgeable of all the requirements and the design philosophy of NFPA 13D.

7.21.1 Water Supply

The Developer will provide to the property line of each residential lot within the subdivision, a service connection to a municipal water distribution system, in accordance to the system outlined in the standard details. This service connection will normally be located 0.3m off the front property line of the lot.

7.21.2 Residential Sprinkler System

A residential sprinkler system employs automatic sprinklers attached to a piped system containing water only and is connected to the municipal water distribution system so that water discharges immediately from the sprinklers when opened by a fire.

A development, if designed for a residential sprinkler system, shall have a caveat assigned to each lot outlining the homeowner’s responsibility to install a sprinkler system.

7.21.3 System Design

The residential sprinkler system design shall be in accordance with NFPA 13D and all equipment and material used shall be ULC of UL listed.

All systems shall be designed and certified by a Professional Engineer registered in the Province of Alberta.

The typical arrangement of connection, piping, valving and required equipment is shown in the Standard Details and shall be in accordance with the latest version of the regulations of the Safety Codes Act.

7.22 SPECIAL CONSIDERATIONS

7.22.1 Cold Weather Considerations

Projects located in Fort Chipewyan typically encounters shallow bedrock and therefore minimum pipe depths specified above are unattainable. The Engineering Consultant shall take into consideration the insulation details and the following during design stage:

1. All water mains are to be insulated.
    a. UV stable high-density polyethylene jacket that is factory applied by continuous extrusion and specially formulated for superior cold weather performance (to –45°C) and below grade applications.
    b. Minimum thickness of insulation on any side of pipe at any location is to be 50mm.
    c. Water mains to be completely looped, including hydrant leads.

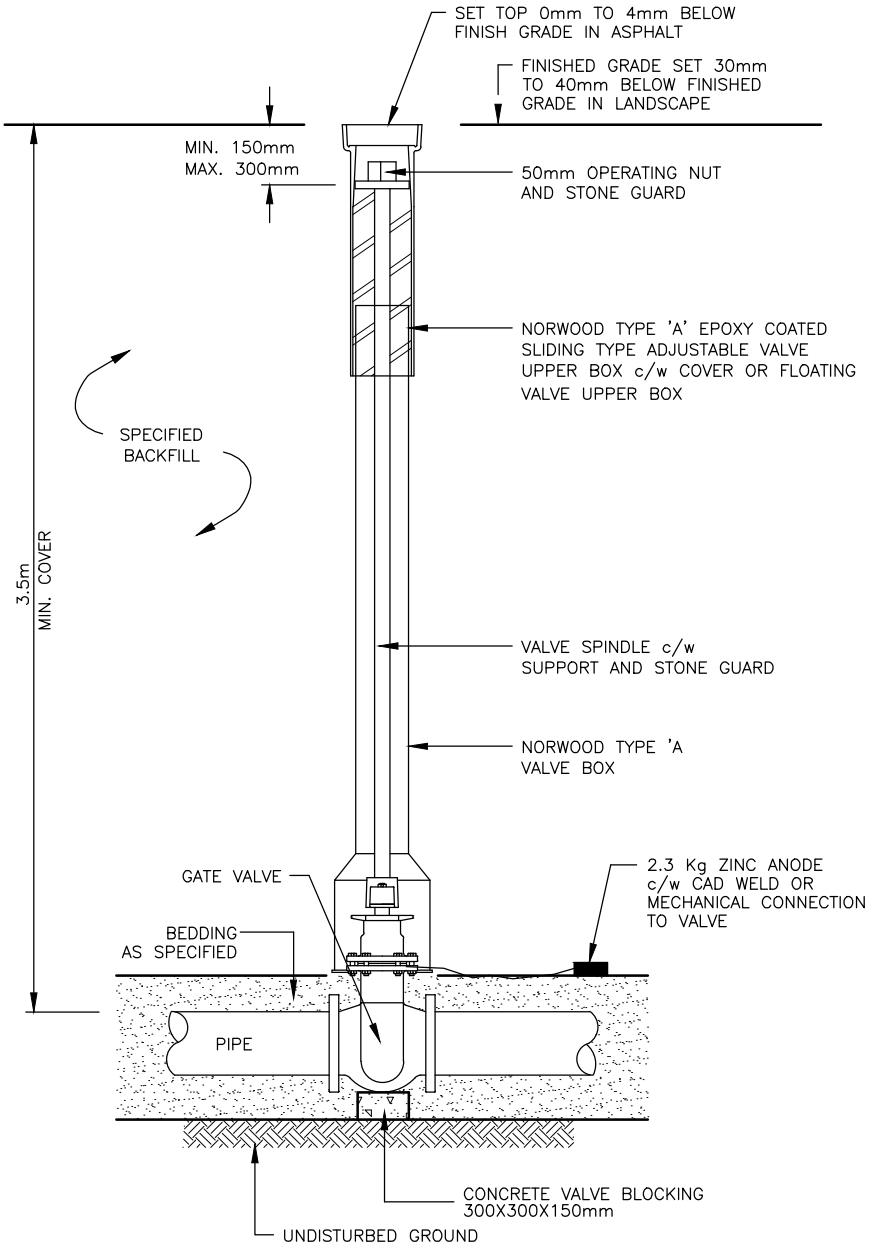
7.23 STANDARD DRAWINGS – WATER DISTRIBUTION SYSTEMS

Dwg. No.	Title
7-100	Water Valve Installation
7-101	50mm Cu Bypass Valve
7-102	Typical Valve and Hydrant Locations
7-200	Hydrant Installation
7-201	Exploded View of Dry Hydrant Construction
7-300	Water Service Connection
7-301	Service Valve Rod for 19mm, 25mm, 38mm and 50mm Service Valves
7-302	Lot Service Thaw Wire Termination
7-303	Service Abandoning Details
7-304	Single Lot Residential Servicing Details

Dwg. No.	Title
7-305	Water Meter Installation Detail for Service 25mm and Under
7-306	Water meter Installation Detail for Service 37.5mm and 50mm
7-308	Water Meter – Building installation Service over 50mm Without Fire Flow
7-309	Water Meter – Building Installation Service Over 50mm with Dedicated Fire Flow Line
7-310	Water Meter Pit
7-311	Rural Residential Servicing Detail
7-313	Underground Meter Vault Detail Combined Fire and Domestic Service
7-315	Typical Residential Sprinkler System Schematic
7-317	Typical Underground PRV Station Detail for Services 200mm and Under
7-318	Typical Underground PRV Station Concrete Chamber Details
7-319	Parks Water Service Detail 50 mm and 100 mm
7-400	Poured Concrete Thrust Blocks for Horizontal Tees and Bends
7-401	Poured Concrete Thrust Blocks for Vertical Bends (Downward Thrust)
7-402	Poured Concrete Thrust Blocks for Vertical Bends (Upward Thrust)
7-500	Typical Insulation Details for Pipes
7-501	Insulated Pipe Crossing
7-502	Insulated Water Service Connection
7-503	Insulated Water Service Connection – Plan View
7-600	Anode Installation at Hydrant
7-601	Typical Anode Installation for Iron Fittings Used with PVC Water Mains
7-604	Typical CAP Weld Connection
7-606	Anode Installation for Steel Water Mains
7-700	Air Vacuum Assembly
7-701	Air Vacuum and Air Release Valve Chamber Detail
7-702	Frost Cover Detail for Valve Chambers
7-703	Enhanced Frost Cover Detail for Valve Chambers
7-800	Pipe Zone Bedding Details (Class A, A-1, B)
7-801	Pipe Zone Bedding Details (Class C, C-1, D)
7-850	Class I Trench Backfill
7-851	Class II Trench Backfill

Dwg. No.	Title
7-852	Class III Trench Backfill
7-853	Class IV Trench Backfill
7-854	Trench Backfill for Emergency Repairs in Paved Areas
7-855	Trench Backfill for Emergency Repairs in Grassed or Sodded Areas
7-900	Pipe Support - Type I
7-901	Pipe Support - Type II
7-902	Pipe Support - Type III
7-904	Warning Water Line

STANDARD DETAIL:	7-100
DATE.: JAN. 2021	REV: 6



NOTES:

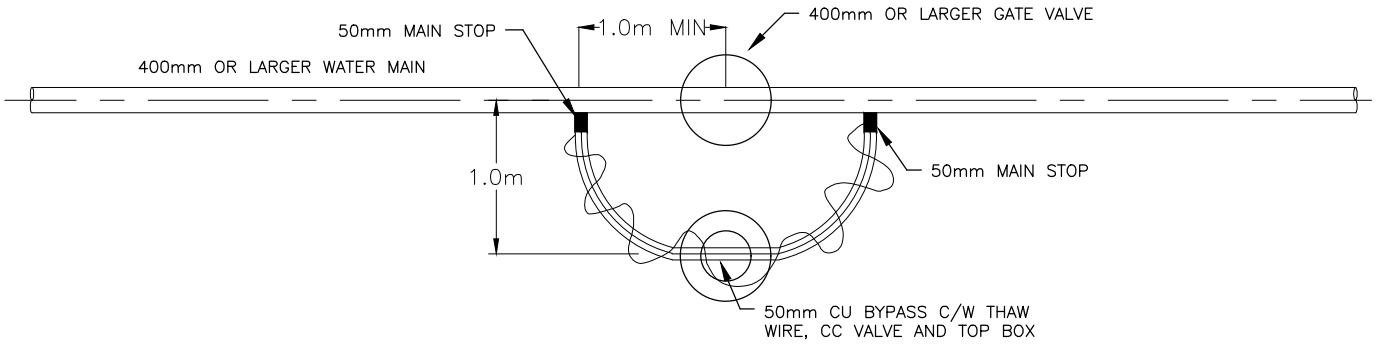
(1) VALVE BOX TOPS TO BE SET FLUSH WITH SURFACE IN BOULEVARDS, GREEN SPACES AND CONCRETE SIDEWALKS.

(2) ALL GATE VALVES 400mm AND LARGER SHALL HAVE BYPASS VALVE BUILT INTO THE BODY OF THE VALVE OR PIPED AROUND THE VALVE WITH STANDARD 50mm DIAMETER MUNICIPAL FITTINGS. LARGE DIAMETER VALVES CAN BE DIRECT BURIED WITH BOTH THE MAINLINE VALVE AND BYPASS VALVE BOXES SET TO FINISHED GRADE, OR HOUSED INSIDE A VALVE CHAMBER

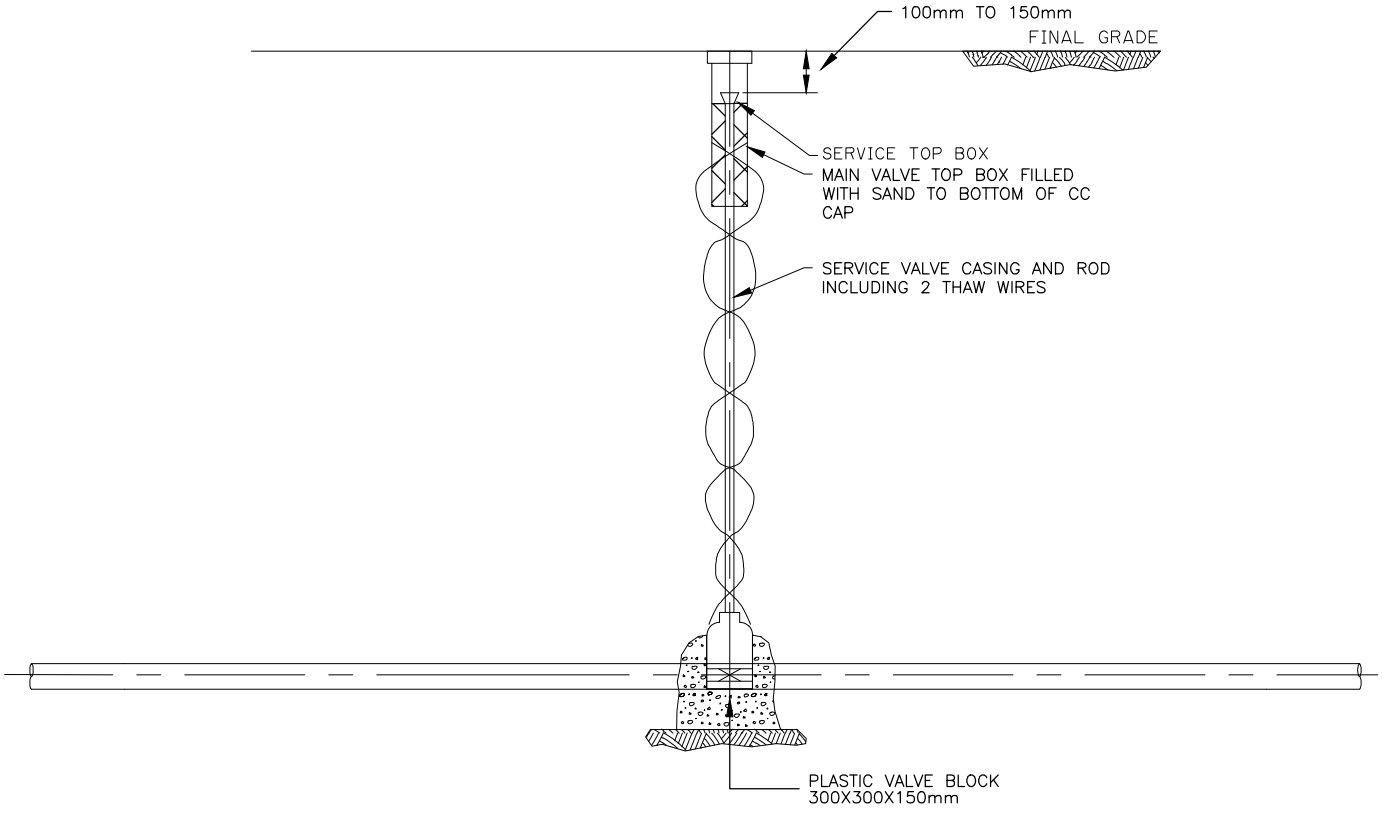
REGIONAL MUNICIPALITY OF WOOD BUFFALO

WATER VALVE INSTALLATION

STANDARD DETAIL:	7-101
DATE.: JAN. 2021	REV: 0



PLAN VIEW



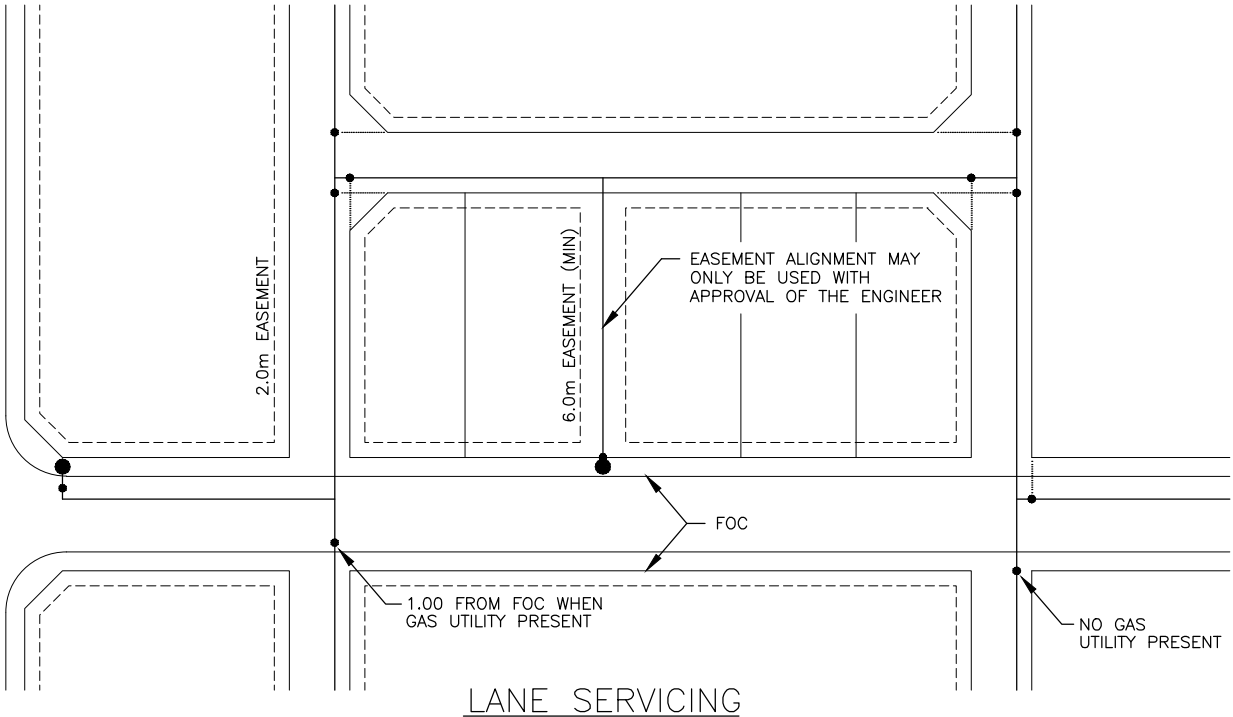
PROFILE VIEW

NOTES:
(1) 50mm cu BYPASS TO BE 1.0M FROM WATER MAIN
(2) 50mm MAIN STOPS TO BE MIN 1.0M FROM GATE VALVE AND MIN 300mm FROM WATER MAIN JOINT

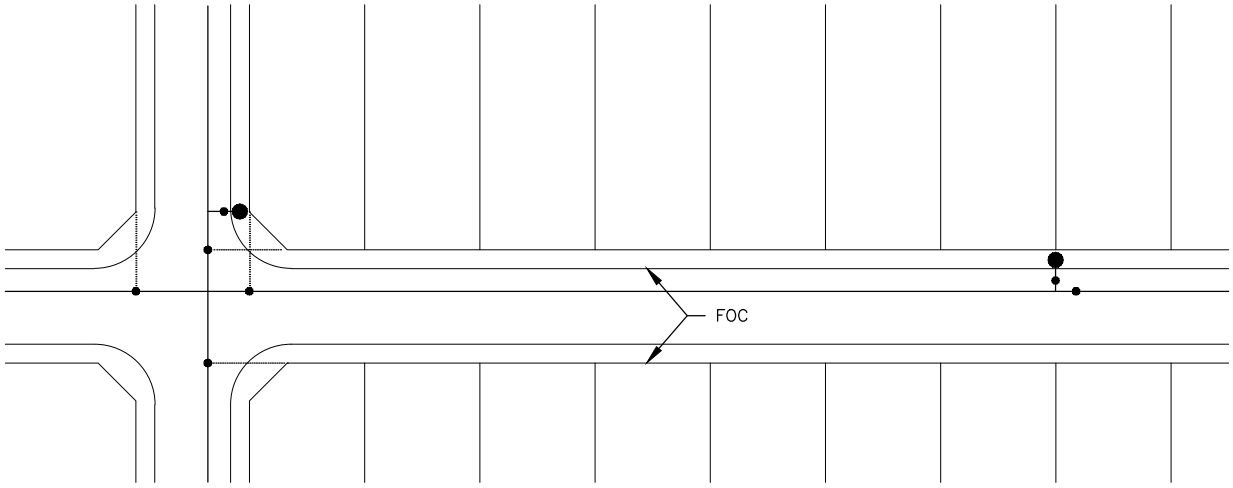
REGIONAL MUNICIPALITY OF WOOD BUFFALO

50mm Cu BYPASS VALVE

STANDARD DETAIL:	7-102
DATE.: JAN. 2021	REV: 0



LANE SERVICING



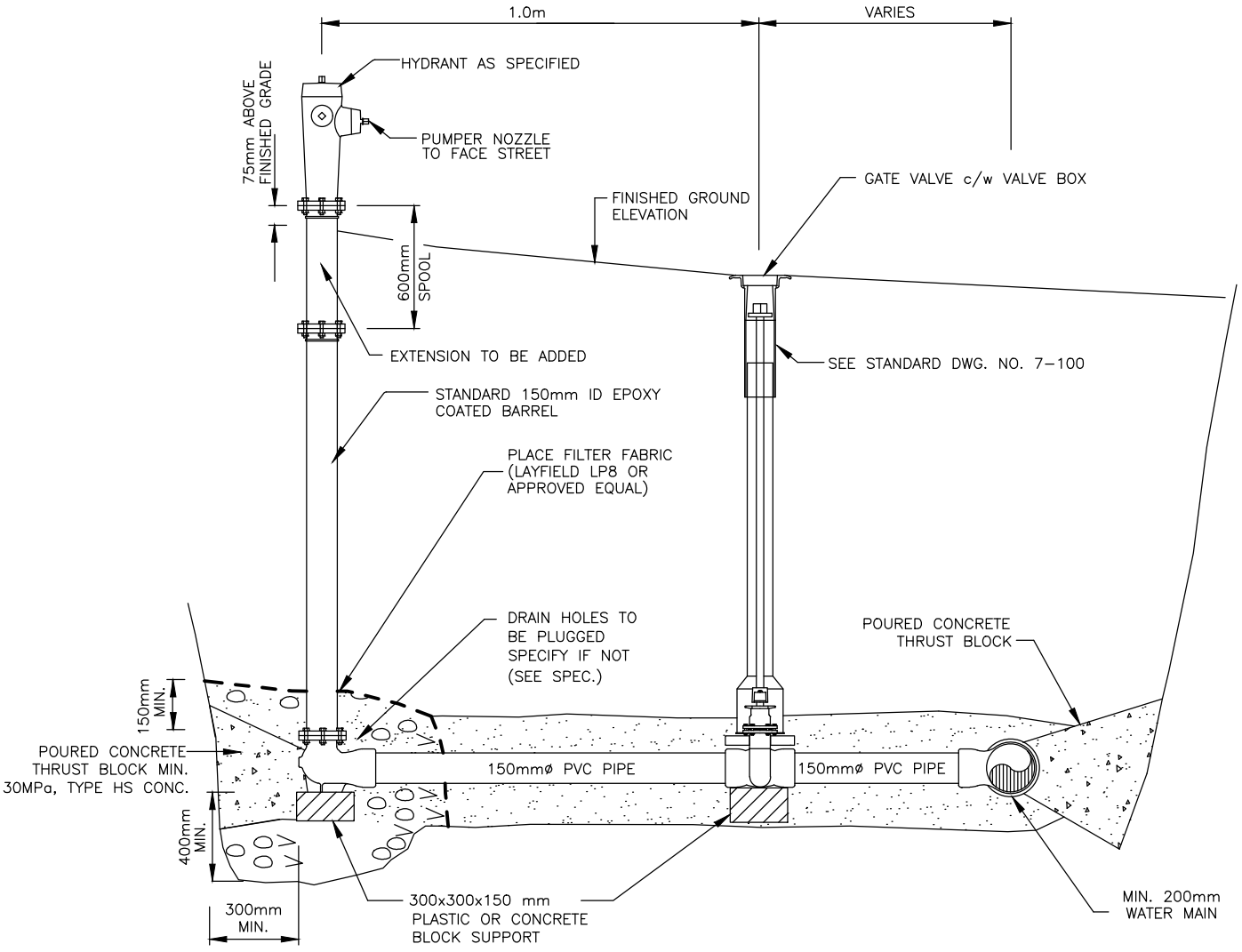
ROAD SERVICING

NOTES:
(1) AVOID USE OF EASEMENTS WHERE A STREET OR LANE ALIGNMENT IS AVAILABLE.
(2) HYDRANTS NORMALLY TO BE LOCATED NEAR STREET INTERSECTIONS.
(3) MAIN VALVES TO BE LOCATED OPPOSITE PROPERTY LINES AS ILLUSTRATED.
(4) HYDRANT VALVES TO BE LOCATED 1.0m FROM HYDRANT.
(5) HYDRANT IS SHOWN THUS: ●
(6) VALVE IS SHOWN THUS: ●

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL VALVE AND HYDRANT LOCATIONS

STANDARD DETAIL:	7-200
DATE: JAN. 2021	REV: 8



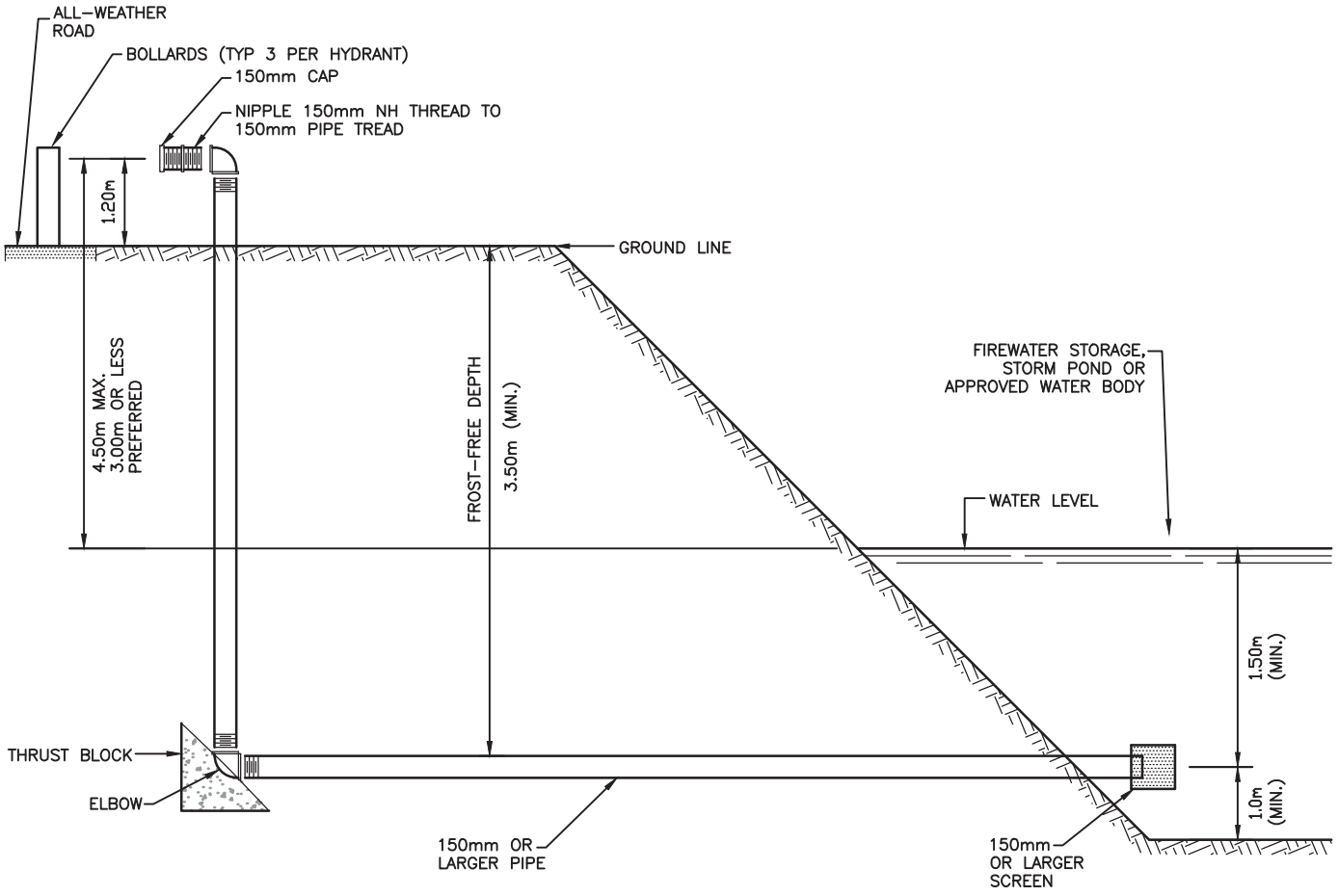
NOTES:

(1) HYDRANT TO BE SET PLUMB WITH BARREL EXTENSIONS TO SUIT DEPTH OF BRANCH. BRANCH TO BE SET LEVEL WITH A MIN. OF 3.5m OF COVER ABOVE TOP OF PIPE. EXTENSIONS TO BE INSTALLED BETWEEN HYDRANT AND TOP OF BARREL.
(2) ALL THRUST BLOCKING TO BE AGAINST UNDISTURBED TRENCH WALL.
(3) VALVE BOX TO BE INSTALLED IN VERTICAL POSITION WITH TOP FLUSH WITH FINISHED GRADE.
(4) HYDRANT SHALL BE COMPRESSION TYPE AS SPECIFIED.
(5) ALL CAST IRON VALVES AND FITTINGS SHALL BE CATHODICALLY PROTECTED SACRIFICIAL ANODE, SEE STANDARD DWG. NO. 7-600.
(6) HYDRANT TO BE SUPPLIED WITH 600mm SPOOL PIECE & A BREAKAWAY FLANGE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

HYDRANT INSTALLATION

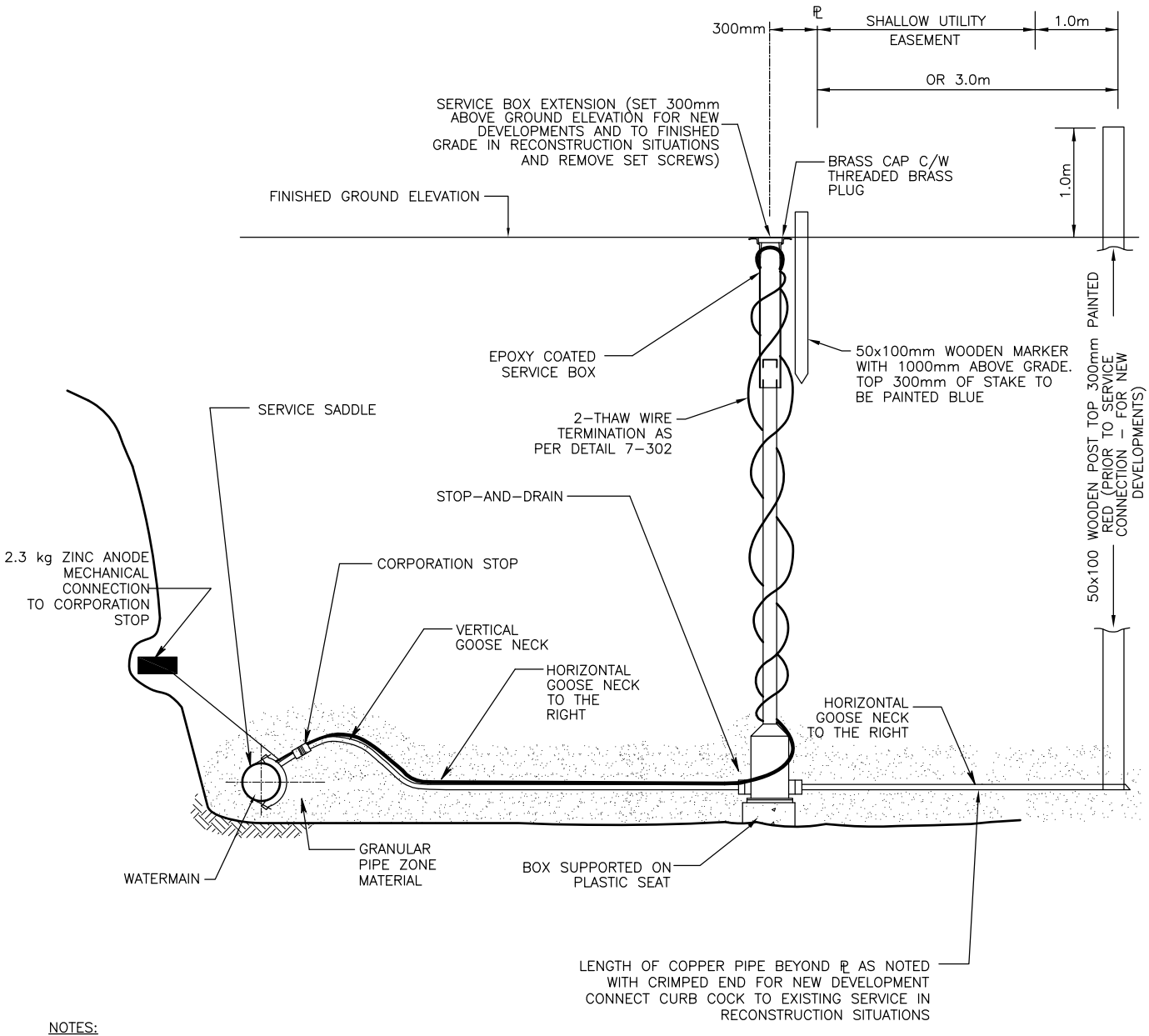
STANDARD DETAIL:	7-201
DATE: OCT 2016	REV: 2



REGIONAL MUNICIPALITY OF WOOD BUFFALO

EXPLODED VIEW OF DRY HYDRANT CONSTRUCTION

STANDARD DETAIL:	7-300
DATE.: JAN. 2021	REV: 9



NOTES:

(1) SERVICES TO BE INSTALLED AT RIGHT ANGLES TO WATERMAINS.

(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 3.0m.

(5) LOCATE SERVICE BOX IN LANDSCAPE AREA WHERE POSSIBLE.

(6) Q-LINE WATER SERVICE PIPE & FITTINGS ARE NOT PERMITTED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WATER SERVICE CONNECTION

STANDARD DETAIL:	7-301
DATE.: JAN. 2021	REV: 6

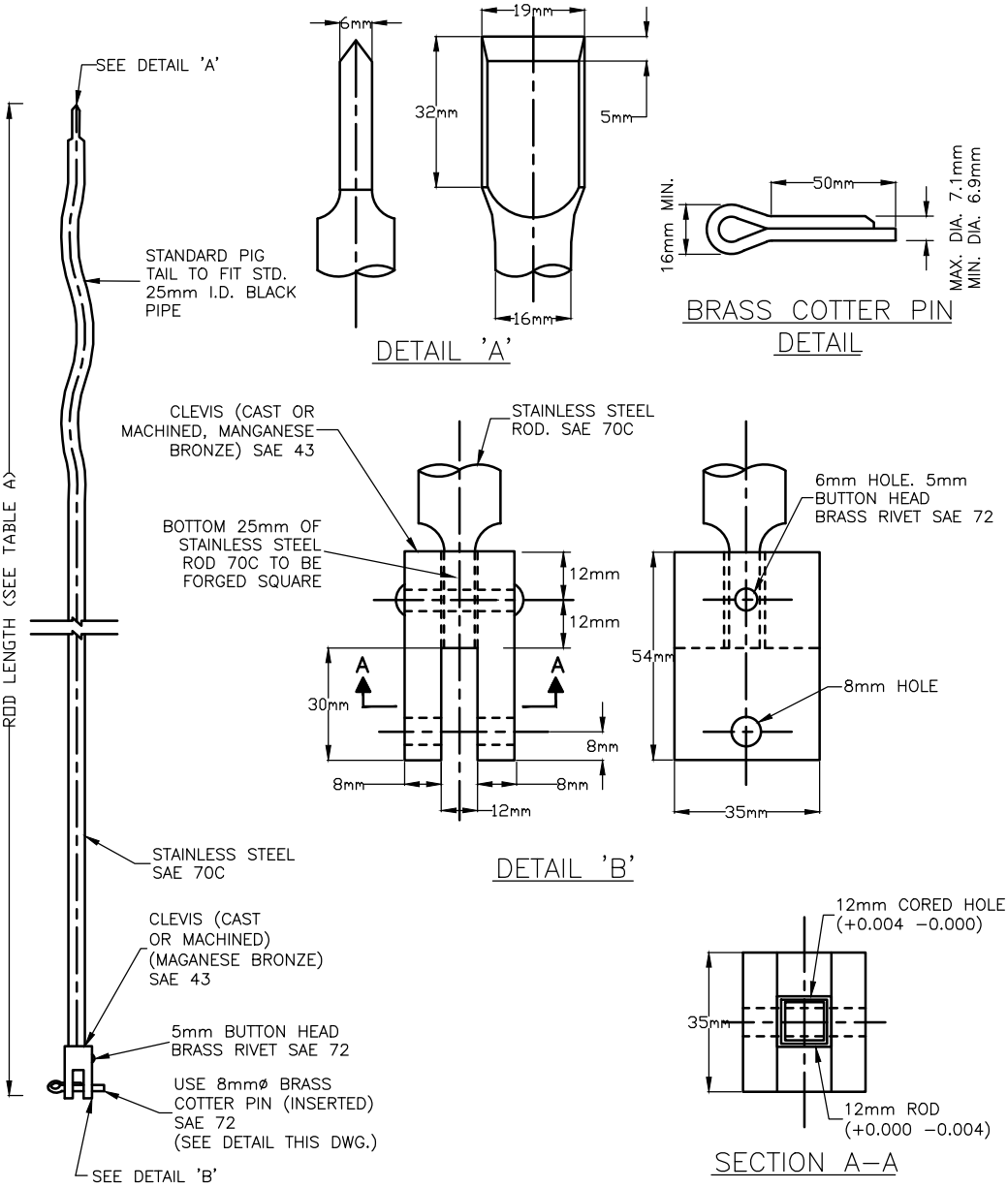


TABLE A

DEPTH OF COVER	ROD LENGTH	CASING LENGTH
2.4m	2.15m	1.97m
2.7m	2.45m	2.27m
3.0m	2.75m	2.57m
3.3m	3.05m	2.87m

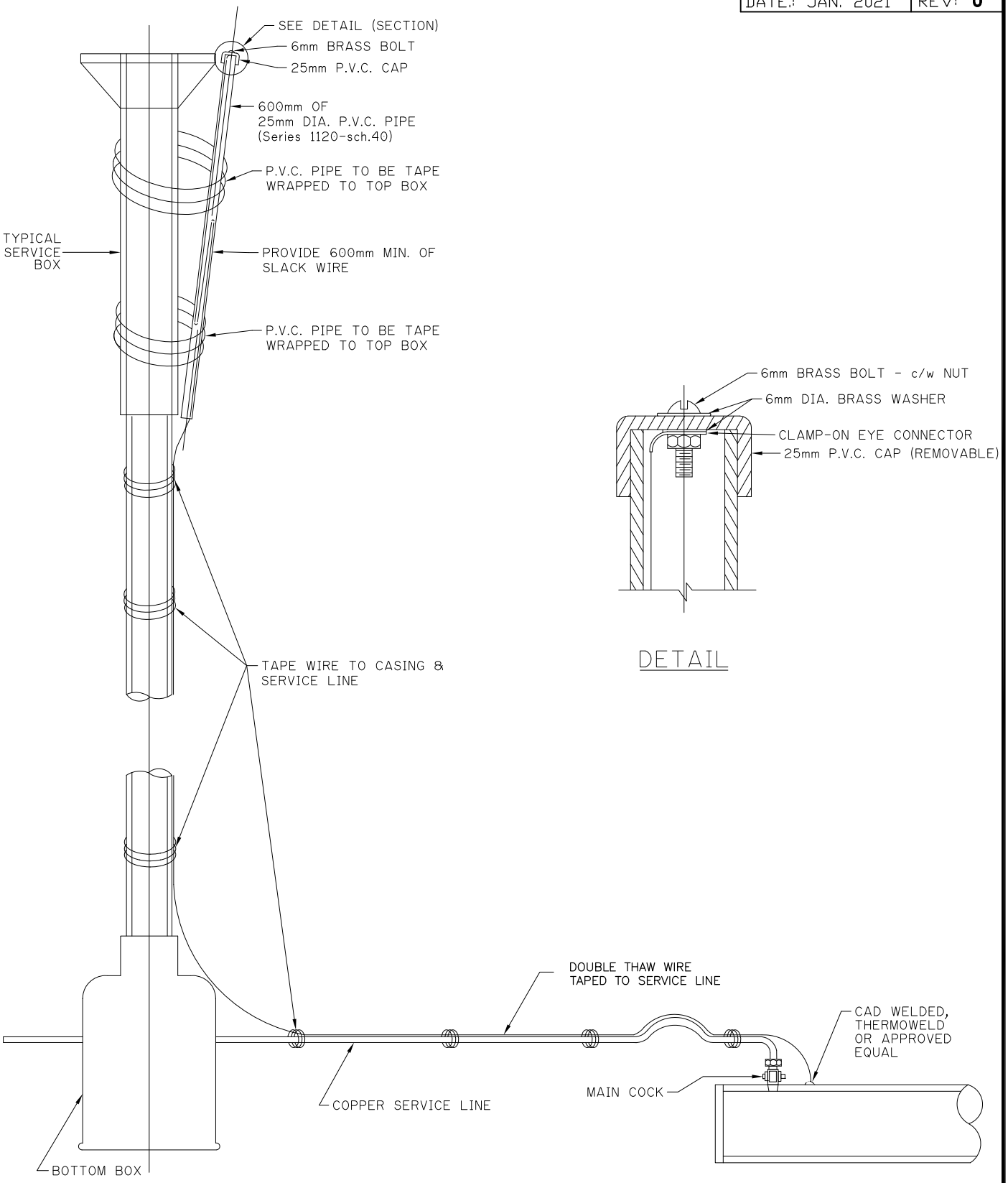
NOTES:

(1) SERVICE VALVE RODS ARE NOT TO BE CUT OR MODIFIED IN ANY WAY.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SERVICE VALVE ROD FOR 19mm, 25mm, 38mm, 50mm SERVICE VALVES

STANDARD DETAIL:	7-302
DATE.: JAN. 2021	REV: 0

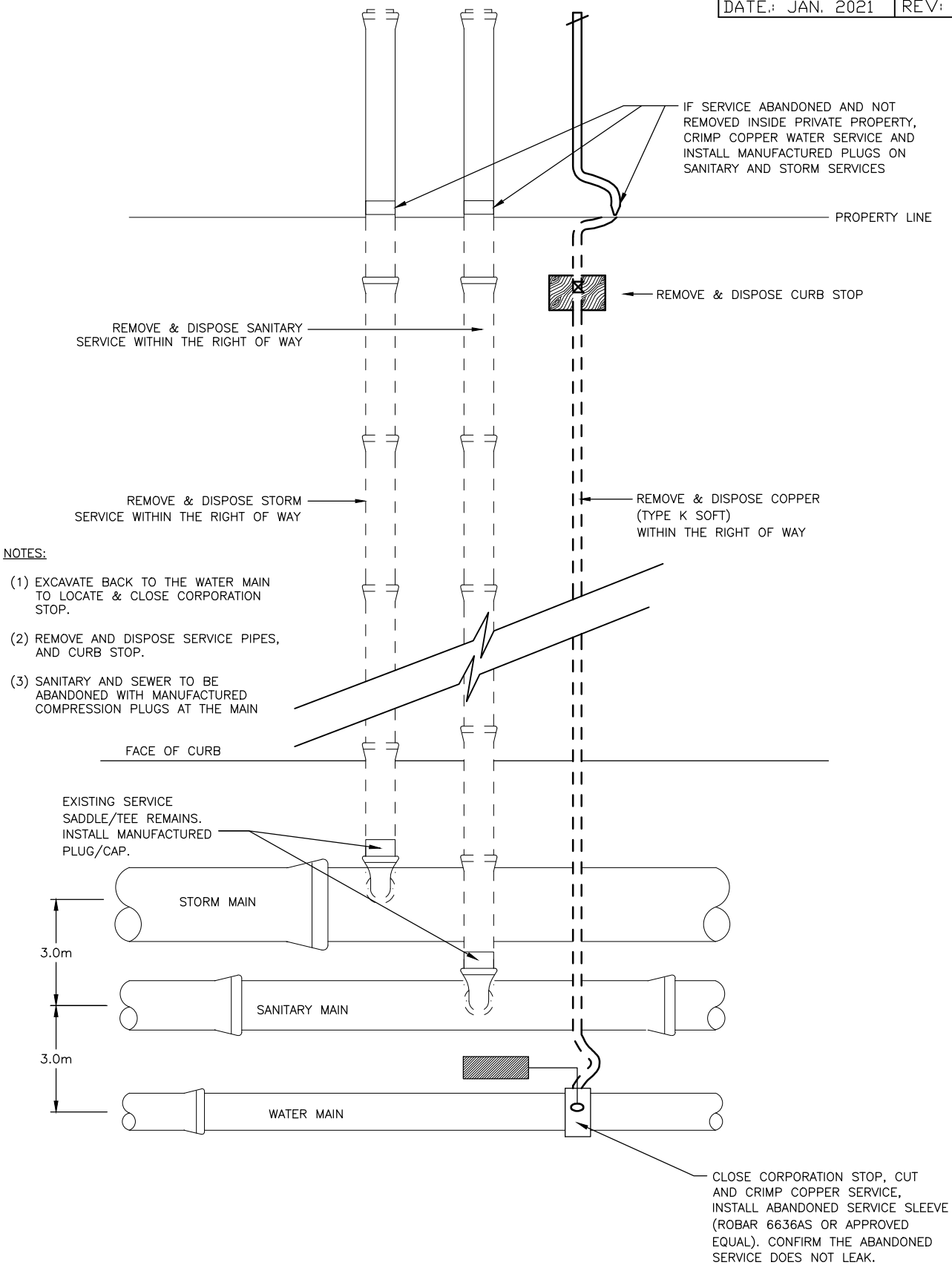


DETAIL

REGIONAL MUNICIPALITY OF WOOD BUFFALO

LOT SERVICE THAW WIRE TERMINATION

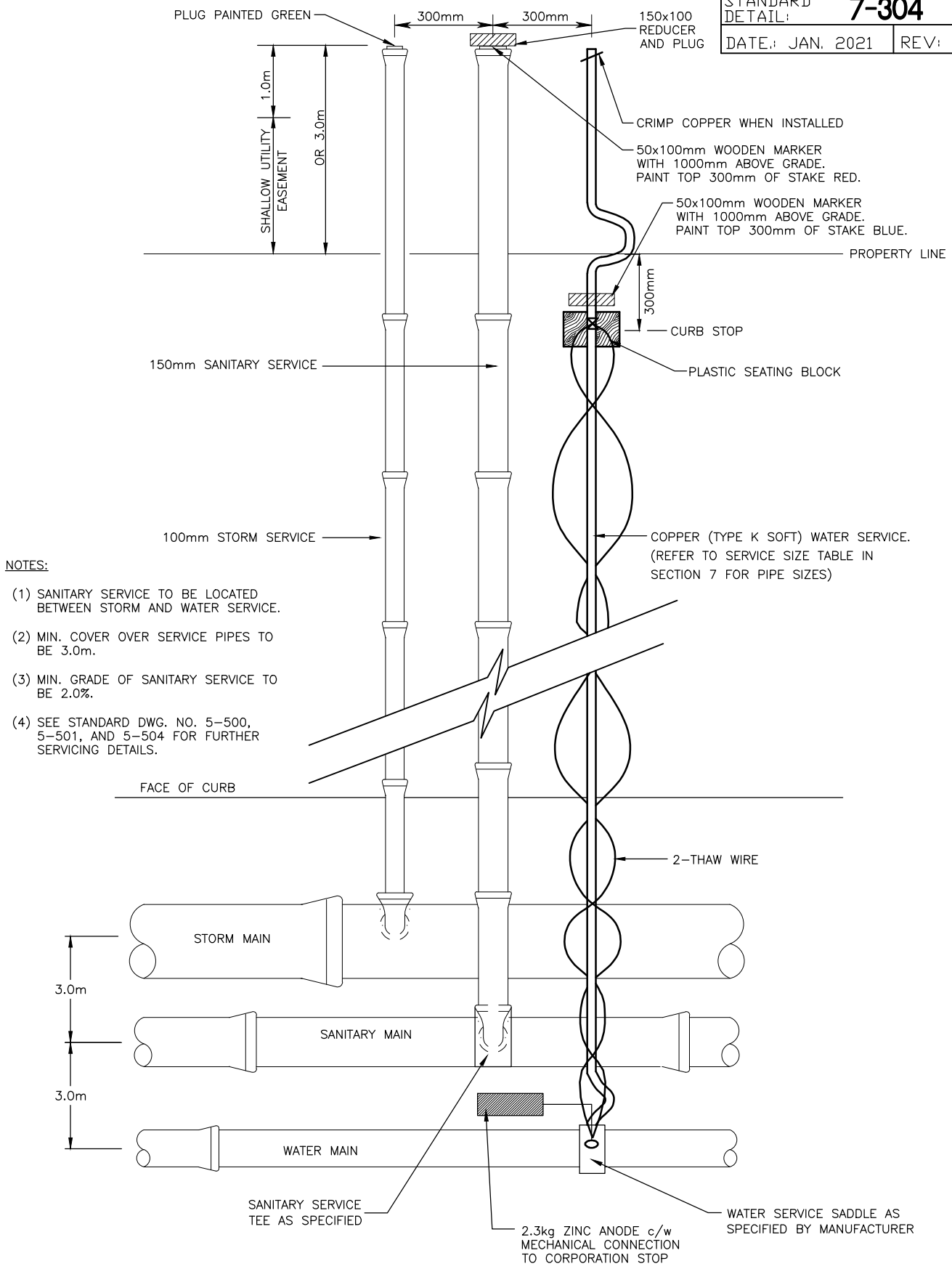
STANDARD DETAIL:	7-303
DATE.: JAN. 2021	REV: 0



REGIONAL MUNICIPALITY OF WOOD BUFFALO

SERVICE ABANDONING DETAILS

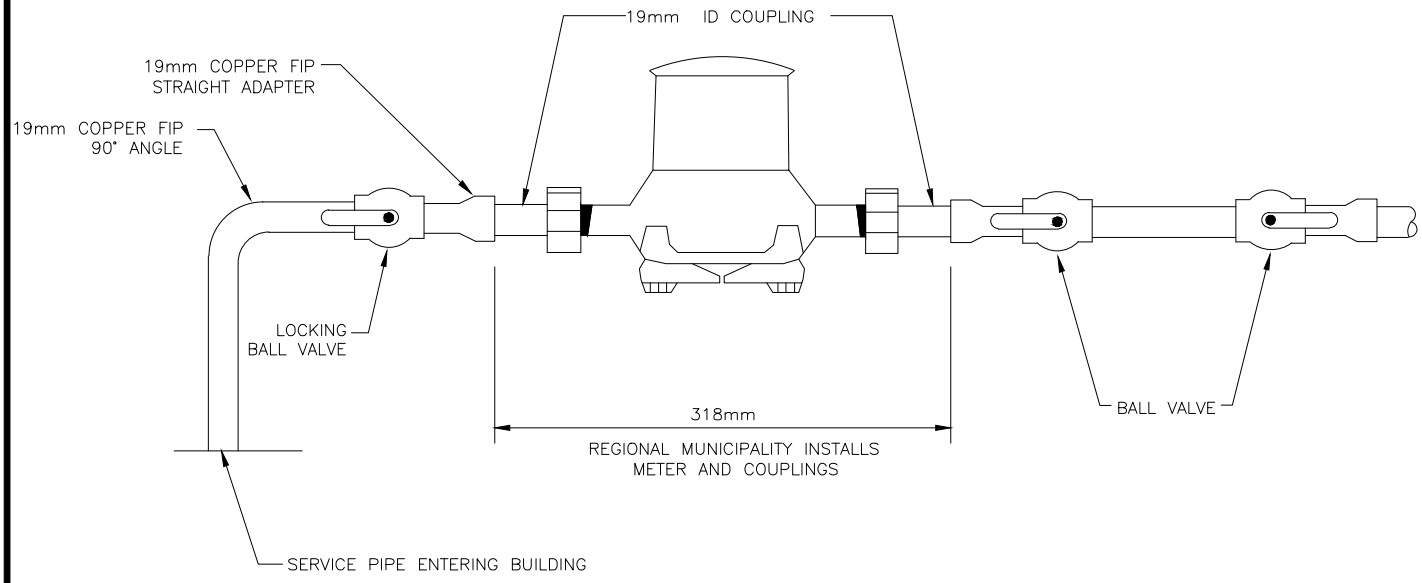
STANDARD DETAIL:	7-304
DATE: JAN. 2021	REV: 7



REGIONAL MUNICIPALITY OF WOOD BUFFALO

SINGLE LOT RESIDENTIAL SERVICING DETAILS

STANDARD DETAIL:	7-305
DATE.: JAN. 2021	REV: 7



WATER METER INSTALLATION DETAIL – FOR SERVICES 25mm AND UNDER
(19mm SERVICE REQUIRING 16mm x 19mm WATER METER SHOWN IN DRAWING)

(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 1.8m HEIGHT CLEARANCE.

5 WATER METER MUST HAVE 0.6m CLEARANCE ON ALL SIDES AND BE UNOBSTRUCTED.

(6) SEE STANDARD DWG. NO. 7–300 FOR SERVICING DETAILS.

(7) LARGER PIPE SIZE REQUIRED FOR RESIDENCES WITH FIRE SPRINKLER SYSTEMS AND LARGER DEMANDS. (SEE GUIDELINES)

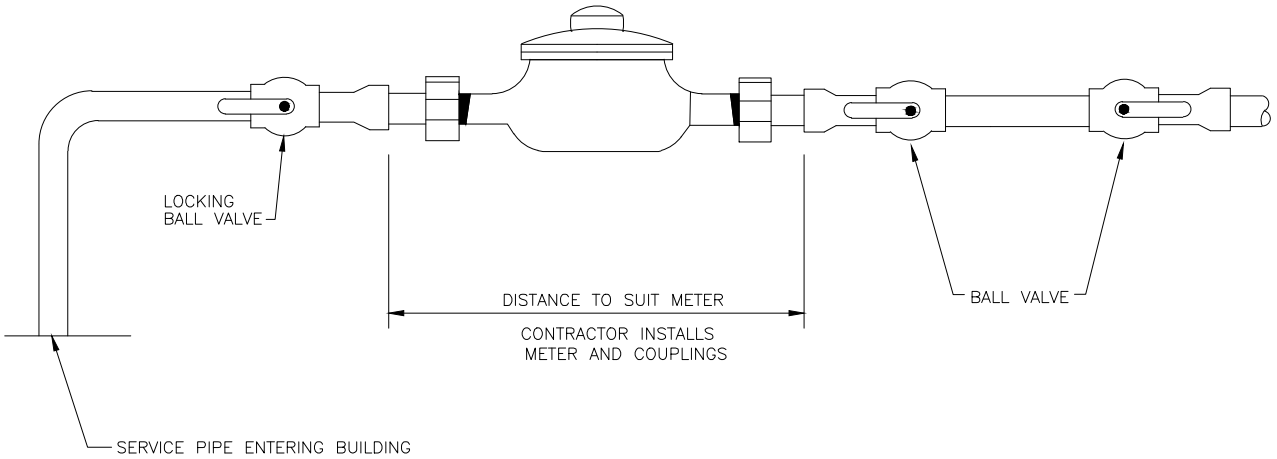
(8) OWNERS MUST PROTECT METER FROM HEAT OR FROST DAMAGE.

(9) 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 50mm 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.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WATER METER INSTALLATION DETAIL FOR SERVICE 25mm AND UNDER

STANDARD DETAIL:	7-306
DATE: JAN. 2021	REV: 4



WATER METER INSTALLATION DETAIL – FOR SERVICES 37.5mm AND 50mm
(19mm SERVICE REQUIRING 16mm x 19mm WATER METER SHOWN IN DRAWING)

(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 DOUBLE CHECK VALVES SHALL HAVE A BALL VALVE INSTALLED IMMEDIATELY UPSTREAM AND IMMEDIATELY DOWNSTREAM.

(4) WATER METER MUST BE ACCESSIBLE WITH 1.8m HEIGHT CLEARANCE.

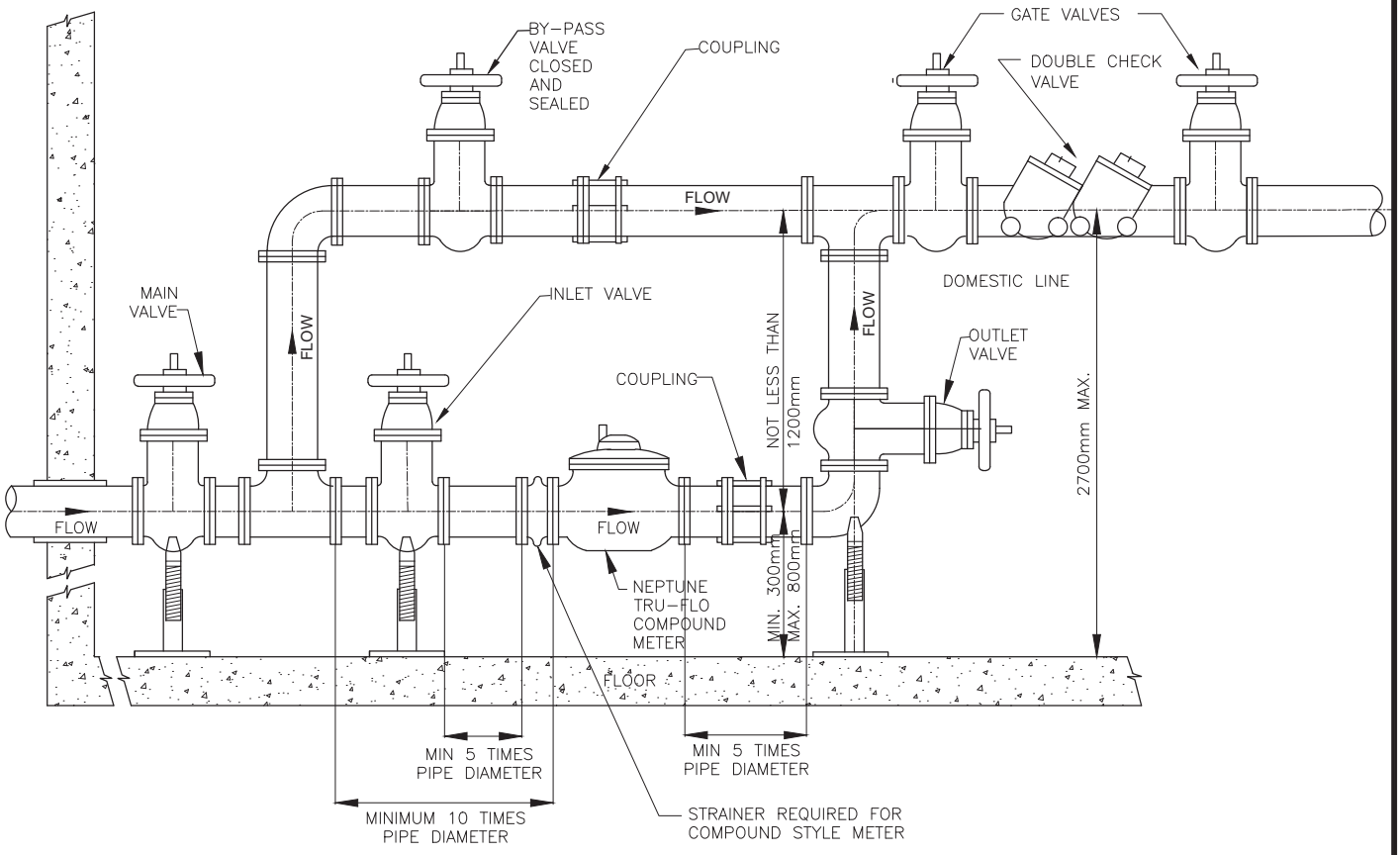
(5) WATER METER MUST HAVE 0.6m CLEARANCE ON ALL SIDES.

(6) OWNERS MUST PROTECT METER FROM HEAT OR FROST DAMAGE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WATER METER INSTALLATION DETAIL FOR SERVICE 37.5mm AND 50mm

STANDARD DETAIL:	7-308
DATE: OCT 2016	REV: 2



NOTES:

(1) WATER METER SHALL BE INSTALLED NO MORE THAN 2000mm FROM THE POINT OF ENTRY OF WATER SERVICE.

(2) FOR SIZING OF WATER METERS CONTACT THE RMWB – METERING SECTION.

(3) METER MUST BE INSTALLED IN A HORIZONTAL AND UPRIGHT POSITION. THE REGISTER MUST BE UPRIGHT AND VISIBLE.

(4) MINIMUM CLEARANCE BETWEEN WALL AND METER MUST BE 300mm.

(5) MINIMUM DISTANCE BETWEEN FLOOR AND METER SHOULD BE 300mm AND NO MORE THAN 1.0m.

(6) A FLOOR DRAIN IS TO BE PROVIDED.

(7) THE AREA IN FRONT OF THE METER SHALL BE FREE OF OBSTRUCTIONS FOR 600mm TO ALLOW FOR READING AND SERVICING.

(8) GATE VALVES ARE REQUIRED IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE WATER METER & DOUBLE CHECK VALVE.

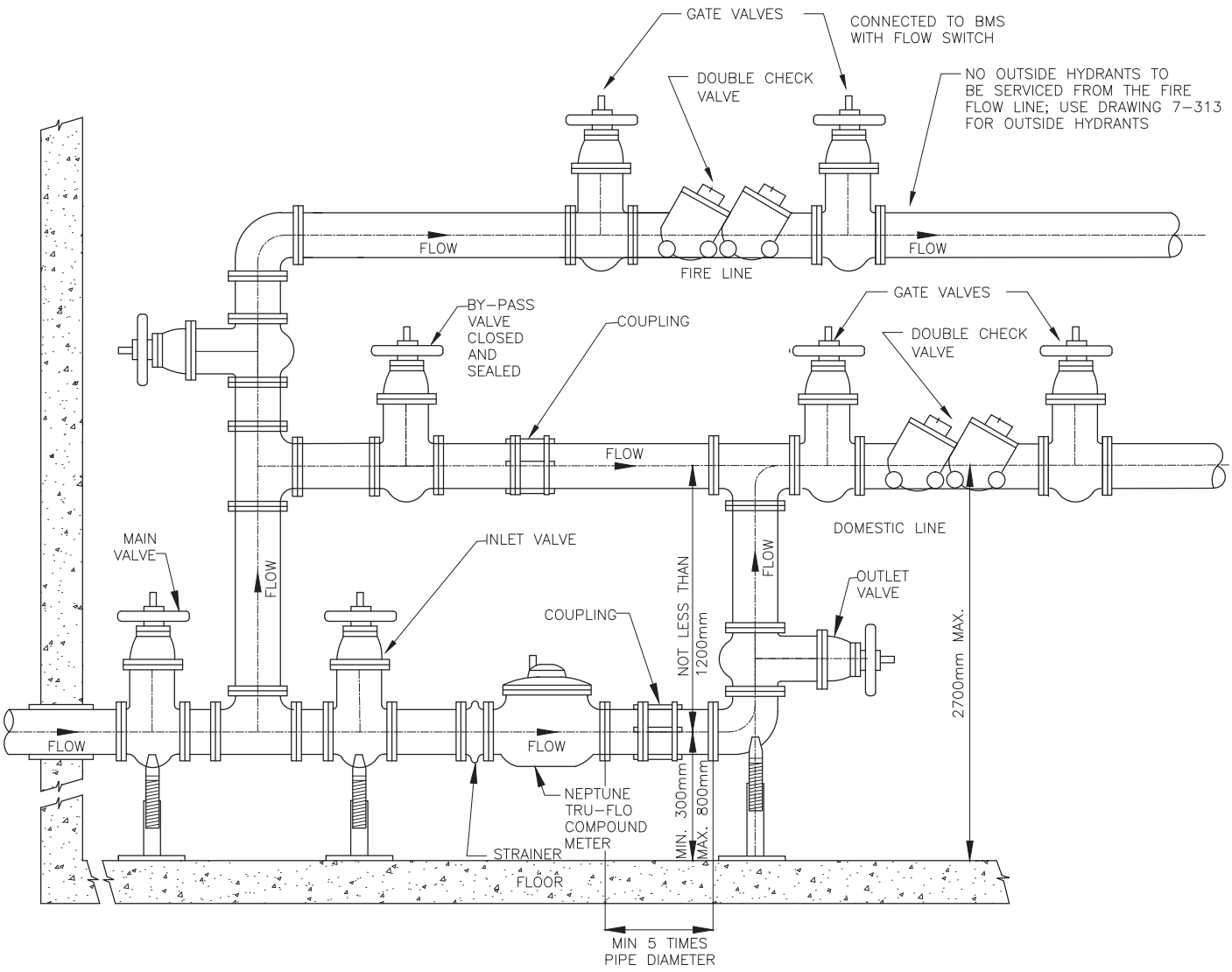
(9) OWNER MUST PROTECT METER FROM HEAT OR FROST DAMAGE.

(10) ALL WATER METERS FOR SERVICES LARGER THAN 25mm SHALL BE INSTALLED BY THE OWNER. THE MUNICIPALITY SHALL INSPECT AND OPERATE THE METER.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WATER METER - BUILDING INSTALLATION SERVICE OVER 50mm WITHOUT FIRE FLOW

STANDARD DETAIL:	7-309
DATE: OCT 2016	REV: 7



NOTES:

(1) WATER METER SHALL BE INSTALLED NO MORE THAN 2000mm FROM THE POINT OF ENTRY OF WATER SERVICE.

(2) FOR SIZING OF WATER METERS CONTACT THE RMWB – METERING SECTION.

(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 300mm.

(5) MINIMUM DISTANCE BETWEEN FLOOR AND METER SHOULD BE 300mm AND NO MORE THAN 1.0m.

(6) A FLOOR DRAIN IS TO BE PROVIDED.

(7) THE AREA IN FRONT OF THE METER SHALL BE FREE OF OBSTRUCTIONS FOR 600mm 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.

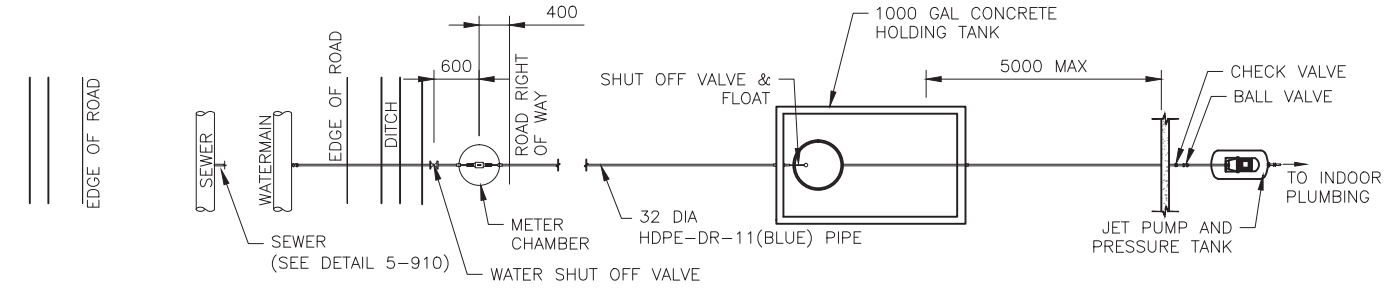
(10) ALL WATER METERS FOR SERVICES LARGER THAN 25mm SHALL BE INSTALLED BY THE OWNER. THE MUNICIPALITY SHALL INSPECT AND OPERATE THE METER.

(11) NOT APPLICABLE FOR DEVELOPMENTS WITH OUTSIDE HYDRANT. USE DRAWING 7-313.

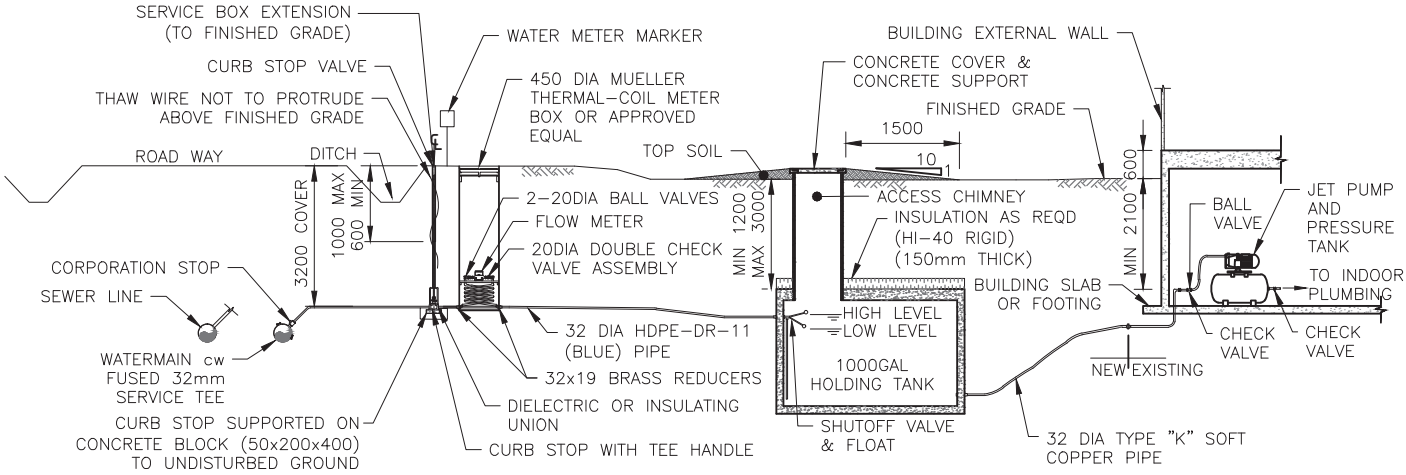
REGIONAL MUNICIPALITY OF WOOD BUFFALO

WATER METER - BUILDING INSTALLATION SERVICE OVER 50mm WITH DEDICATED FIRE FLOW LINE

STANDARD DETAIL:	7-310
DATE: OCT 2016	REV: 0



PLAN



ELEVATION

NOTES:

(1) FLOW METER TO BE INSTALLED BY MUNICIPALITY.

(2) SERVICES INSTALLED AT RIGHT ANGLES TO WATER MAINS AND BE LOCATED 0.4m FROM PROPERTY LINE OR AS SPECIFIED IN CONTRACT DOCUMENTS.

(3) COAT CORPORATION STOP AND PIPE NIPPLE WITH "DENSO MASTIC" AND "DENSO TAPE" OR APPROVED EQUAL.

(4) DIAMETER OF COPPER SERVICE PIPE TO BE UNIFORM FROM CORPORATION STOP TO WATER METER.

(5) MINIMUM COVER OVER SERVICE PIPES TO BE 3.5m AS SHOWN.

(6) WHEN CUT BACK SLOPES ARE USED IN LIEU OF CAGES AND SHORING, THESE SLOPES ARE TO MEET REQUIREMENTS OF LOCAL CODES.

(7) SERVICE TEE TO BE 600 MIN APART OR AS RECOMMENDED BY THE MANUFACTURER OR WHICHEVER IS GREATER.

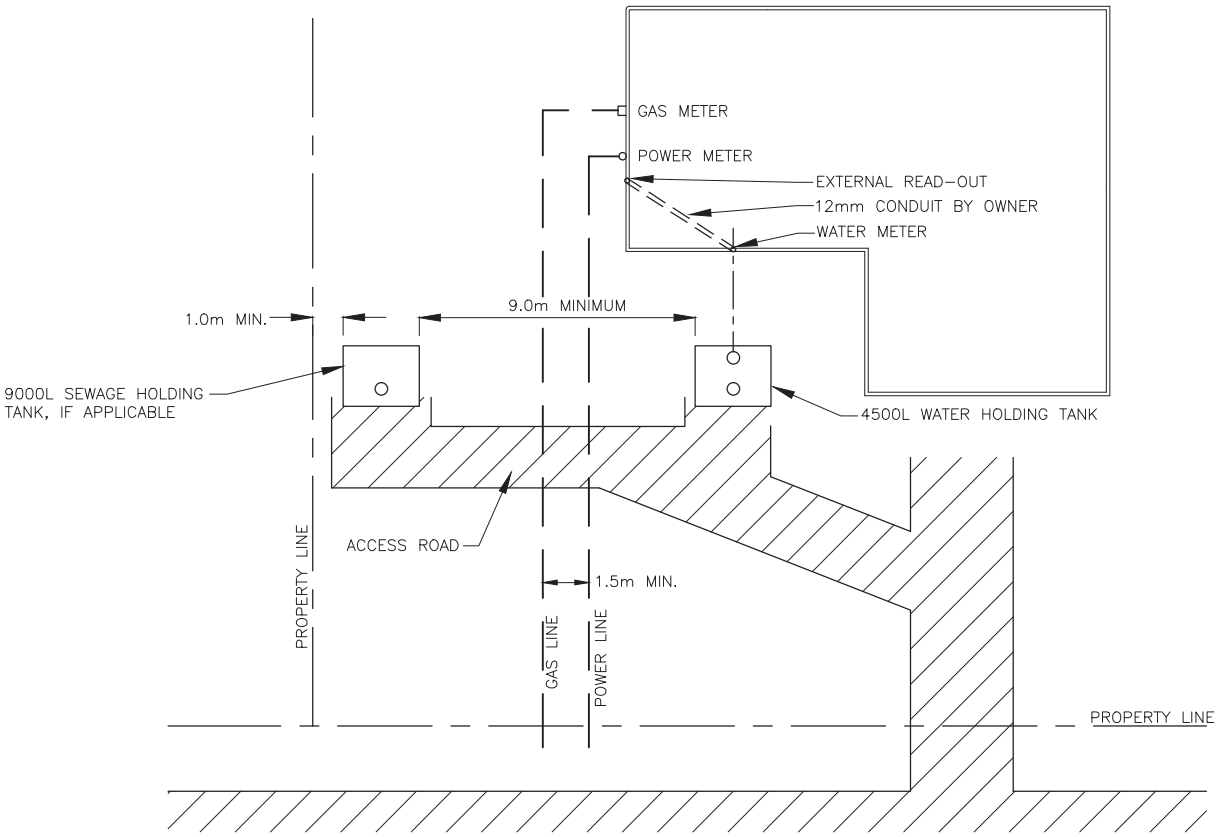
(8) SERVICE CARDS TO SHOW ELEVATION AND LOCATION OF SERVICE FITTINGS.

(9) ALL DIMENSIONS SHOWN IN MILLIMETERS UNLESS NOTED OTHERWISE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WATER METER PIT

STANDARD DETAIL:	7-311
DATE: OCT 2016	REV: 6



GENERAL

(1) ALL INSTALLATIONS IN ACCORDANCE WITH THE REGIONAL MUNICIPALITY OF WOOD BUFFALO, ENGINEERING SERVICES GUIDELINES AND DEVELOPMENT PROCEDURES AND OTHER APPLICABLE PROVINCIAL CODES AND REGULATIONS.

(2) ACCESS/ROAD AREA TO PROVIDE SUFFICIENT ROOM FOR ACCESS AND MANEUVERING AND BE CAPABLE OF WITHSTANDING WATER AND SEWAGE TRUCK WHEEL LOADS.

(3) LAYOUT AND LOCATIONS FOR ILLUSTRATIVE PURPOSES, DESIGN TO SUIT.

SANITARY

(1) 9000L TANK (CSA APPROVED).

(2) SUPPLIED AND INSTALLED IN ACCORDANCE WITH SAFETY CODES COUNCIL, ALBERTA PRIVATE SEWAGE SYSTEMS, STANDARD OF PRACTICE.

WATER

(1) POINT OF ENTRY FOR WATER LINE RECOMMENDED TO BE AS CLOSE AS POSSIBLE TO THE POWER METER.

(2) WATER METER MUST BE ACCESSIBLE WITH 1.8 m HEIGHT CLEARANCE.

(3) LOCATE WATER METER CLOSE TO SUMP OR SPILLAGE AREA IN BASEMENT, OR UTILITY ROOM. ROOM SHOULD NOT HAVE CARPET OR DRYWALL.

(4) WIRING FOR REMOTE READ TO BE RUN FROM WATER METER LOCATION TO POWER METER LOCATION.

(5) WIRE TO BE PROVIDED BY RMWB.

(6) OWNERS MUST PROTECT METER FROM HEAT OR FROST DAMAGE.

(7) SEE STANDARD DWG. NO. 7-305 FOR RESIDENTIAL METER REQUIREMENTS (SIMILAR)

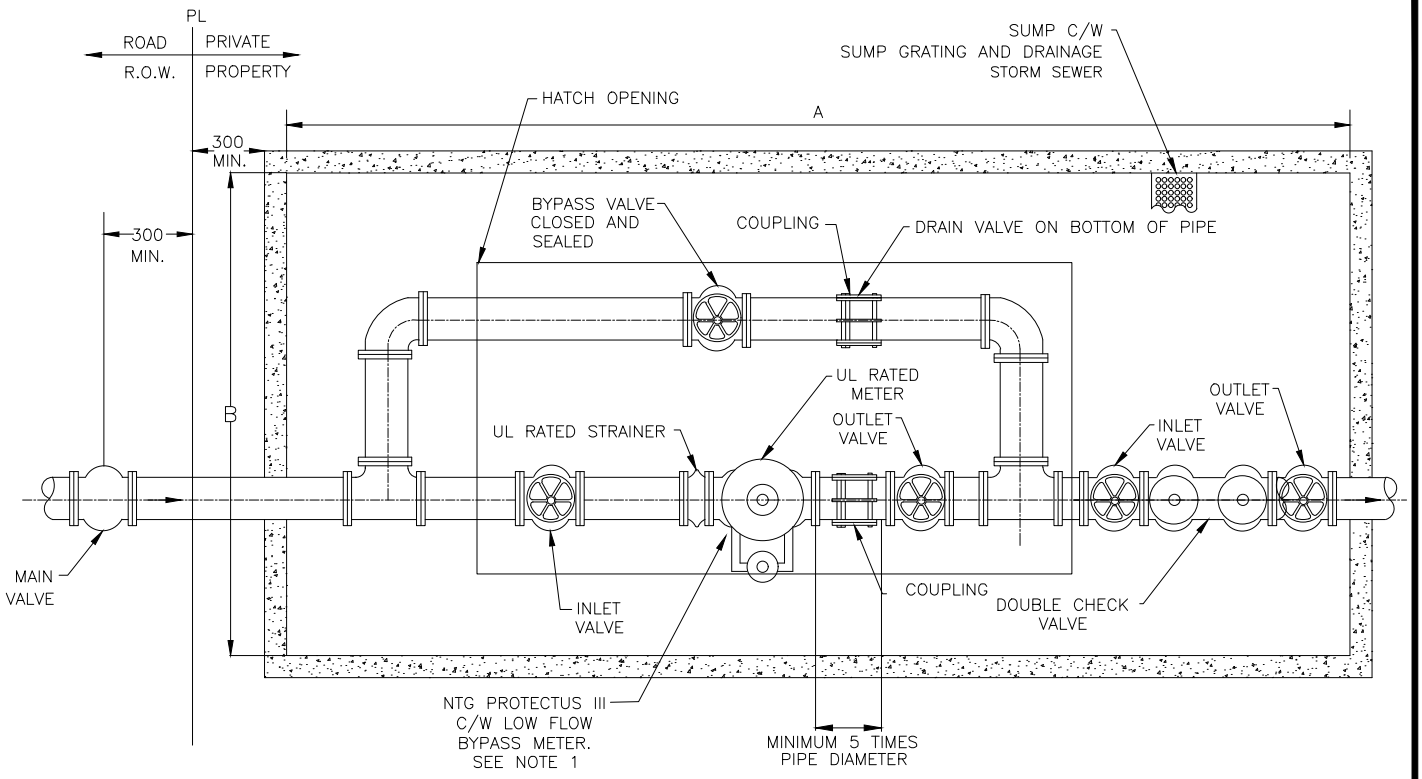
(8) TANK AND PUMP MAY BE LOCATED WITHIN RESIDENCE, WITH EXTERNAL 150mm FILL/VENT PIPE. COMPLETE WITH 50mm FILL LINE AND 75mm VENT PIPE.

(9) COMPONENTS – PUMP AND PRESSURE SYSTEM.
4500L TANK W/ LOCKING CAP (CSA APPROVED)
50mm CAMLOCK FITTINGS; LABELLED "WATER"
CSA APPROVED PIPE AND FITTINGS.
FILL LINE AND WATER LEVEL INDICATOR (INSIDE RESIDENCE INSTALLATION ONLY).

REGIONAL MUNICIPALITY OF WOOD BUFFALO

RURAL RESIDENTIAL SERVICING DETAIL

STANDARD DETAIL:	7-313
DATE.: JAN. 2021	REV: 4



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 300mm.

(6) THE BY–PASS PIPING SHALL BE THE SAME SIZE AND MATERIAL AS THE 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 TO 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.

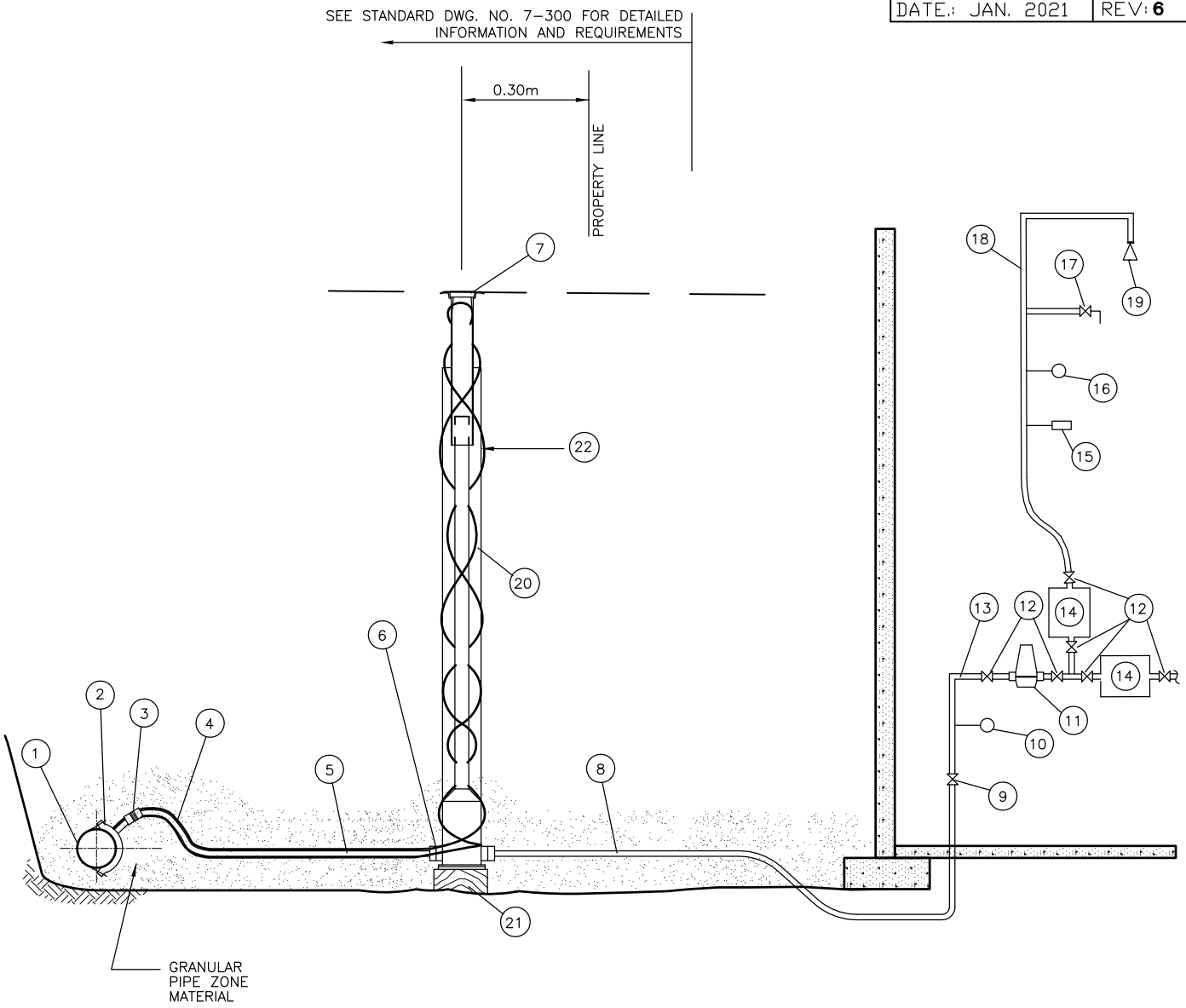
(11) VAULTS MUST BE WATER TIGHT AND COUNTERACT ANY FLOAT FORCES.

(12) VAULTS TO BE OWNED AND MAINTAINED BY PROPERTY OWNER.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

UNDERGROUND METER VAULT DETAIL COMBINED FIRE AND DOMESTIC SERVICE

STANDARD DETAIL:	7-315
DATE: JAN. 2021	REV: 6



No.	DESCRIPTION	SIZES
1.	WATER MAIN	150mm MIN.
2.	SERVICE SADDLE	38mm
3.	MAIN STOP	38mm
4.	HORIZONTAL/VERTICAL GOOSE NECK	38mm
5.	TYPE K COPPER SERVICE PIPE	38mm
6.	CURB COCK	38mm
7.	CURB COCK CASING	38mm
8.	SERVICE PIPE	SIZE SET BY SPRINKLER DESIGN
9.	MAIN SHUT OFF VALVE	
10.	PRESSURE GAUGE	

SEE NOTE 2

No.	DESCRIPTION	SIZES
11.	WATER METER	TO MATCH SERVICE PIPE
12.	DOMESTIC WATER SHUT OFF VALVE	
13.	SERVICE PIPE	
14.	DOUBLE CHECK VALVE ASSEMBLY	SIZE SET BY SPRINKLER DESIGN
15.	FLOW ALARM	
16.	PRESSURE GAUGE	
17.	TEST AND DRAIN VALVE	
18.	SPRINKLER PIPING	
19.	RESIDENTIAL SPRINKLER	
20.	2-THAW WIRES	
21.	CONCRETE BRICK	
22.	SERVICE BOX	

NOTES:

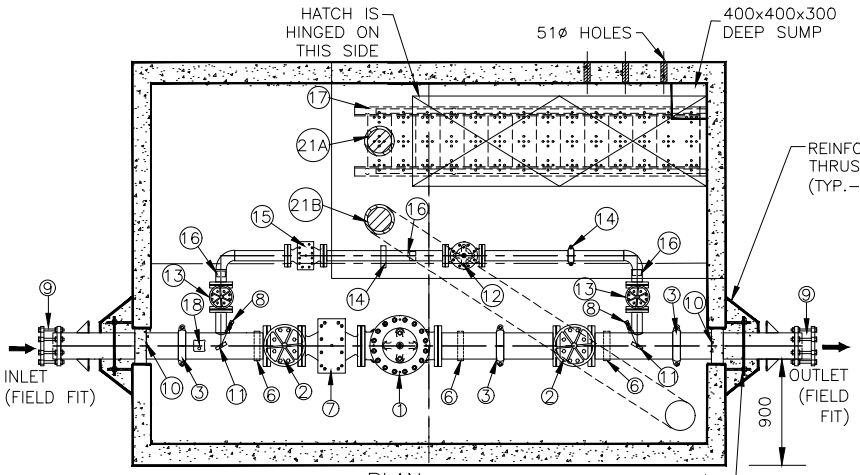
(1) FOR ADDITIONAL SERVICE CONNECTION DETAILS SEE STANDARD DWG. NO. 7-300.

(2) MINIMUM SERVICE SIZE. SPRINKLER SYSTEM DESIGNER TO CONFIRM OR SPECIFY APPROPRIATE SERVICE SIZE.

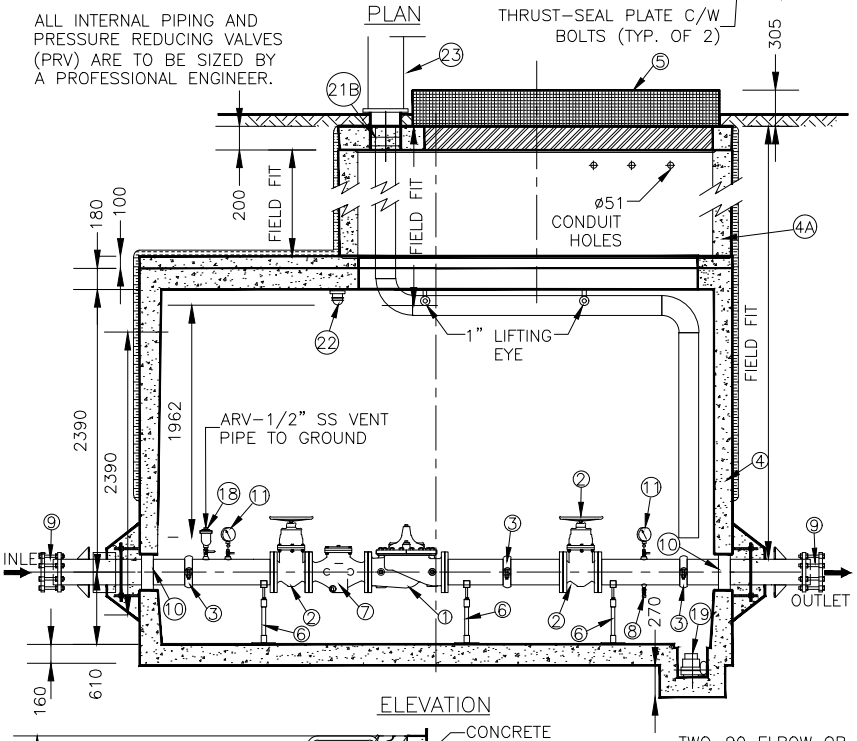
REGIONAL MUNICIPALITY OF WOOD BUFFALO

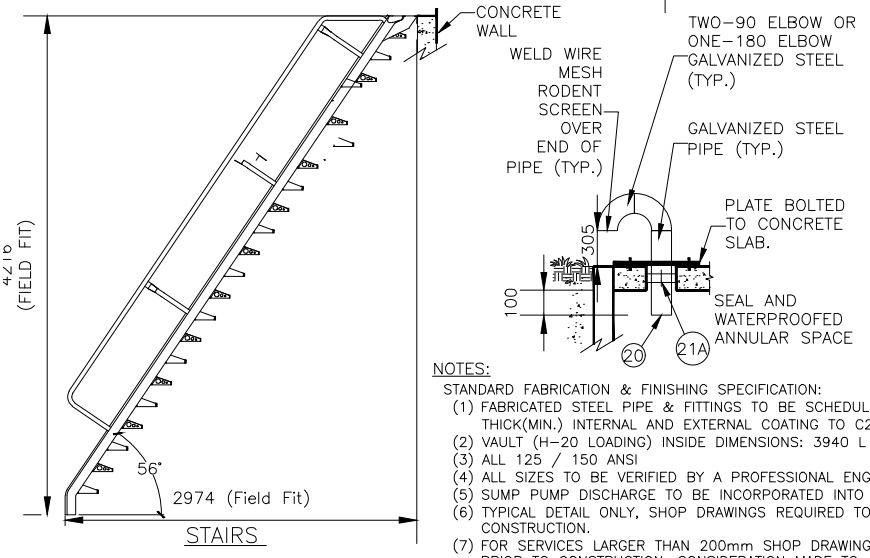
TYPICAL RESIDENTIAL SPRINKLER SYSTEM SCHEMATIC

STANDARD DETAIL:	7-317
DATE.: FEB. 2021	REV: 4



ALL INTERNAL PIPING AND PRESSURE REDUCING VALVES (PRV) ARE TO BE SIZED BY A PROFESSIONAL ENGINEER.





BILL OF MATERIALS		
ITEM	QTY	DESCRIPTION
1	1	CLA–VAL PRESSURE REDUCING VALVE
		C/W X101 POSITION INDICATOR
		DI BODY, S.S. TRIM & BOLTS – #150 FLGD
2	2	MUELLER NRS RW
		GATE VALVE C/W HANDWHEEL – #150 FLGD
3	3	SHURJOINT #Z07 Rigid Coupling
4	1	WATER–TIGHT PRECAST CONCRETE VAULT
		EXTERIOR SEALANT
		C/W 75 (3") SPRAY FOAM INSULATION
4A	1	CONCRETE RISER (DEPTH VARIES)
5	1	BILCO TYPE L ROOF SCUTTLE 30"X96"
		300 PSI LOADING (BOLTED ON TOP OF CHAMBER)
	1	CONCRETE 1055 (3151) COLLAR (200MM DEPTH)
6	3	ADJUSTABLE PIPE SUPPORTS
7	1	STRAINER #150 FLG C/W BLOWDOWN
8	2	19 (3/4") HOSE BIB C/W ISOLATION BALL VALVE
9	2	TRANSITION COUPLING
		(SUPPLIED BY OTHERS)
10	2	PIPE SEAL ASSEMBLY PS–400(E) TO SUIT PIPE DIA.
11	2	100 (4") WIKA 213–53–LM PRESSURE GAUGE
		(0–300PSI) C/W ISOLATION BALL VALVE,DUAL UNITS
12	1	MUELLER NRS RW PRESSURE REDUCING VALVE
		C/W X101 POSITION INDICATOR,
		DI BODY, S.S TRIM – #150 FLGD
13	2	NRS RW
		GATE VALVE C/W HANDWHEEL – #150 FLGD
14	2	VICTAULIC COUPLING
15	1	STRAINER #150 FLG C/W BLOWDOWN
16	3	ADJUSTABLE PIPE SUPPORTS
17	1	STAIRS
		(INSTALLED BY CONTRACTOR)
18	1	25 (1") AIR RELEASE VALVE C/W
		ISOLATION BALL VALVE (300 PSI, DUAL UNITS), THRD
19	1	LIBERTY 253–2 SUBMERSIBLE SUMP PUMP#L–L2532
20	2	150 (6") FABRICATED VENT PIPES
21	2	150 (6") PIPE SEAL PS–300(E) FOR VENT PIPES
22	3	LED LIGHTING
23	1	DEXON BLOWER HEATER & VENTILATION SYSTEM
		MODEL MDH4–1 (120/240VAC) 4000WATT
		(SECURED ON SITE BY ELECTRICAL CONTRACTOR)

NOTES:

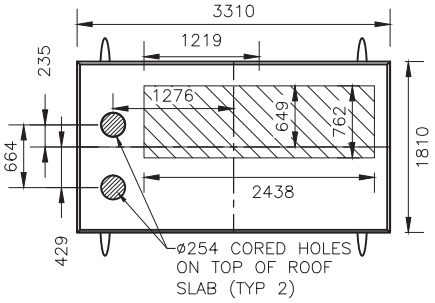
STANDARD FABRICATION & FINISHING SPECIFICATION:

(1) FABRICATED STEEL PIPE & FITTINGS TO BE SCHEDULE NO. 40 304 STAINLESS STEEL PIPE OR 290MPa STEEL 6.35mm THICK(MIN.) INTERNAL AND EXTERNAL COATING TO C213–07 FUSION BONDED EPOXY.
(2) VAULT (H–20 LOADING) INSIDE DIMENSIONS: 3940 L x 3048 w X 1980 H.
(3) ALL 125 / 150 ANSI
(4) ALL SIZES TO BE VERIFIED BY A PROFESSIONAL ENGINEER.
(5) SUMP PUMP DISCHARGE TO BE INCORPORATED INTO THE SITE GRADING BY THE ENGINEER.
(6) TYPICAL DETAIL ONLY, SHOP DRAWINGS REQUIRED TO BE REVIEWED AND APPROVED BY THE MUNICIPALITY PRIOR TO CONSTRUCTION.
(7) FOR SERVICES LARGER THAN 200mm SHOP DRAWINGS REQUIRED TO BE REVIEWED AND APPROVED BY THE MUNICIPALITY PRIOR TO CONSTRUCTION. CONSIDERATION MADE TO ALLOW FOR SUFFICIENT SPACE TO MOVE AROUND THE PIPING AND PERMANENT HANDRAIL WITH SWING GATE AROUND THE HATCH.

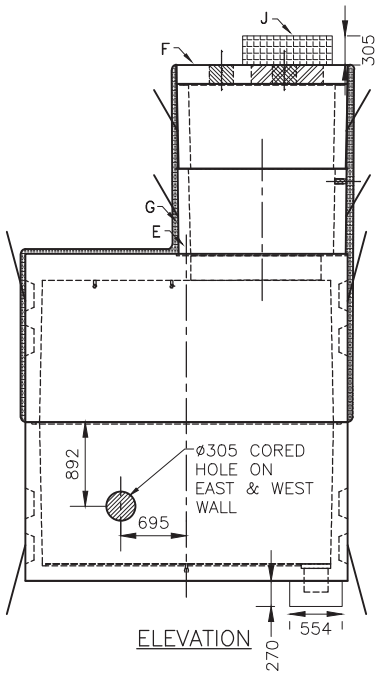
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL UNDERGROUND PRV STATION DETAIL FOR SERVICES 200mm AND UNDER

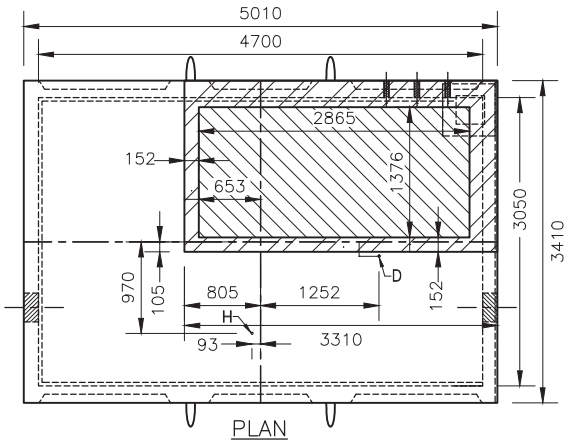
STANDARD DETAIL:	7-318
DATE: OCT 2016	REV: 4



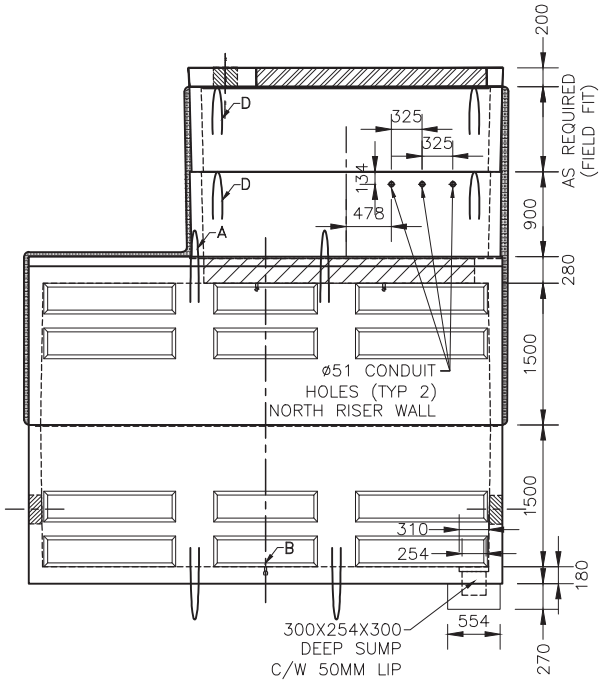
ROOF SLAB



ELEVATION



PLAN



ELEVATION

BILL OF MATERIALS

A) DOUBLE 10Ø X 3050 C.L. LIFTING CABLES THRU SLOT IN FORM (TYP 8) (PROJECT 760)

B) 19Ø SLF INSERT

C) RECESSED 19Ø PVC W/ COUPLER TO INSIDE ** PLUG DRAIN BEFORE SHIPPING **

D) SINGLE 10Ø X 3050 C.L. LIFTING CABLES THRU SLOTS IN FORM (TYP 8) (PROJECT 500)

E) RISER; 1–900MM; 1–VARIES

F) ROOF SLAB COLLAR (200MM DEPTH)

G) CHAMBER INSULATION

H) ø25 LIFTING EYE QTY:2

J) BILCO 30"X96" ROOF SCUTTLE (BOLTED ON TOP OF COLLAR)
INTERNALLY REINFORCED FOR 40PSF LIVE LOAD

CONCRETE MIX#: CHAMBERS
- 35 MPA MIN @ 28 DAYS
- 7.5 MPA MIN STRIPPING/HANDLING STRENGTH
- AIR ENTRAINMENT: 6.5±1.5%

FINISH: FORM & FLOAT

REBAR:
TOP: STD DWG#: VC47–0T–0915–R
BTM: STD DWG#: VC47–10–SUMP–R

COVER:
TOP: 25 TO CORE TOP, 38 TO OUTSIDE WALLS
BTM: 50 TO CORE TOP, 38 TO OUTSIDE WALLS

WEIGHT:
TOP SECTION WGT: 32,000 LB
BOT. SECTION WGT: 50,000 LB

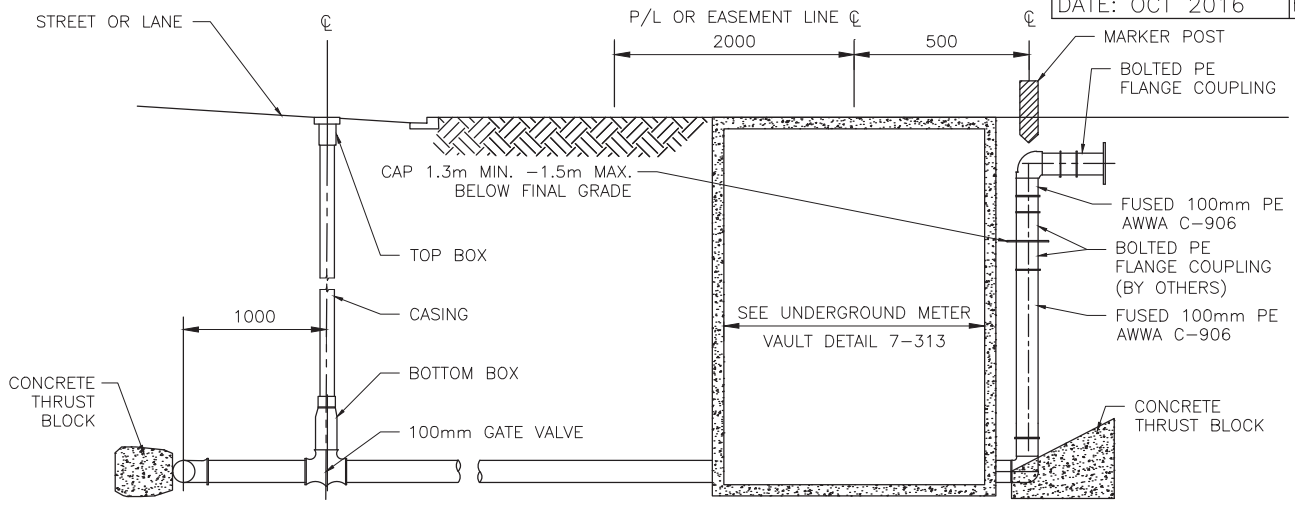
CONCRETE CHAMBER EXTERIOR COATED WITH BLACK CS–55 DAMPPROOFING (BOTTOM ONLY)

CONCRETE WALLS & CEILING COATED WITH WHITE CS–55 TO IMPROVE LIGHTING

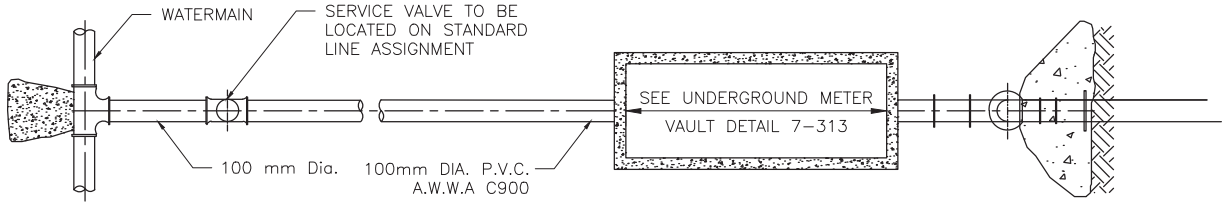
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL UNDERGROUND PRV STATION CONCRETE CHAMBER DETAILS

STANDARD DETAIL:	7- 319
DATE: OCT 2016	REV: 3

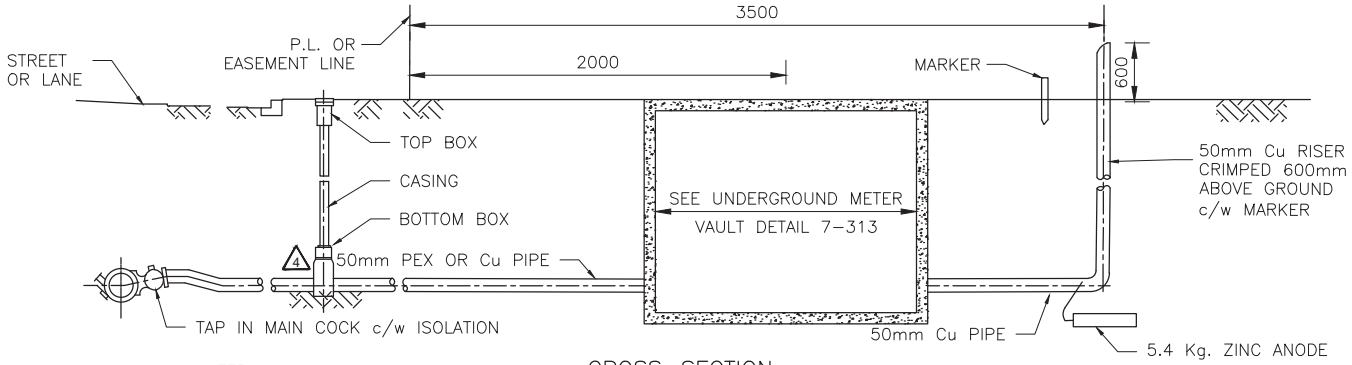


CROSS–SECTION

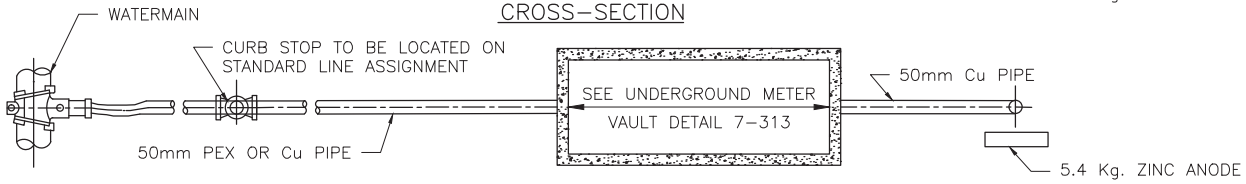


PLAN VIEW

TYPICAL 100mm PARKS WATER SERVICE



CROSS–SECTION



TYPICAL 50mm PARKS WATER SERVICE

NOTE:

(1) CALL PARKS FOR INSPECTION ON PARKS PROPERTY.

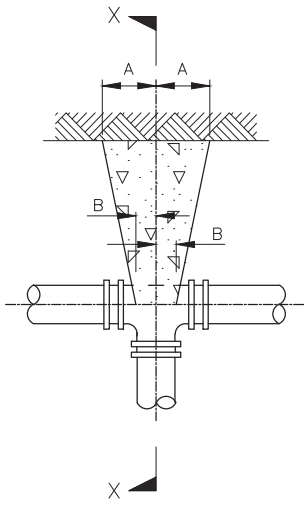
(2) PROVIDE BACK FLOW PREVENTERS ON ALL SERVICE CONNECTIONS.

(3) DIMENSIONS ARE IN MILLIMETERS UNLESS SPECIFIED.

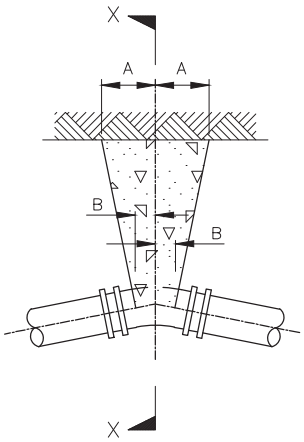
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PARKS WATER SERVICE DETAIL 50 mm AND 100 mm

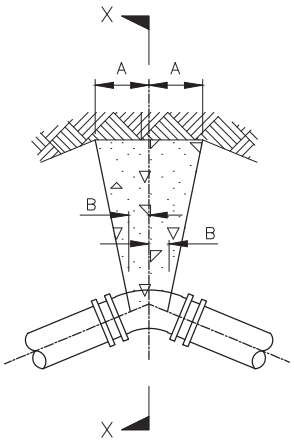
STANDARD DETAIL:	7-400
DATE: OCT 2016	REV: 5



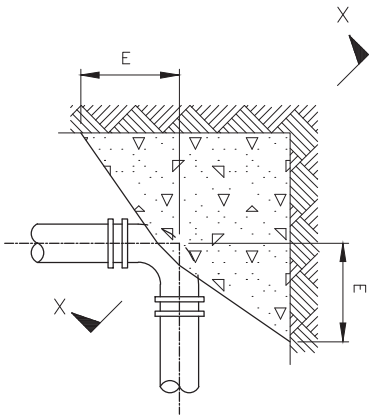
TEE



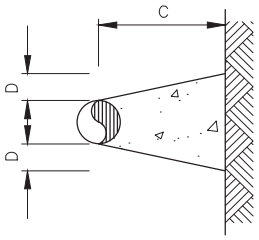
11 1/4° & 22 1/2° BENDS



45° BENDS



90° BENDS



SECTION X–X

PIPE SIZE mm	MINIMUM DIMENSIONS IN mm'S															
	TEE				11 1/4° & 22 1/2° BENDS				45° BEND				90° BEND			
	A	B	C	D	A	B	C	D	A	B	C	D	C	D	E	
150	150	75	450	75	150	75	450	75	225	75	425	75	350	75	300	
200	200	125	550	75	225	100	550	100	225	100	550	100	550	100	350	
250	250	175	600	75	300	125	600	125	300	125	600	125	600	125	400	
300	300	225	750	75	375	150	750	150	375	150	750	150	750	150	600	
400	450	300	850	75	500	225	850	150	500	225	825	150	975	150	600	
450	550	350	900	100	550	275	900	275	600	275	900	175				
600	600	450	1075	150	750	375	1075	300	750	375	1050	300				
750	750	600	1200	175	900	450	1200	375	900	450	1200					

NOTES:

(1) ALL CONCRETE TO BE TYPE HS 30 MPa COMPRESSIVE STRENGTH AFTER 28 DAYS.

(2) ALL CONCRETE TO BEAR AGAINST UNDISTURBED TRENCH WALL.

(3) DIMENSIONS ARE INADEQUATE WHERE TEST PRESSURE EXCEEDS 1050 kPa.

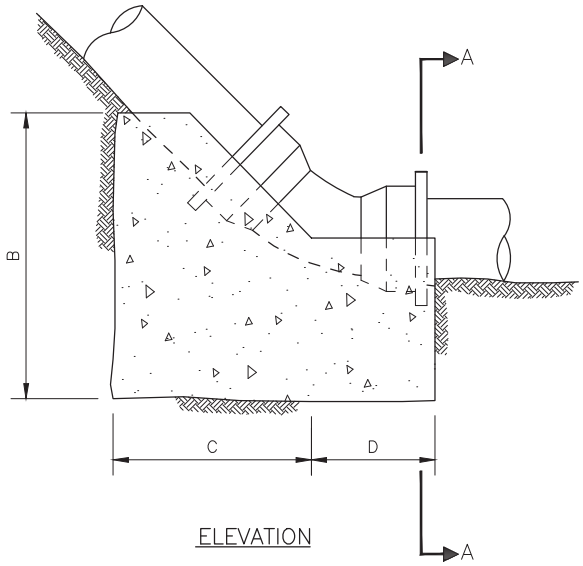
(4) BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

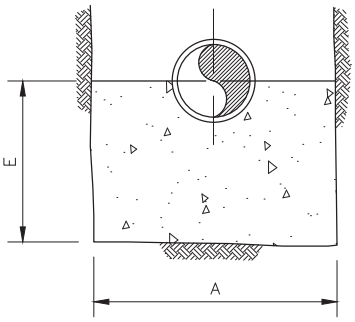
POURED CONCRETE THRUST BLOCKS FOR HORIZONTAL TEES AND BENDS

Time: 2:17pm
Date: Oct 26, 2016
File: P:\2015\3455\00_Engineering_Serv\Working_Dwgs\100_Civil\3455-7-400.dwg by
Xrefs: RMWB_Detail3

STANDARD DETAIL:	7-401
DATE: OCT 2016	REV: 5



ELEVATION



SECTION A–A

MINIMUM DIMENSIONS IN mm's										
PIPE SIZE mm	45° ELBOWS					22 1/2° & 11 1/4° ELBOWS				
	A	B	C	D	E	A	B	C	D	E
100	600	600	375	300	375	600	450	375	300	375
150	600	600	375	300	375	600	450	375	300	375
200	600	600	375	300	375	600	450	375	300	375
250	750	900	450	375	450	750	525	450	375	450
300	900	1050	750	450	600	900	675	525	450	600
400	900	1050	750	450	600	900	675	525	450	600

NOTES:

(1) ALL CONCRETE TO BE TYPE HS 30 MPa COMPRESSIVE STRENGTH AFTER 28 DAYS.

(2) ALL CONCRETE TO BEAR AGAINST UNDISTURBED TRENCH WALL.

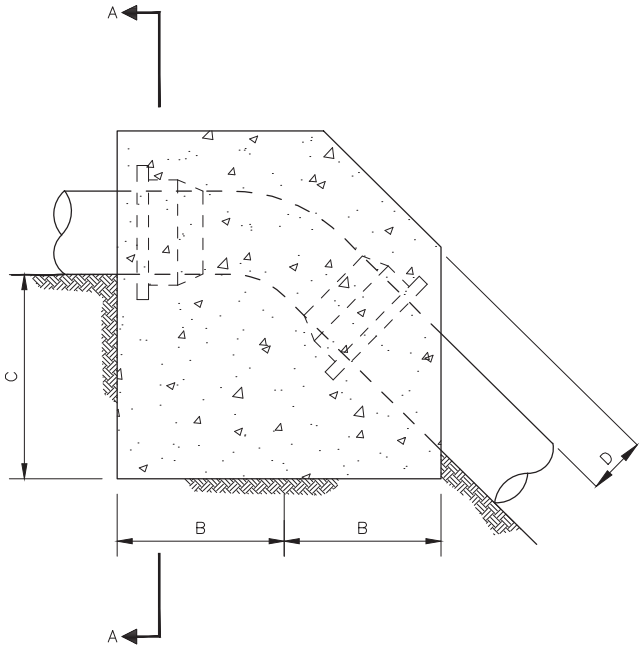
(3) DIMENSIONS ARE INADEQUATE WHERE TEST PRESSURE EXCEEDS 1050 kPa.

(4) BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS.

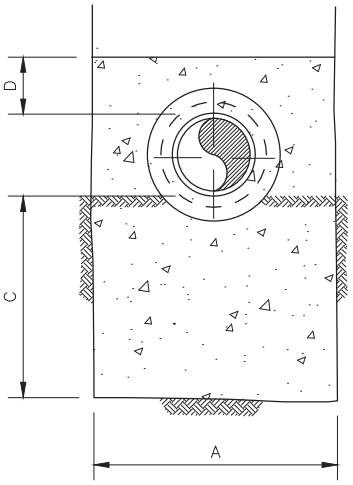
REGIONAL MUNICIPALITY OF WOOD BUFFALO

POURED CONCRETE THRUST BLOCKS FOR VERTICAL BENDS (DOWNWARD THRUST)

STANDARD DETAIL:	7-402
DATE: OCT 2016	REV: 5



ELEVATION



SECTION A–A

MINIMUM DIMENSIONS IN mm's								
PIPE SIZE mm	45° ELBOWS				22 1/2° & 11 1/4° ELBOWS			
	A	B	C	D	A	B	C	D
100	300	600	500	225	300	600	375	225
150	300	600	500	225	300	600	375	225
200	375	600	500	250	300	600	375	250
250	450	750	600	300	375	750	450	300
300	600	900	900	375	525	900	750	375
400	600	900	900	450	525	900	750	450

NOTES:

(1) ALL CONCRETE TO BE TYPE HS 30 MPa COMPRESSIVE STRENGTH AFTER 28 DAYS.

(2) ALL CONCRETE TO BEAR AGAINST UNDISTURBED TRENCH WALL.

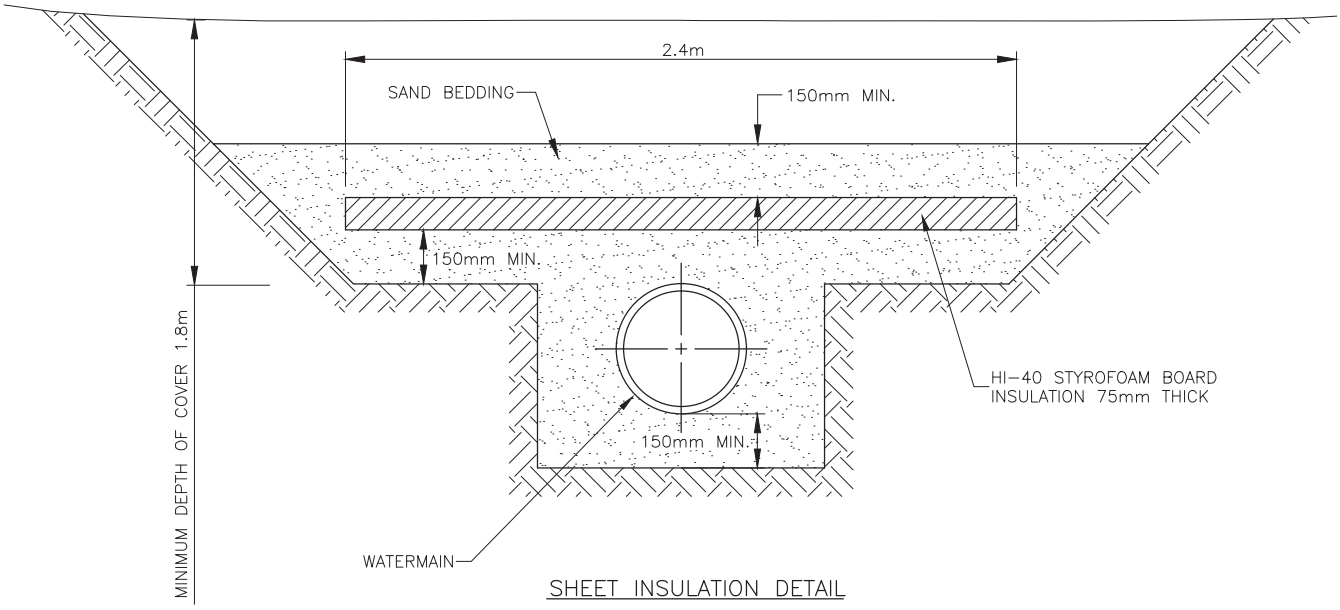
(3) DIMENSIONS ARE INADEQUATE WHERE TEST PRESSURE EXCEEDS 1050 kPa.

(4) BOND BREAKER TO BE USED BETWEEN CONCRETE AND FITTINGS.

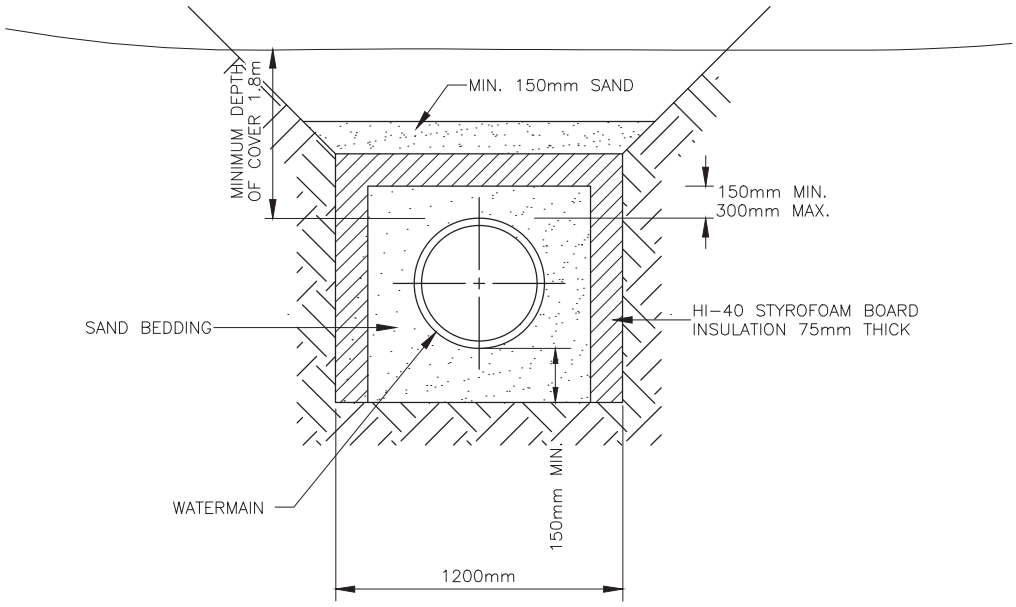
REGIONAL MUNICIPALITY OF WOOD BUFFALO

POURED CONCRETE THRUST BLOCKS FOR VERTICAL BENDS (UPWARD THRUST)

STANDARD DETAIL:	7-500
DATE: OCT 2016	REV: 5



SHEET INSULATION DETAIL



BOX INSULATION DETAIL

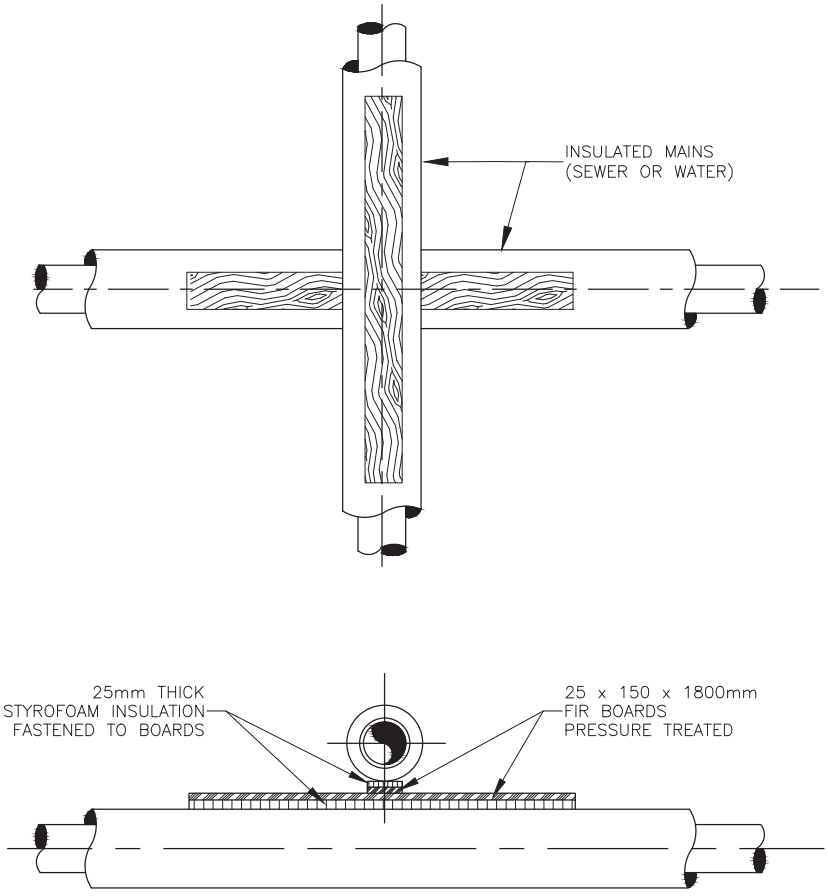
NOTES:

(1) THE ABOVE ARE MINIMUMS ONLY. THE DESIGNER IS RESPONSIBLE TO DESIGN HEAT LOSS REQUIREMENTS AND INCREASE INSULATION REQUIREMENTS AS NECESSARY.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL INSULATION DETAILS FOR PIPES

STANDARD DETAIL:	7-501
DATE: OCT 2016	REV: 5



CROSSING MAINS

NOTES:

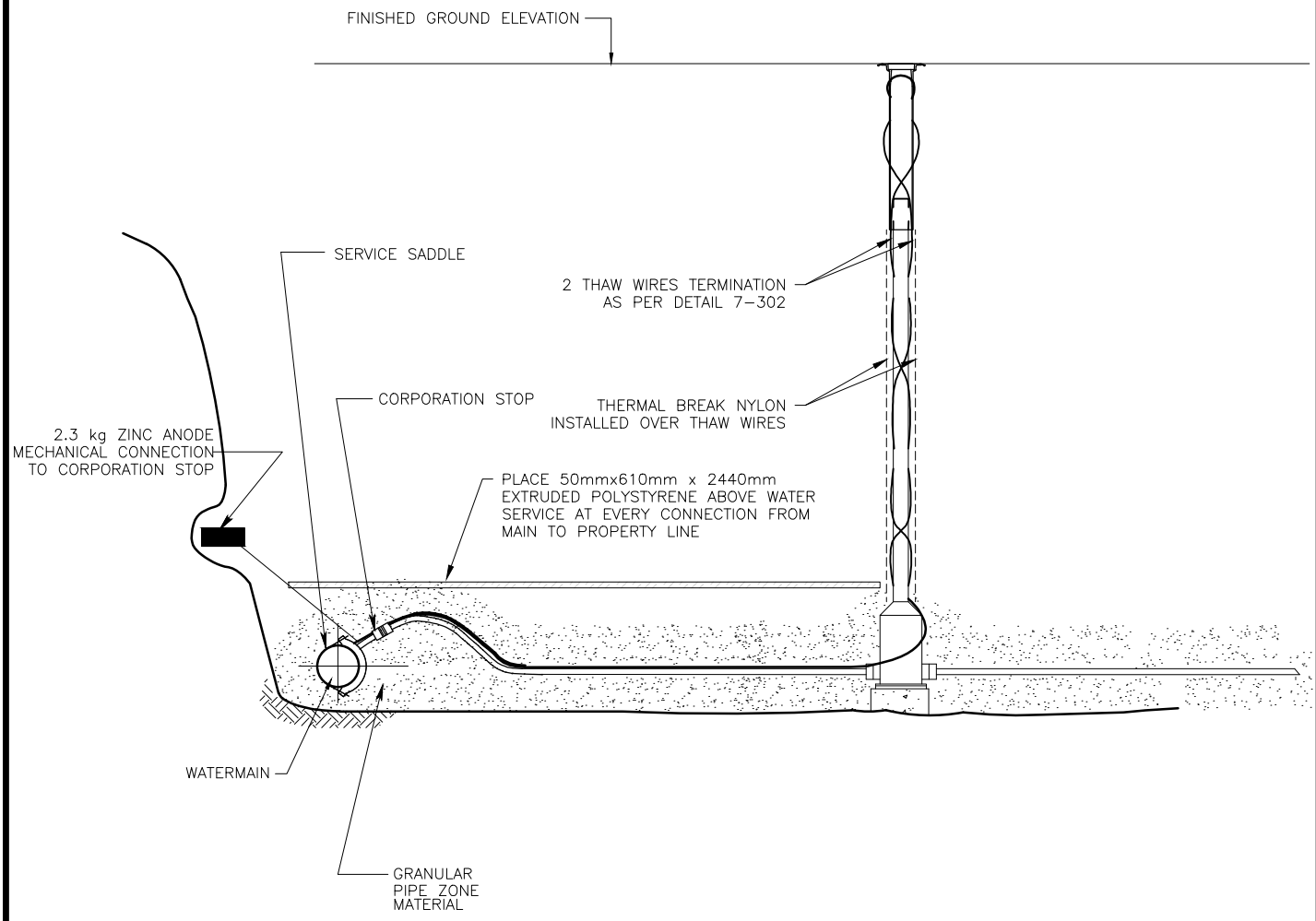
(1) PIPE JOINTS ON LOWER MAIN TO BE LOCATED 1500, 2000, 2750mm FROM THE CROSSING DEPENDING ON THE TYPE OF PIPE USED, EXCEPT FITTING JOINTS MAY BE LOCATED WHERE REQUIRED.

(2) IF THE UPPER PIPE IS A WATERMAIN DO NOT LOCATE ANY VALVES OR HYDRANTS WITHIN 3.0m OF THIS CROSSING.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

INSULATED PIPE CROSSING

STANDARD DETAIL:	7-502
DATE: MAR. 2021	REV: 0



NOTES:

(1) SERVICES DETAILS AS PER 7-300

(2) INSTALL TO MAX DEPTH TO ENSURE COVER, 3.0m.

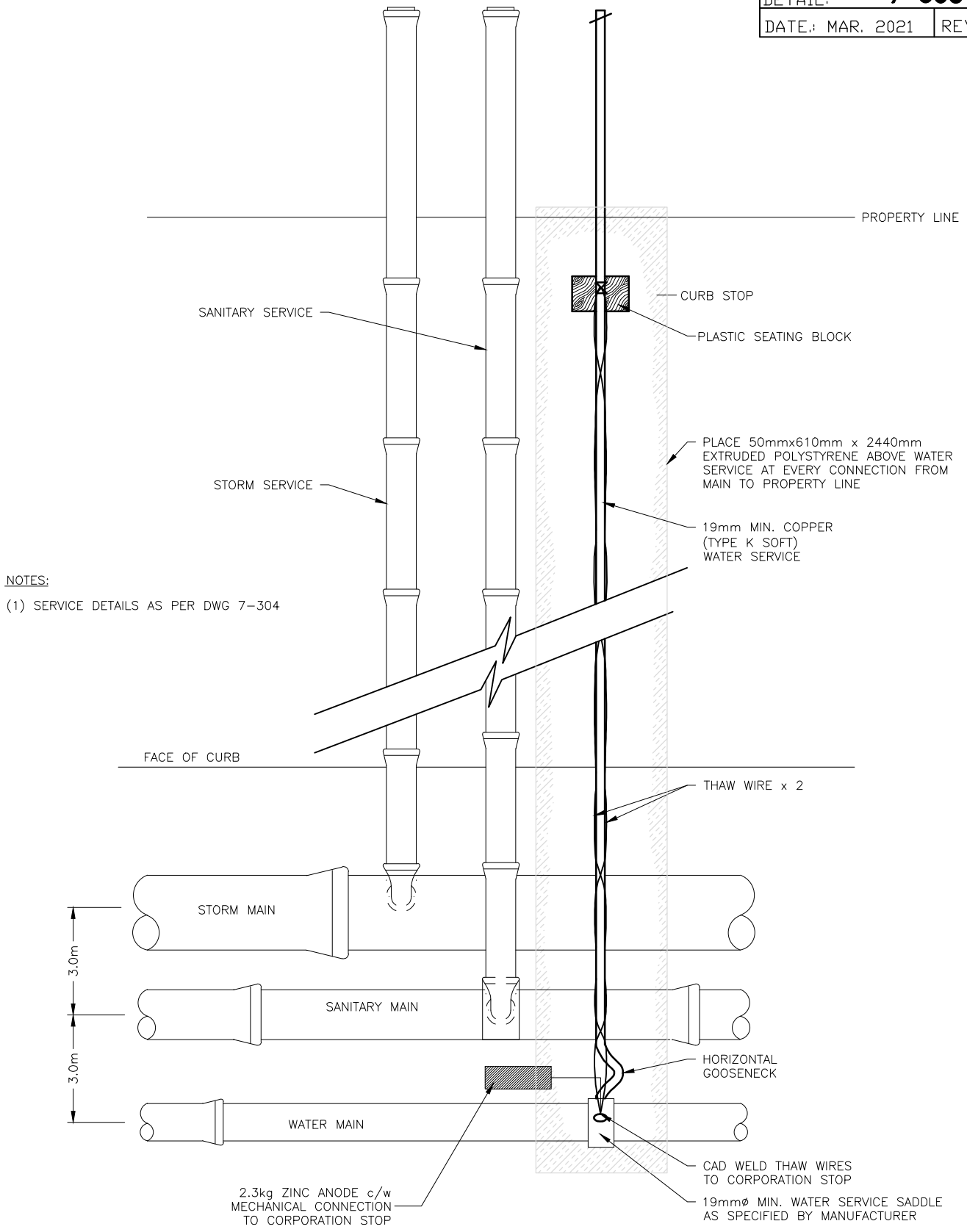
(3) APPLY THIN LAYER OF BACKFILL PRIOR TO INSTALLING INSULATION LAYER

(4) INSTALL POLYSTYRENE ABOVE WATER SERVICE FROM MAIN TO PROPERTY LINE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

INSULATED WATER SERVICE CONNECTION

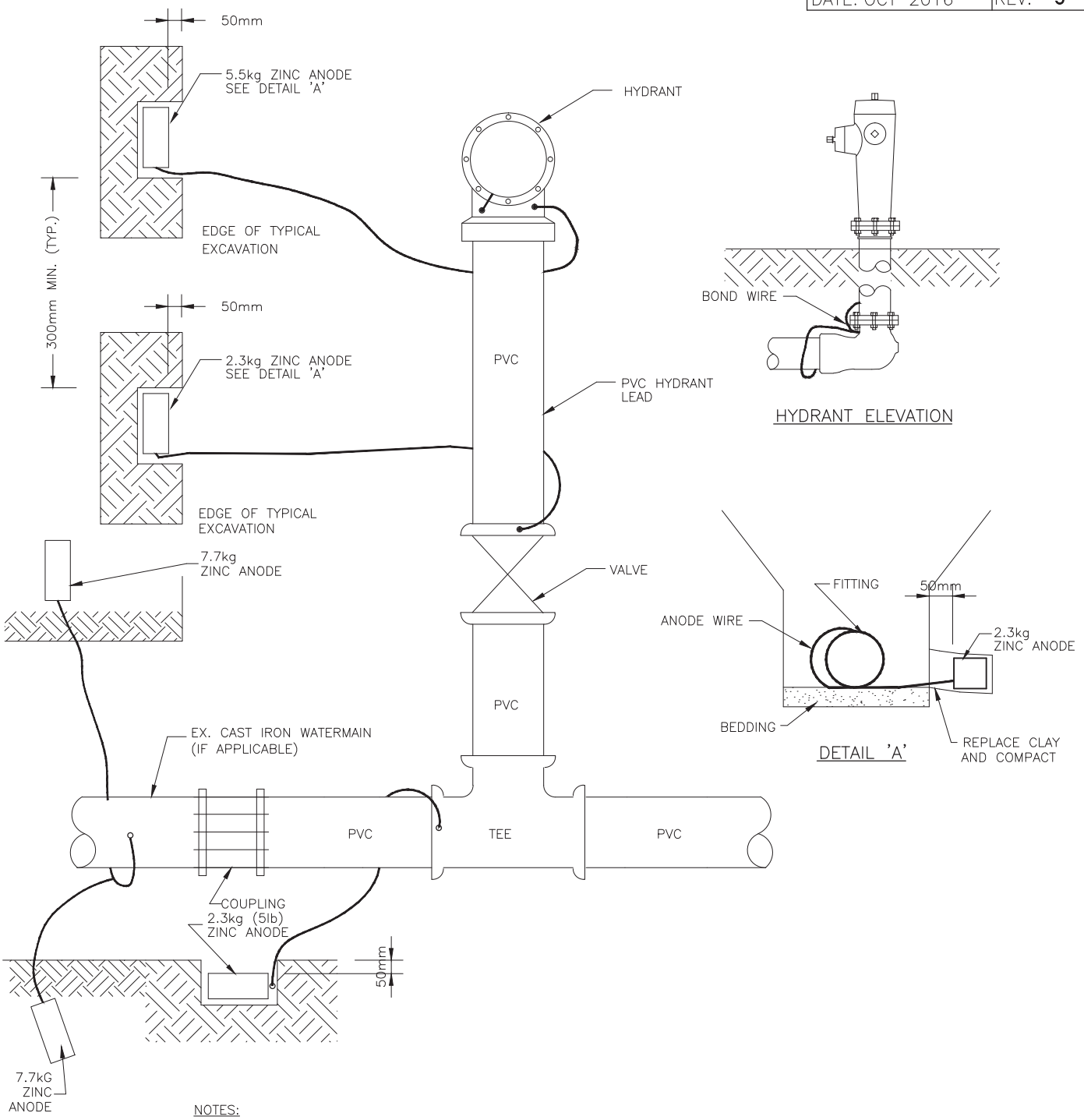
STANDARD DETAIL:	7-503
DATE: MAR. 2021	REV: 0



REGIONAL MUNICIPALITY OF WOOD BUFFALO

INSULATED WATER SERVICE CONNECTION - PLAN VIEW

STANDARD DETAIL:	7-600
DATE: OCT 2016	REV: 5



NOTES:

(1) MINIMUM DISTANCE FROM ANODE TO PIPE, FITTING, VALVE, OR HYDRANT IS 150mm.

(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 50mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.

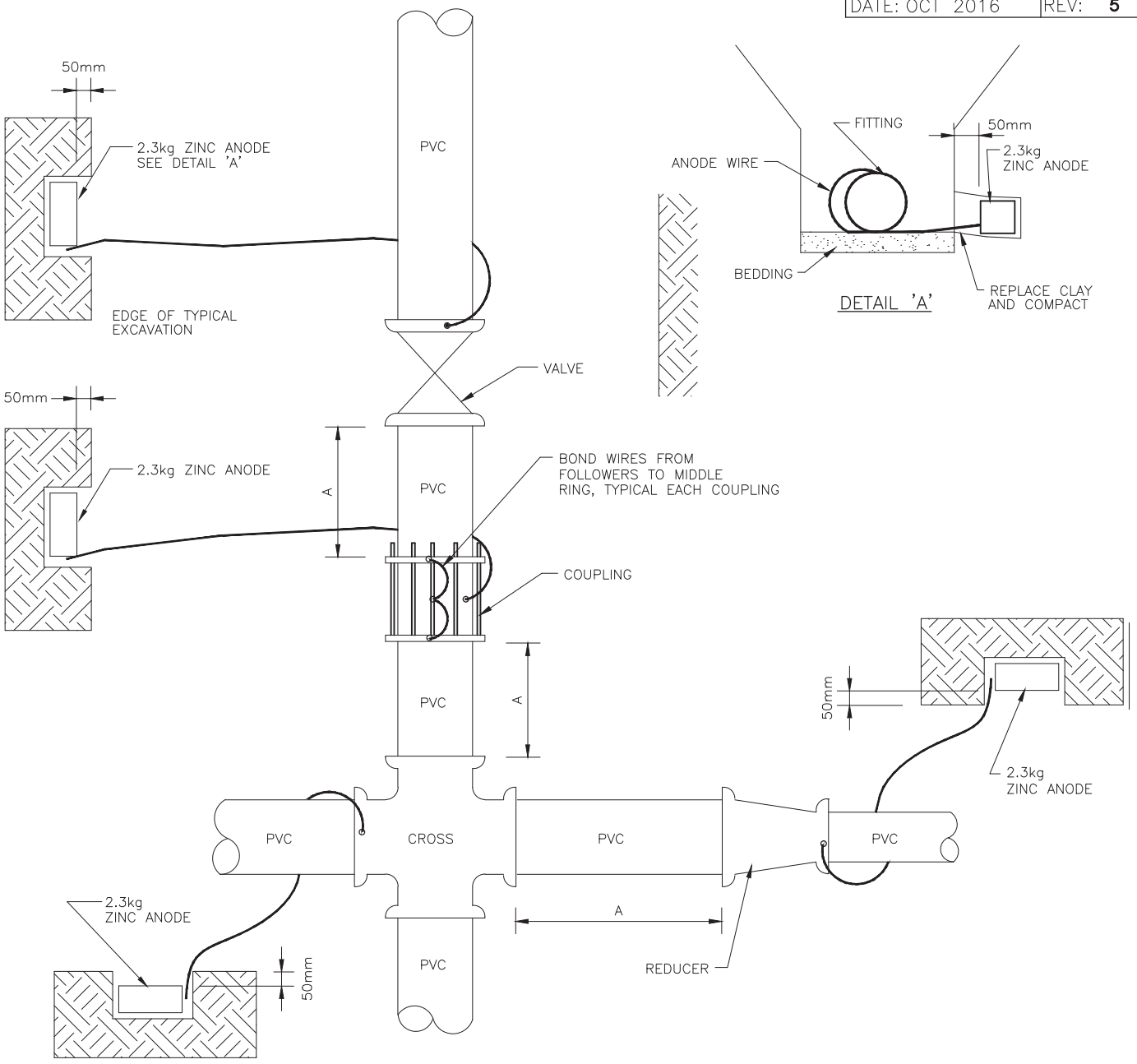
(4) ANODES TO BE AT LEAST 300mm CLEAR OF THRUST BLOCK.

(5) 5.5kg ANODE TO BE PROVIDED FOR MAINSTOP CLAMP ON SERVICE LINE 1000mm FROM MAINSTOP.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

ANODE INSTALLATION AT HYDRANT

STANDARD DETAIL:	7-601
DATE: OCT 2016	REV: 5



NOTES:

(1) MINIMUM DISTANCE FROM ANODE TO PIPE, FITTING, VALVE OR HYDRANT IS 150mm.

(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 2.3kg.

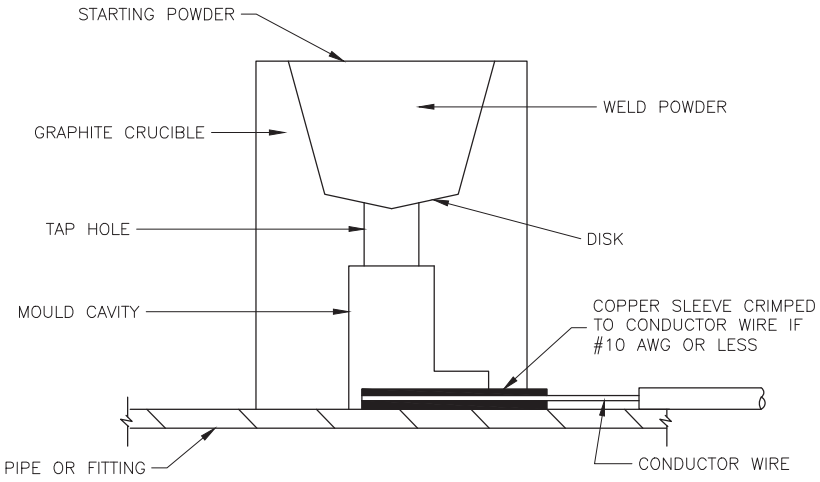
(5) ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.

(6) ANODES TO BE AT LEAST 300mm CLEAR OF THRUST BLOCK.

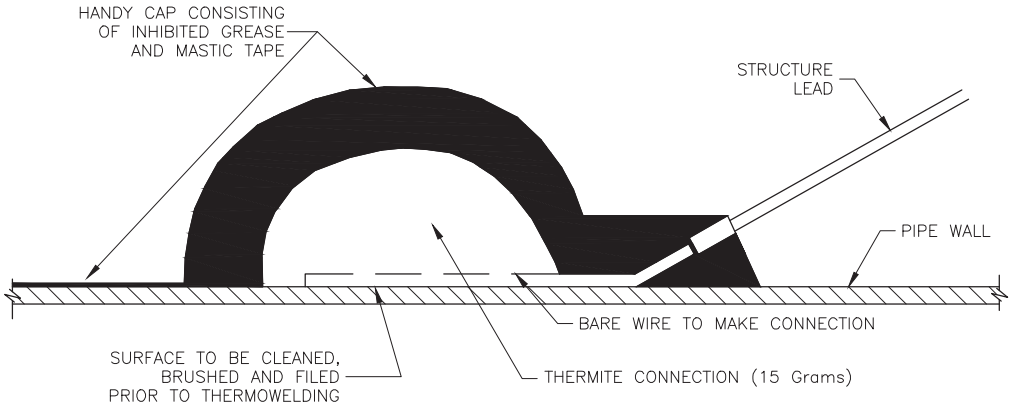
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL ANODE INSTALLATION FOR IRON FITTINGS USED WITH PVC WATER MAINS

STANDARD DETAIL:	7-604
DATE: OCT 2016	REV: 5



WELDING OF TERMINATED CONDUCTOR WIRE

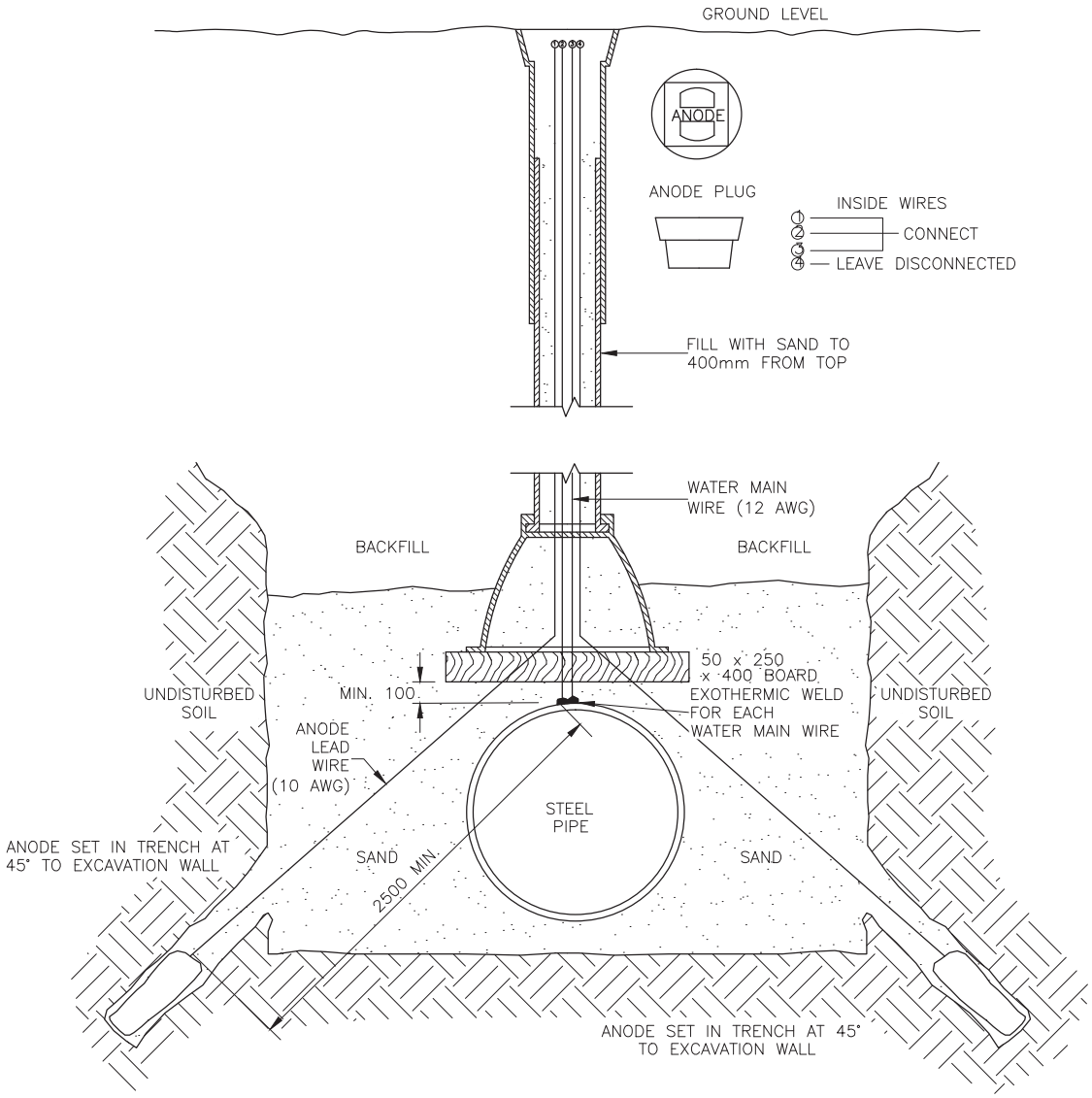


DETAIL 2

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL CAP WELD CONNECTION

STANDARD DETAIL:	7-606
DATE: OCT 2016	REV: 5



NOTES:

(1) ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SPECIFIED.

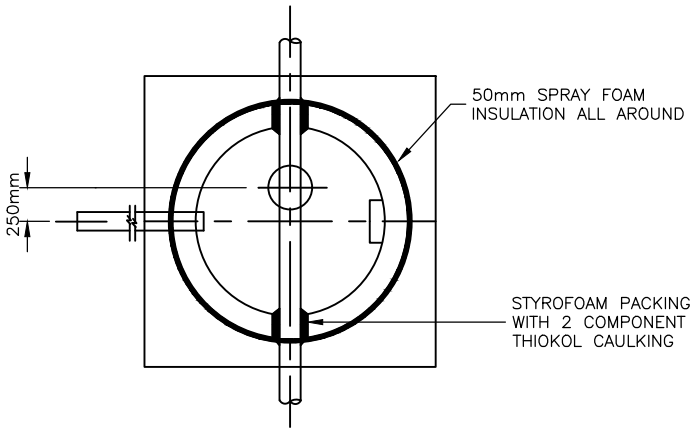
(2) NEW STEEL MAINS – INSTALLATION OF A THIRD ANODE TO BE SET IN TRENCH AT 45° TO EXCAVATION WALL AND A MINIMUM 3.0m CLEARANCE BETWEEN ANODES.

(3) NUMBER, SPACING, TYPE AND WEIGHT OF ANODES TO BE DETERMINED BY ENGINEER.

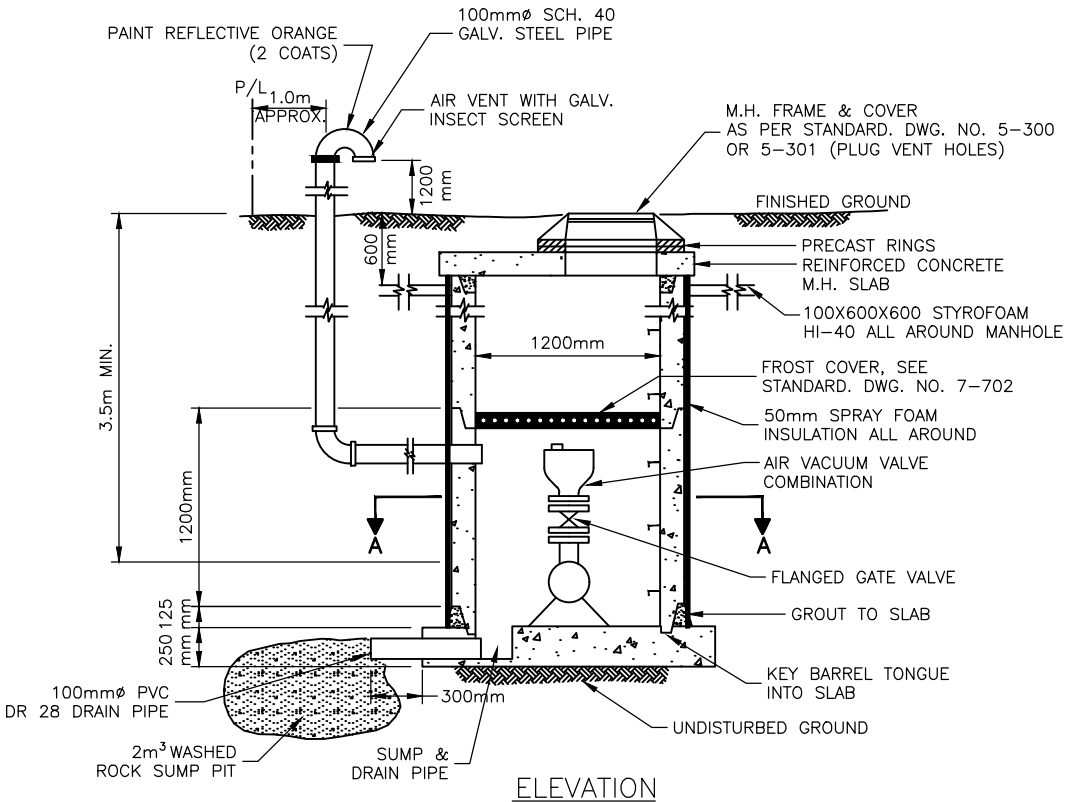
REGIONAL MUNICIPALITY OF WOOD BUFFALO

ANODE INSTALLATION FOR STEEL WATER MAINS

STANDARD DETAIL:	7-700
DATE: JAN. 2021	REV: 6



PLAN A–A



ELEVATION

NOTE:

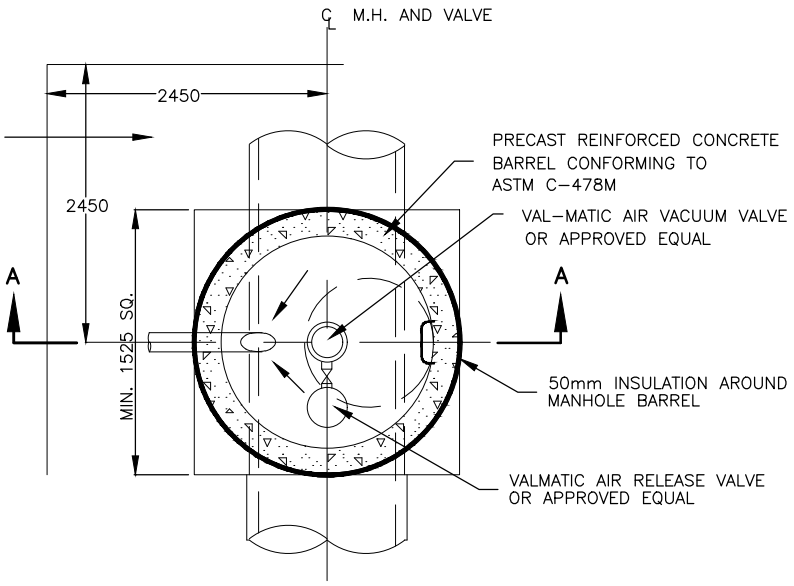
(1) IN AREAS OF HIGH WATER TABLE, SUMP ONLY NO DRAIN PIPE NOR ROCK SUMP PIT.
(2) REFER TO SETION 7.12 CHAMBER DRAINAGE FOR ADDITIONAL INFORMATION TO WATERPROOFING CHAMBERS AND FOR CHAMBERS WITHIN 2m OF WATER TABLE.
(3) INSTALL 50mm INSULATION AROUND CONCRETE BARREL.
(4) DETAIL IS A GUIDELINE ONLY, SHOP DRAWINGS REQUIRED TO BE SUBMITTED AND APPROVED BY THE MUNCIPALITY PRIOR TO CONSTRUCTION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

AIR VACUUM ASSEMBLY

Time: 9:00am
Date: Feb 08, 2021
File: \\Cd1044-f06\work_group\1161\active\116110892O\drawing\sheet_files\figures\Section 7\3658-7-700s.dwg by
Xrefs:

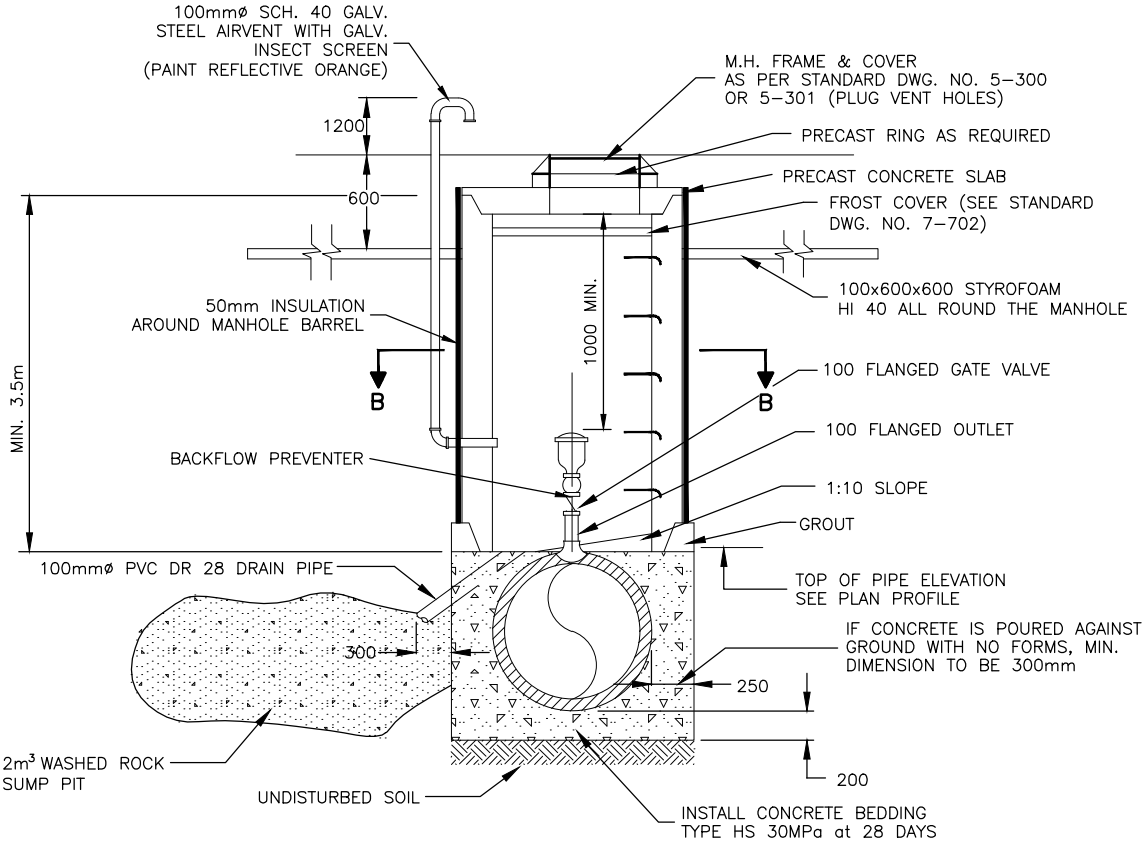
STANDARD DETAIL:	7-701
DATE: JAN. 2021	REV: 6



PLAN B-B

NOTES:

(1) FOR AIR RELEASE MANHOLE, THE DIAMETER OF THE BARREL SHALL BE 1200mm AND NO DRAIN PIPE IS REQUIRED.
(2) ALL AIR RELEASE VALVE OUTLETS SHALL BE ATTACHED WITH A SECTION OF PIPE BENT DOWNWARDS.
(3) INSTALLATION NOT SUITABLE IF NOT LOCATED 2m ABOVE WATER TABLE.
(4) THE AIR VACUUM AND AIR RELEASE VALVE MAY BE REPLACED WITH A COMBINATION AIR AND VACUUM VALVE.
(5) REFER TO SECTION 7.12 CHAMBER DRAINAGE FOR ADDITIONAL INFORMATION TO WATERPROOFING CHAMBERS AND FOR CHAMBERS WITHIN 2m OF WATER TABLE.
(6) INSTALL 50mm INSULATION AROUND CONCRETE BARREL.
(7) DETAIL IS A GUIDELINE ONLY, SHOP DRAWINGS REQUIRED TO BE SUBMITTED AND APPROVED BY THE MUNICIPALITY PRIOR TO CONSTRUCTION.



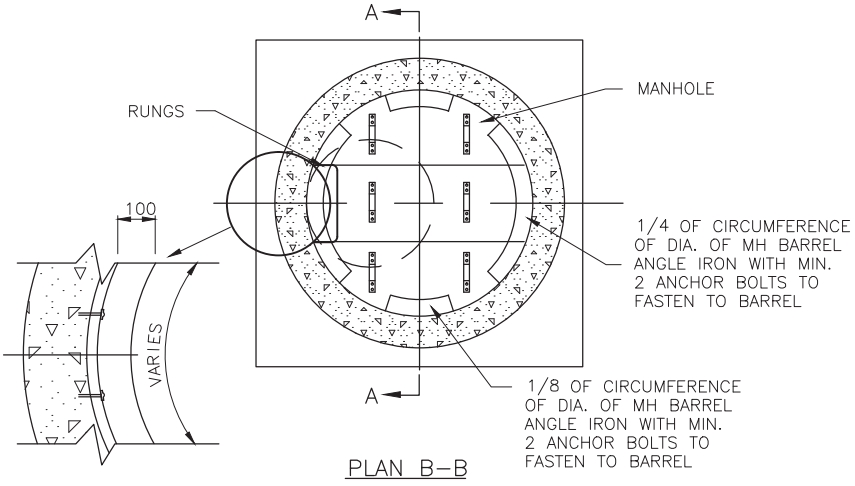
SECTION A-A

REGIONAL MUNICIPALITY OF WOOD BUFFALO

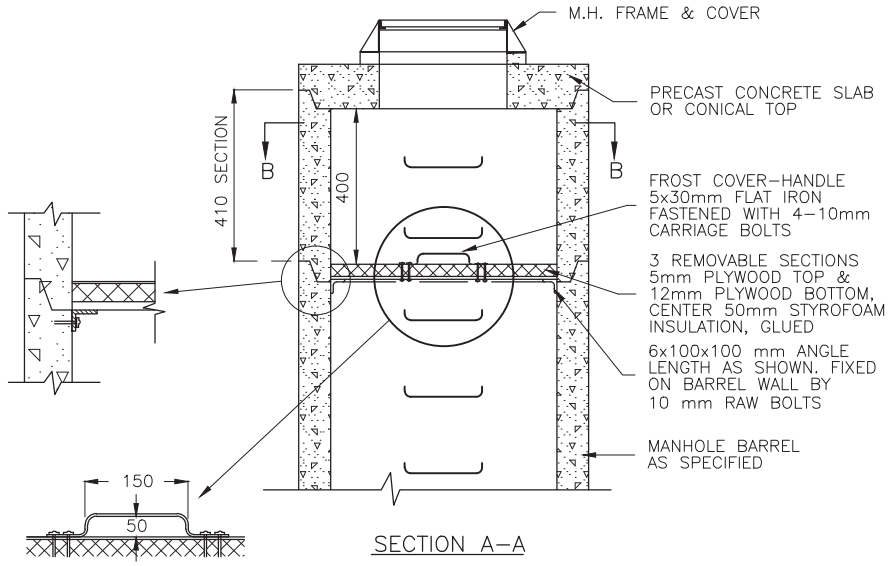
AIR VACUUM AND AIR RELEASE VALVE CHAMBER DETAIL

Time: 8:48am
Date: Feb 08, 2021
File: \\Cd1044-f06\work_group\1161\active\116110892O\drawing\sheet_files\figures\Section 7\3658-7-700s.dwg by
Xrefs:

STANDARD DETAIL:	7-702
DATE: OCT 2016	REV: 5



PLAN B–B



SECTION A–A

FROST COVER–HANDLE

NOTES:

(1) ALL METAL PARTS IN MANHOLE TO BE PRIMED AND PAINTED.

(2) USE EPOXY TYPE ANCHOR BOLTS TO FASTEN TO BARREL.

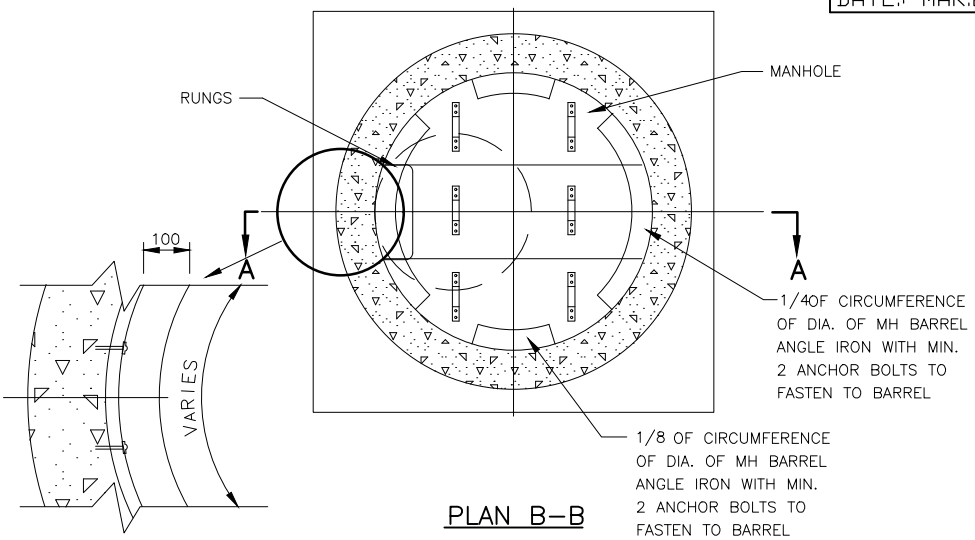
(3) FABRICATE ANGLE TO SUIT BARREL RADIUS.

(4) INSTALL COVER IMMEDIATELY ABOVE VALVES.

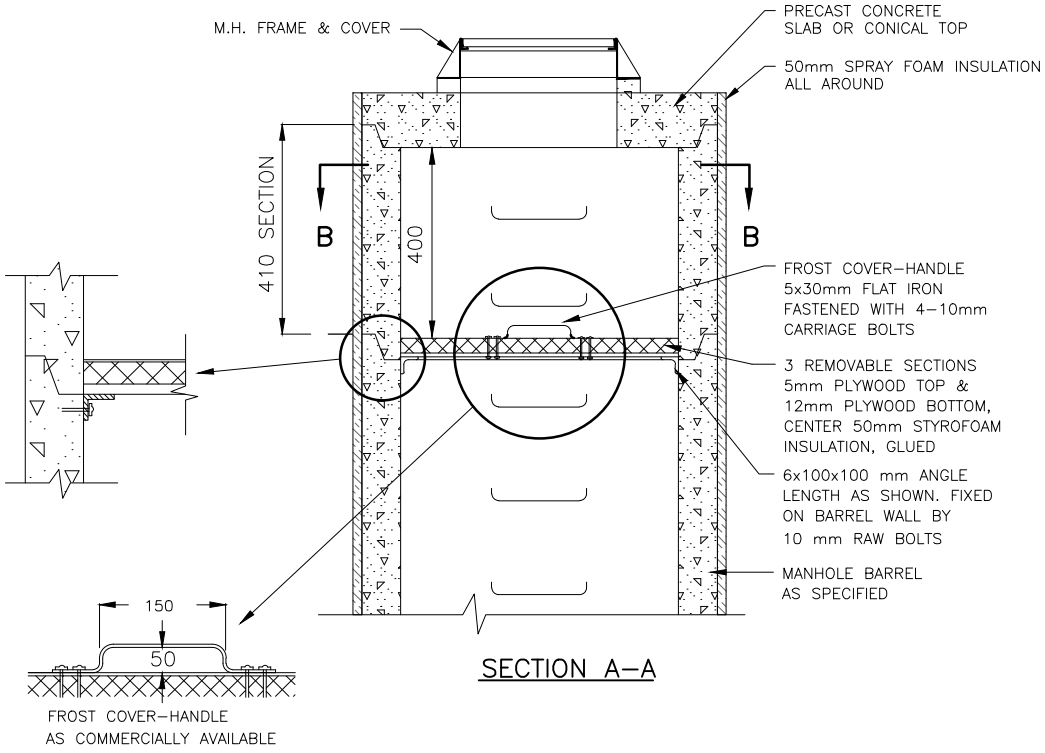
REGIONAL MUNICIPALITY OF WOOD BUFFALO

FROST COVER DETAIL FOR VALVE CHAMBERS

STANDARD DETAIL:	7-703
DATE: MAR.2021	REV: 0



PLAN B–B



SECTION A–A

NOTES:

(1) ALL METAL PARTS IN MANHOLE TO BE PRIMED AND PAINTED.

(2) USE EPOXY ANCHOR BOLTS TO FASTEN TO BARREL.

(3) FABRICATE ANGLE TO SUIT BARREL RADIUS.

(4) INSTALL COVER IMMEDIATELY ABOVE VALVES.

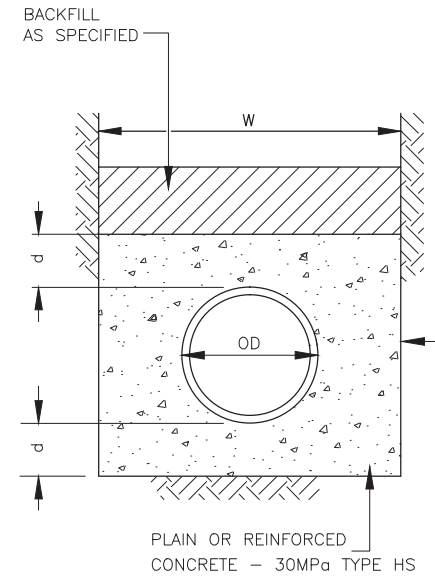
(5) THIS DETAIL TO BE SPECIFIED IN SITUATIONS WHERE THERE IS A HIGHER RISK OF THE WATER SYSTEM FREEZING.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

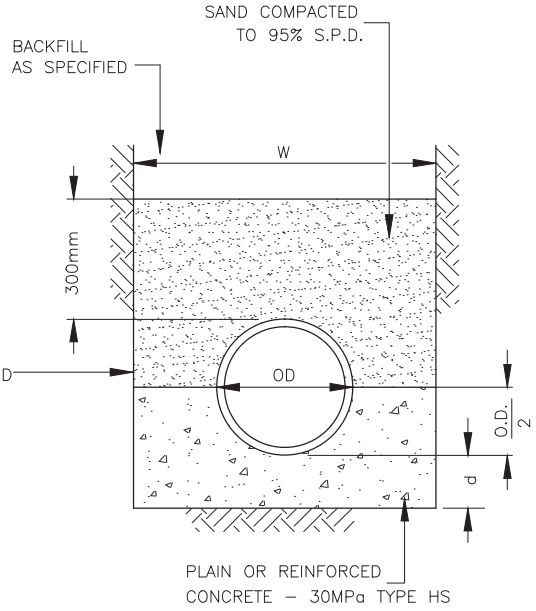
ENHANCED FROST COVER DETAIL FOR VALVE CHAMBERS

Time: 2:26pm
Date: Mar 17, 2021
File: V:\1161\active\116110892O\drawing sheet_files\figures\Section 7\3658-7-703a.dwg by
Xrefs:

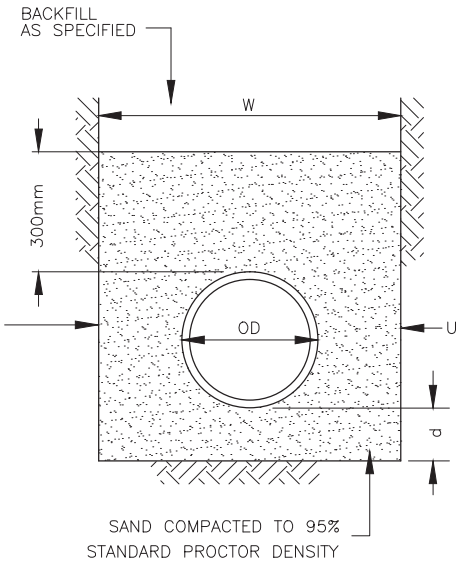
STANDARD DETAIL:	7-800
DATE: OCT 2016	REV: 5



CLASS A



CLASS A–1



CLASS B

PIPE SIZE	d MIN.(mm)
675mm OR SMALLER	75
750mm TO 1500mm	100
1650mm AND LARGER	150
W MIN.	2 X OD

LEGEND:

d = DEPTH OF BEDDING MATERIAL BELOW PIPE
W = TRENCH WIDTH.
OD = OUTSIDE DIAMETER OF PIPE

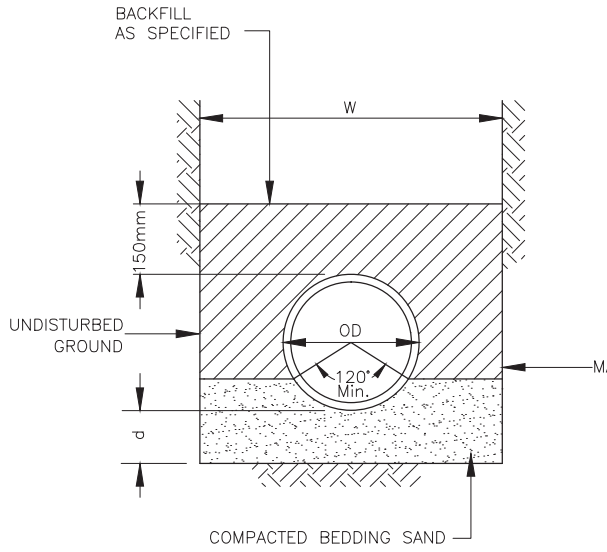
NOTES:

(1) ADD 100mm TO d IN ROCK EXCAVATION.

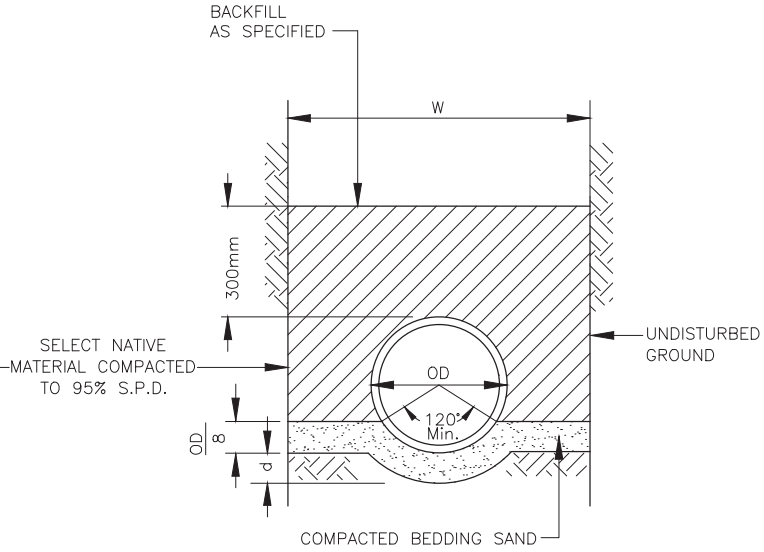
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE ZONE BEDDING DETAILS (CLASS A, A-1, B)

STANDARD DETAIL:	7-801
DATE: OCT 2016	REV: 5

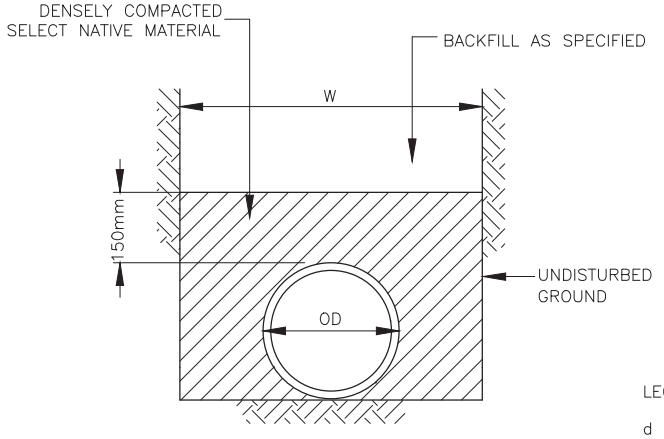


CLASS C



CLASS C–1

ALTERNATE– 375mm I.D. OR SMALLER



CLASS D

PIPE SIZE	d MIN.(mm)
675mm OR SMALLER	75
750mm TO 1500mm	100
1650mm AND LARGER	150
W MIN.	2 x OD

LEGEND:

d = DEPTH OF BEDDING MATERIAL BELOW PIPE
W = TRENCH WIDTH.
OD = OUTSIDE DIAMETER OF PIPE

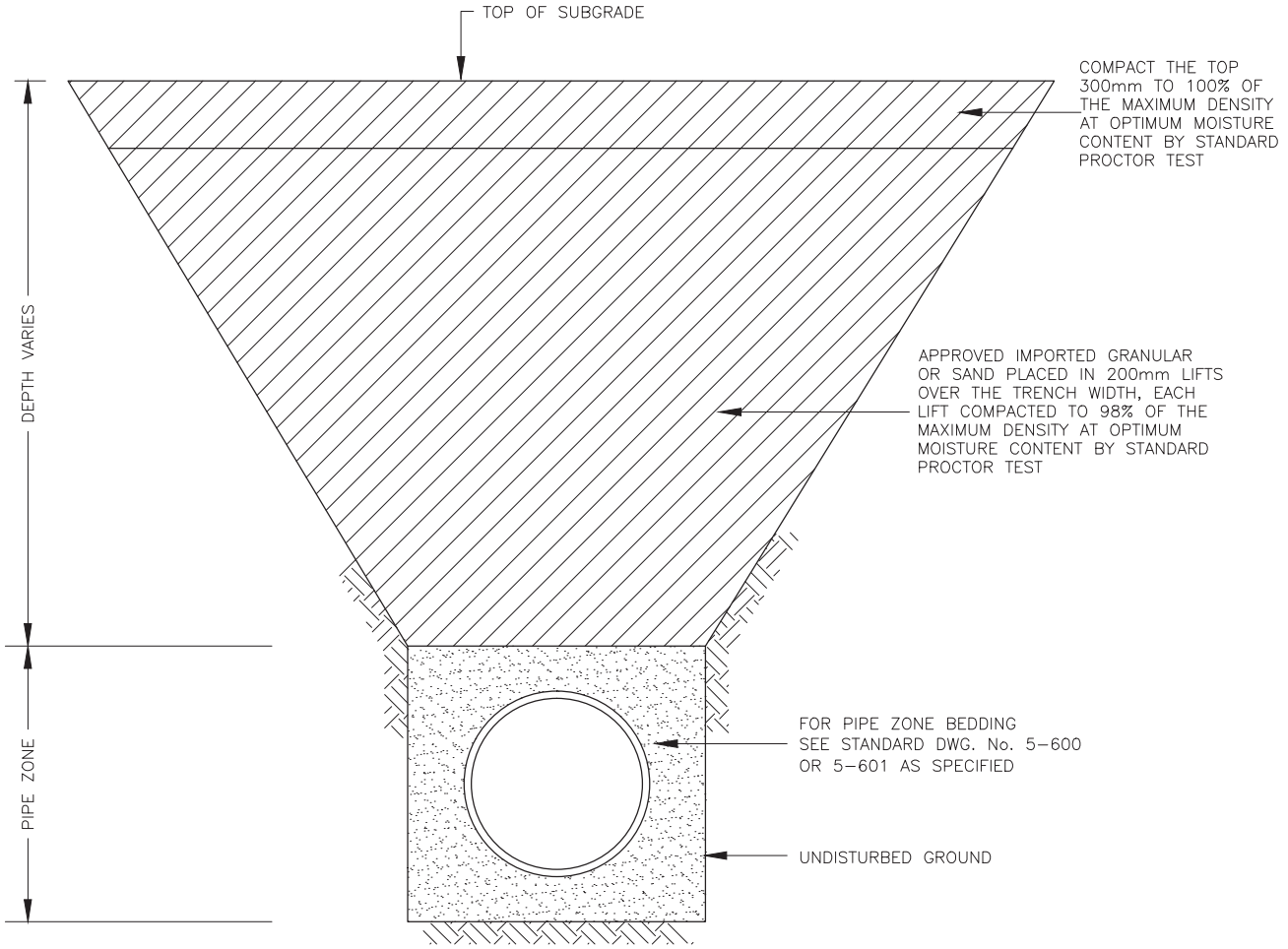
NOTES:

(1) ADD 100mm TO d IN ROCK EXCAVATION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE ZONE BEDDING DETAILS (CLASS C, C-1, D)

STANDARD DETAIL:	7-850
DATE: OCT 2016	REV: 5



NOTES:

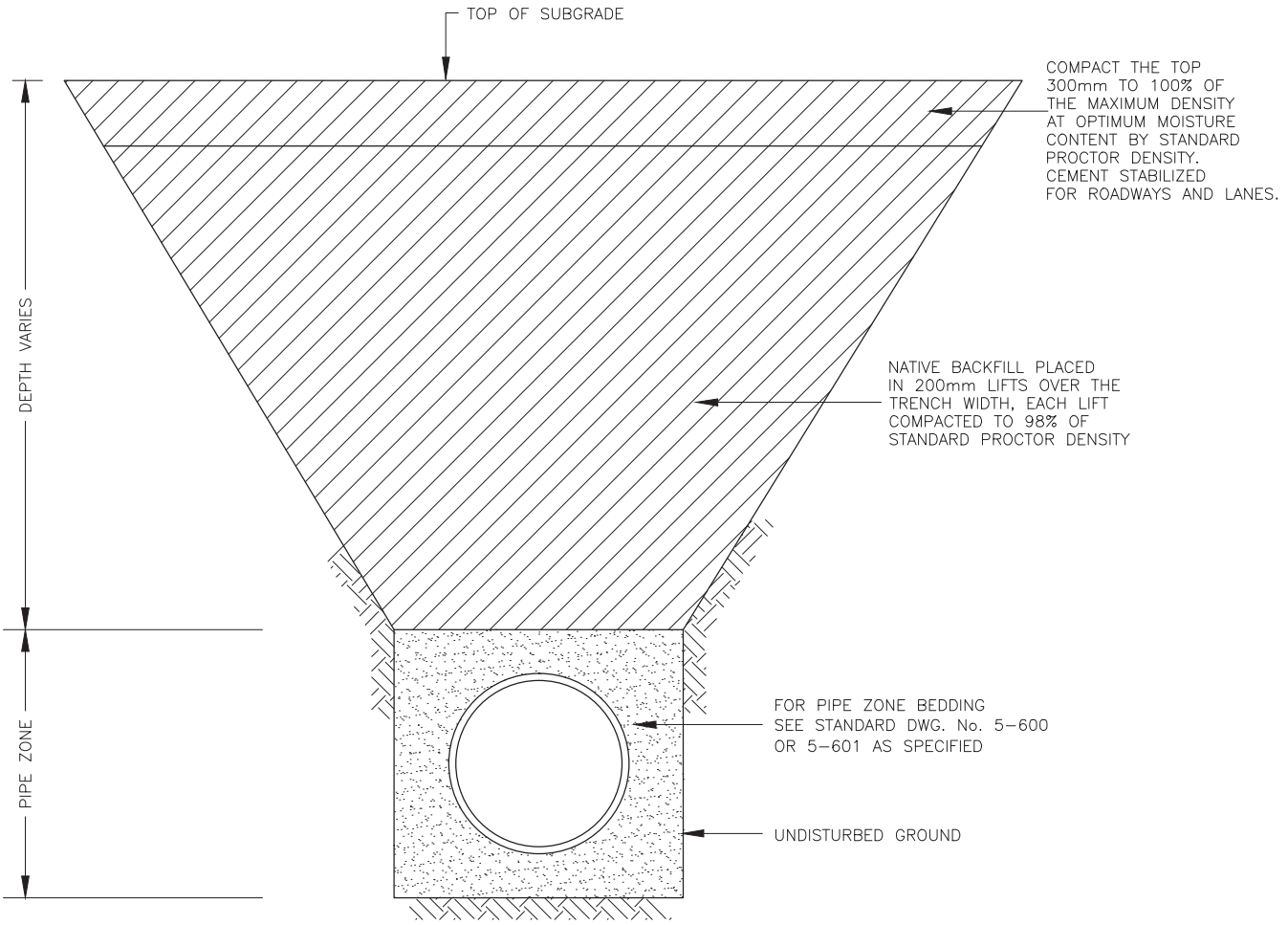
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS I TRENCH BACKFILL

STANDARD DETAIL:	7-851
DATE: OCT 2016	REV: 5



NOTES:

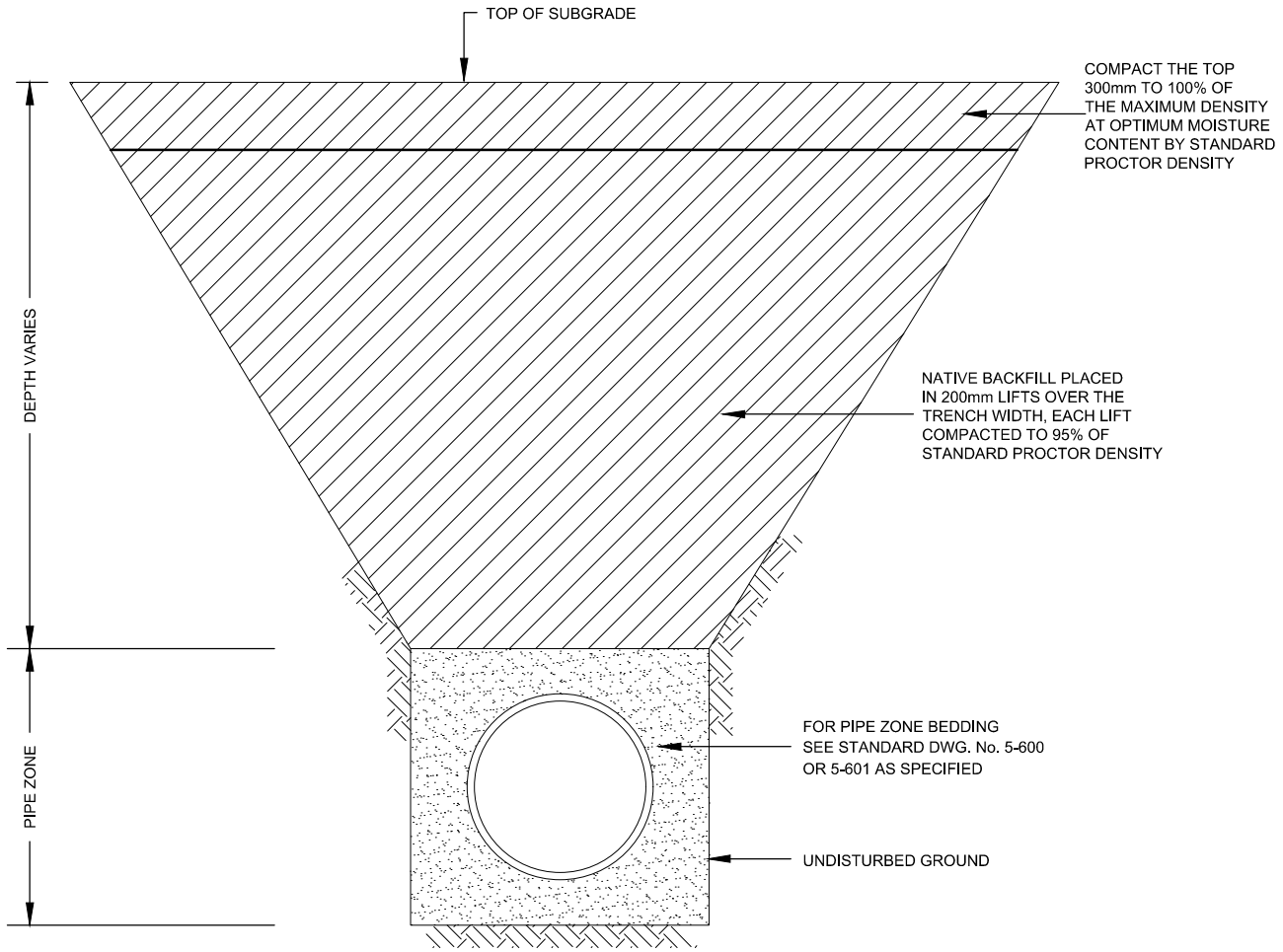
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS II TRENCH BACKFILL

STANDARD DETAIL:	7-852
DATE: JAN. 2021	REV: 5



NOTES:

(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

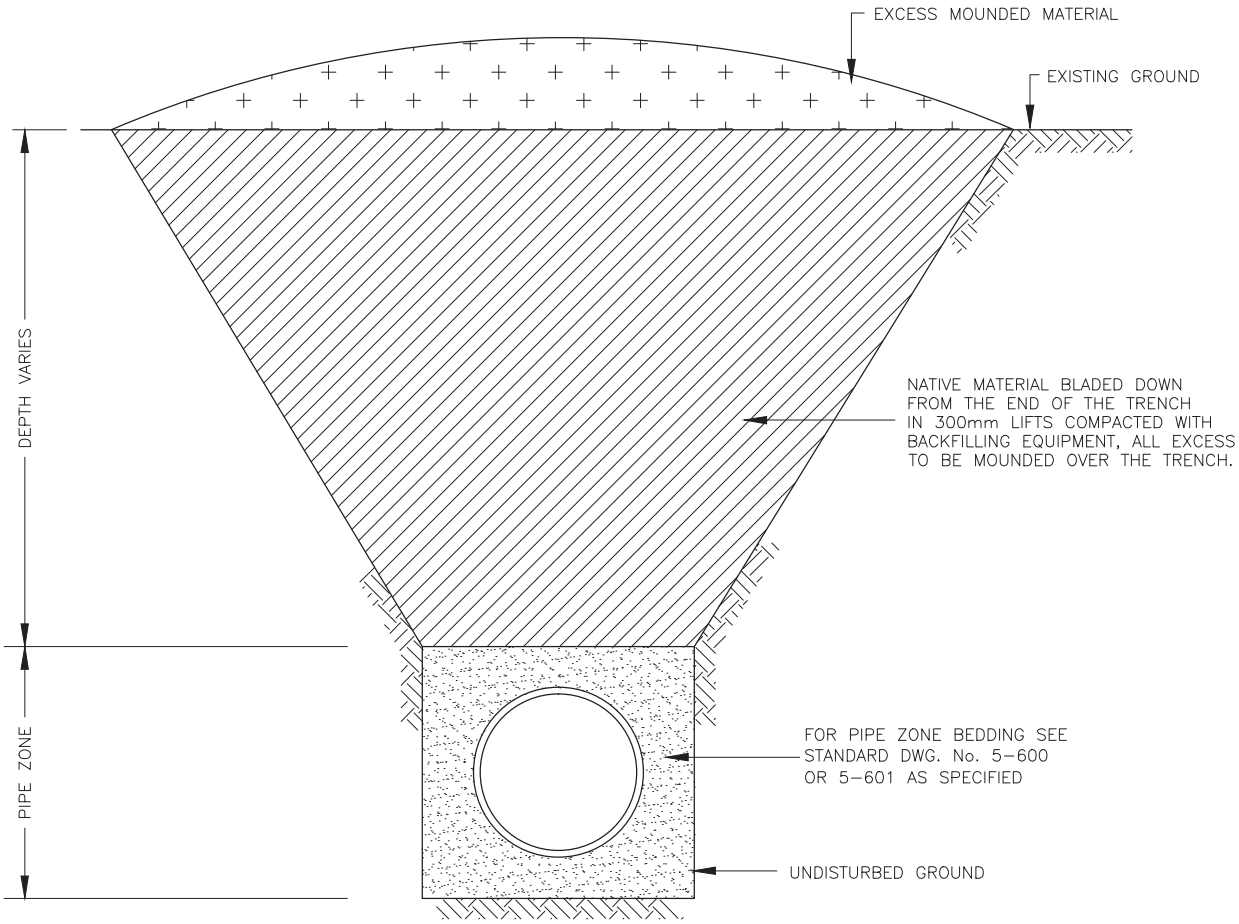
(2) SUBGRADE TO BE SPECIFIED WITH COMPLETE ROADWAY STRUCTURE DESIGN.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS III TRENCH BACKFILL

Time: 4:18pm
Date: Jan 27, 2021
File: \\Cd1044-f06\work_group\1161\active\1161108920\drawing\sheet_files\figures\Section 7\3658-7-800s.dwg by
Xrefs:

STANDARD DETAIL:	7-853
DATE: OCT 2016	REV: 5



NOTES:

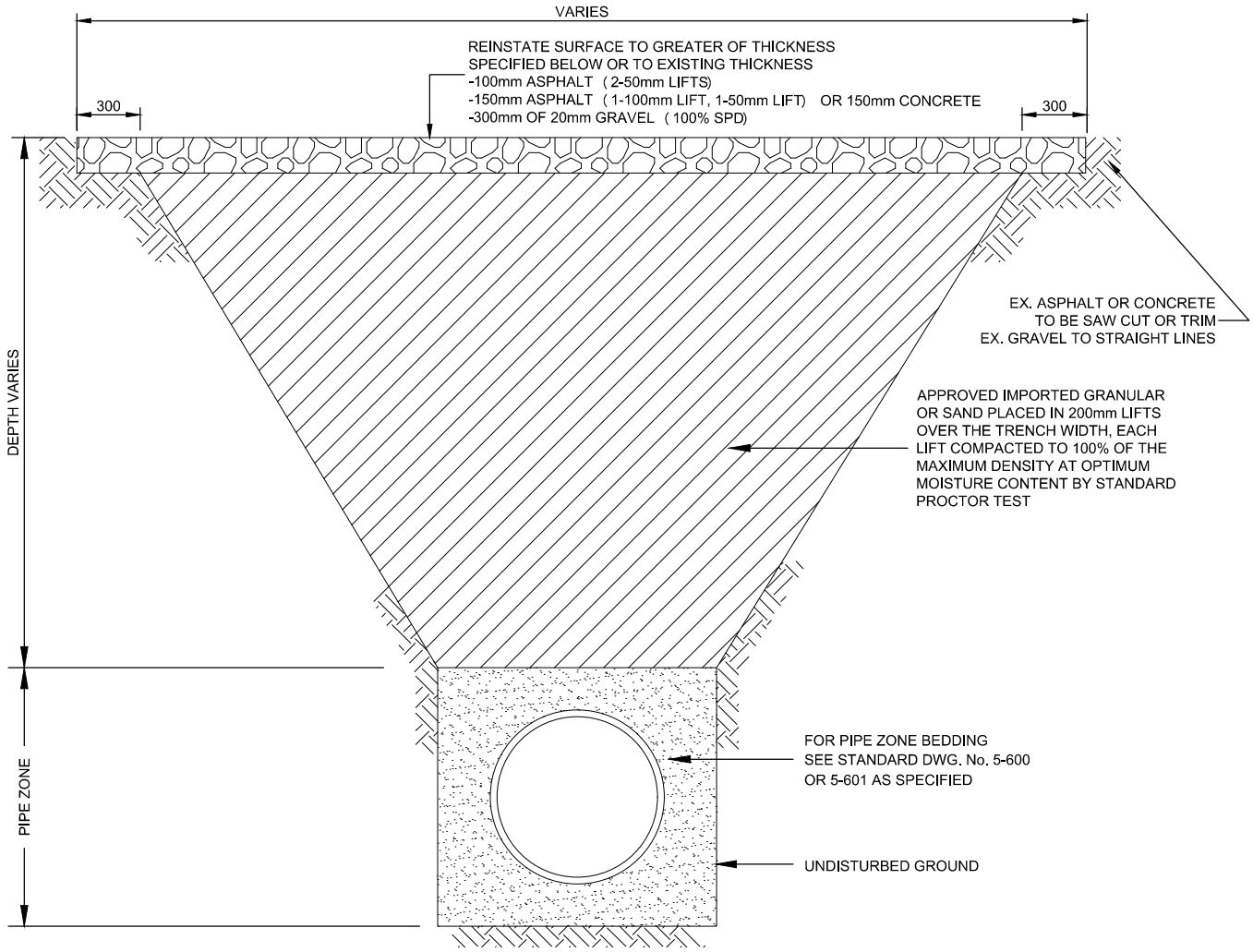
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

(2) SURFACE DRAINAGE TO BE RECTIFIED FOR IMMEDIATE AREA IF CLASS IV BACKFILL IS USED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS IV TRENCH BACKFILL

STANDARD DETAIL:	7-854
DATE: JAN. 2021	REV: 5



NOTES:

(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

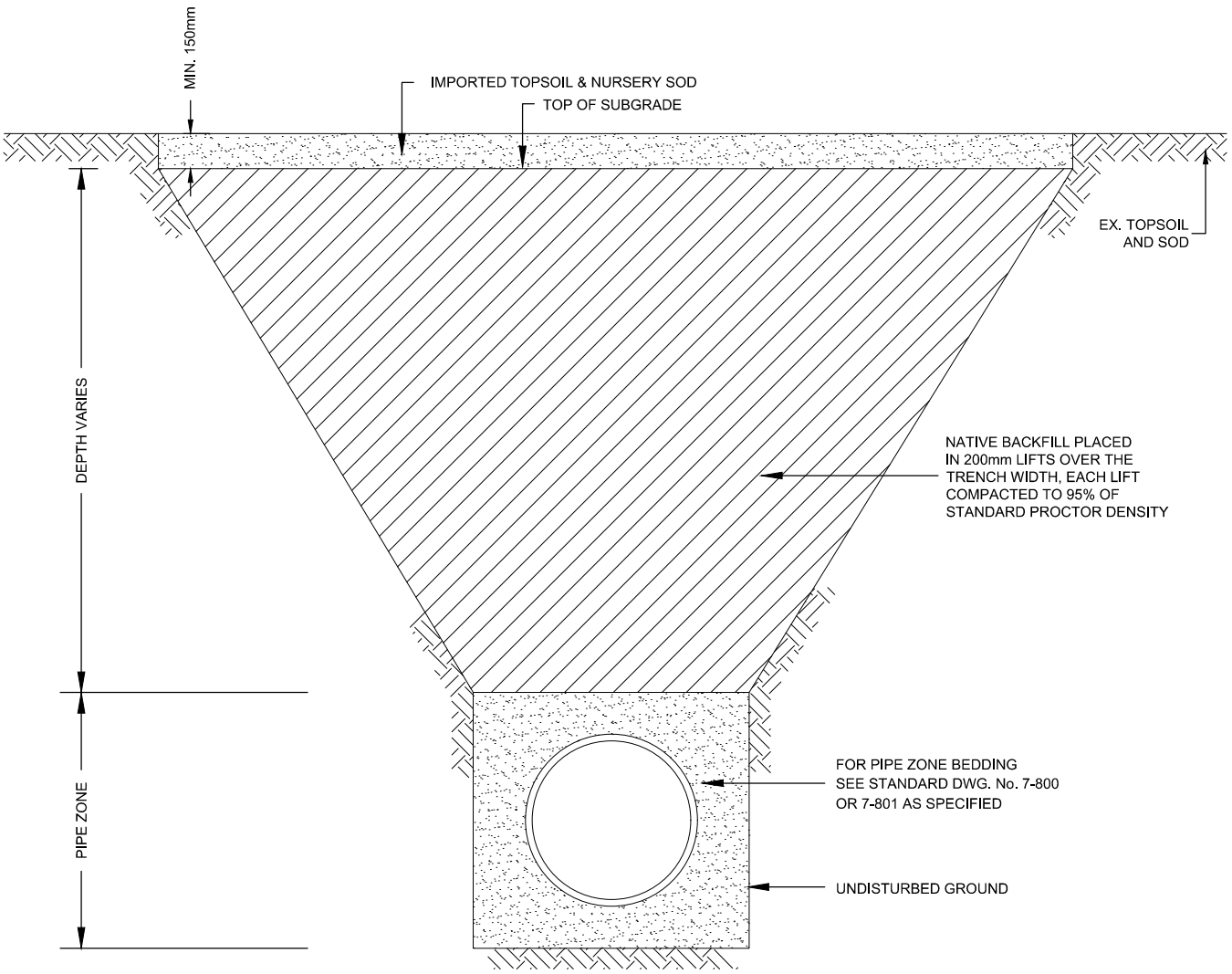
(2) PAVEMENT STRUCTURE DESIGN REQUIRED FOR ASPHALT AND CONCRETE SURFACES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRENCH BACKFILL FOR EMERGENCY REPAIRS IN PAVED AREAS

Time: 4:20pm
Date: Jan 27, 2021
File: \\Cd1044-f06\work_group\1161\active\1161108920\drawing\sheet_files\figures\Section 7\3658-7-800s.dwg by
Xrefs:

STANDARD DETAIL:	7-855
DATE: JAN. 2021	REV: 5



NOTES:

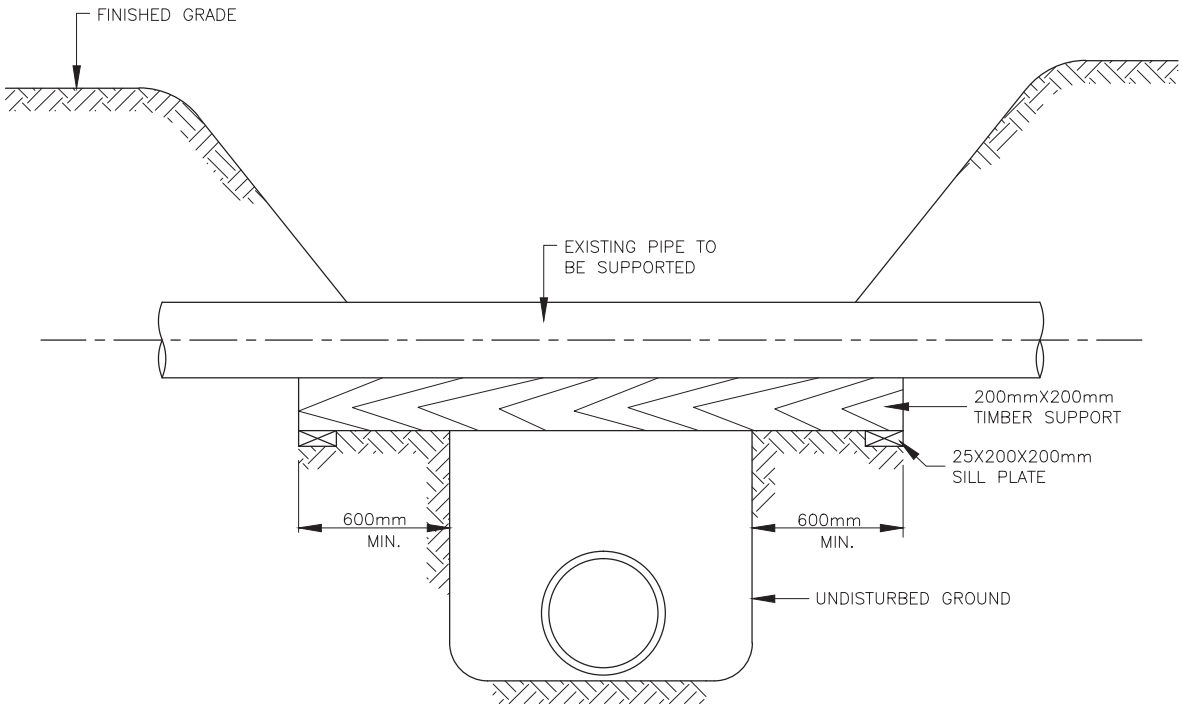
(1) ALL TRENCH WALLS SHALL BE SLOPED OR SHORED IN CONFORMANCE WITH THE OCCUPATIONAL HEALTH AND SAFETY REGULATIONS CURRENTLY IN EFFECT.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TRENCH BACKFILL FOR EMERGENCY REPAIRS IN GRASSED OR SODDED AREAS

Time: 4:21pm
Date: Jan 27, 2021
File: \\Cd1044-f06\work_group\1161\active\116110892O\drawing\sheet_files\figures\Section 7\3658-7-800s.dwg by
Xrefs:

STANDARD DETAIL:	7-900
DATE: OCT 2016	REV: 5



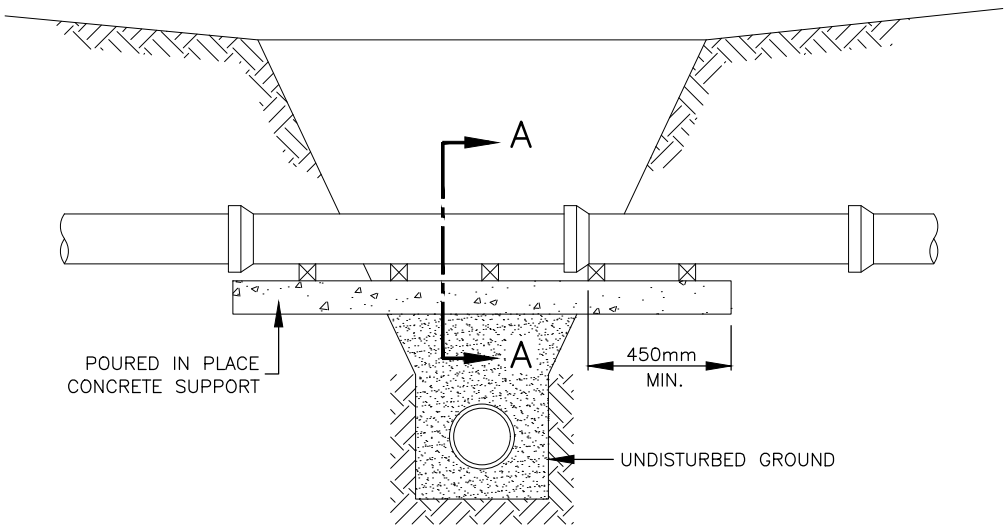
NOTE:

(1) ALL LUMBER TO BE PRESSURE TREATED.

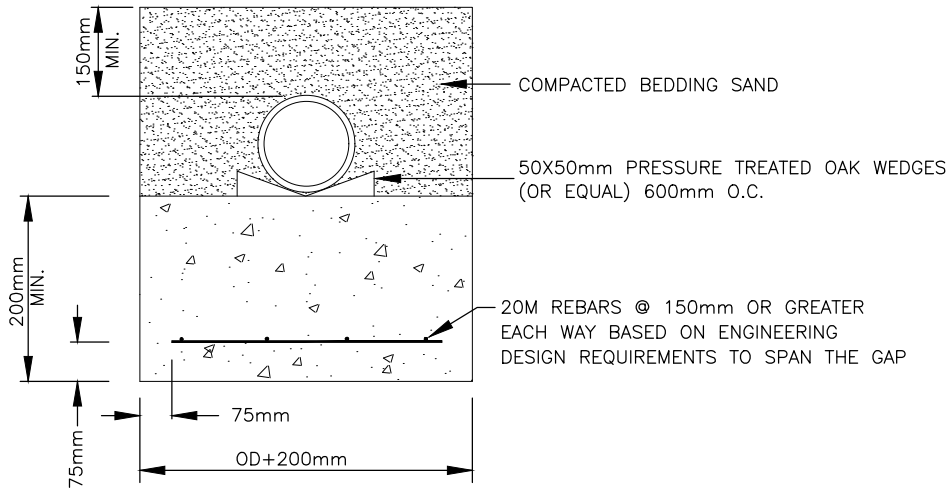
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE SUPPORT - TYPE I

STANDARD DETAIL:	7-901
DATE: JAN. 2021	REV: 6



SECTION



SECTION A–A

NOTE:

(1) CONCRETE 28 DAYS COMPRESSIVE STRENGTH SHALL BE TYPE HS, 30MPa.

(2) MAXIMUM LENGTH BETWEEN JOINTS ON SUPPORT 2m.

(3) ALL REINFORCEMENT BARS TO HAVE 75mm EDGE CLEARANCE.

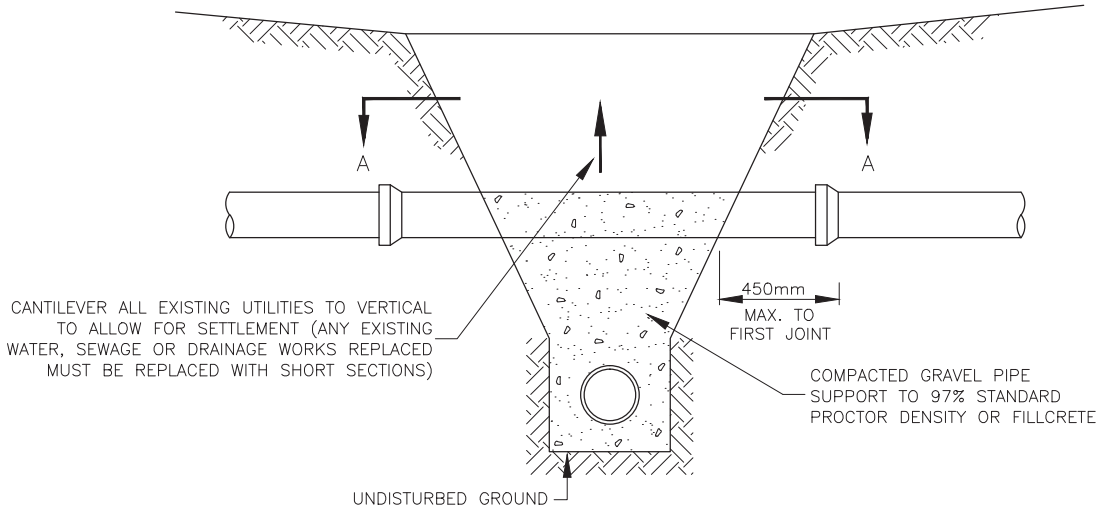
(4) WHERE SPAN EXCEEDS 4.5m CONSTRUCT 300mm DIA. CONCRETE COLUMNS(SONO TUBES) SUPPORTS AT 3.5m O.C.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

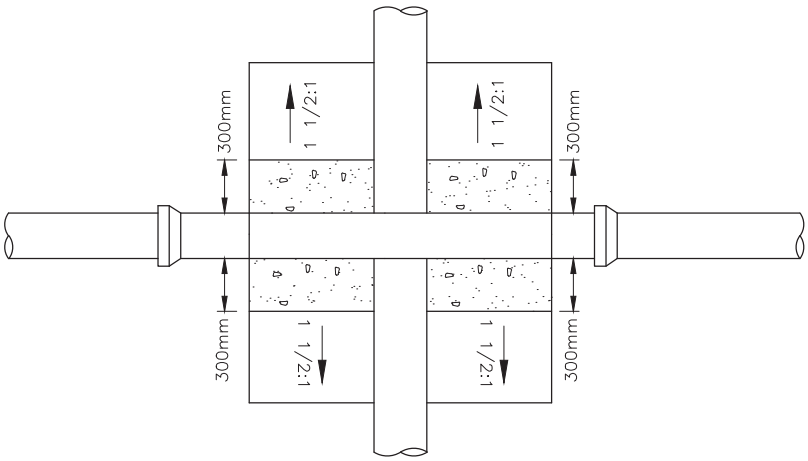
PIPE SUPPORT - TYPE II

Time: 4:24pm
Date: Jan 27, 2021
File: \\Cd1044-f06\work_group\1161\active\1161108920\drawing\sheet_files\figures\Section 7\3658-7-900s.dwg by
Xrefs:

STANDARD DETAIL:	7-902
DATE: OCT 2016	REV: 5



SECTION



SECTION A–A

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PIPE SUPPORT - TYPE III

STANDARD DETAIL:	7-904
DATE: JAN. 2021	REV: 3



SPECIFICATION SIZE:

432mm x 305mm MATERIAL: ALUMINIUM / ENGINEER GRADE

BACKGROUND: RED / BLUE / BLACK ON WHITE BACKGROUND

CORNERS: ROUNDED

HOLES / LOCATION: TOP AND BOTTOM

TYPE OF PROCESS: DI-CUT

NOTES:

(1) WARNING SIGNS TO BE INSTALLED ON RURAL/REGIONAL PIPELINES, OR IN URBAN LANDSCAPED AREAS OUTSIDE OF ROAD R.O.W., AT THE DIRECTION OF THE MUNICIPALITY.

(2) MOUNTED ON TELESPAR, SET 0.9m IN GROUND AT HEIGHT OF 1.5m.

(3) AT 500m INTERVAL, AND AT BENDS IN PIPELINE DIRECTION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WARNING SIGN WATER LINE

Time: 4:25pm
Date: Jan 27, 2021
File: \\Cd1044-f06\work_group\1161\active\116110892O\drawing\sheet_files\figures\Section 7\3658-7-900s.dwg by
Xrefs:

8 Shallow Utilities

8.1 GENERAL

The following provides some of the basic procedures and requirements for the installation of shallow (franchised) utilities. Standards for Duct Banks and District Energy systems are also included in this Section. See Standard Drawings at the end of this section for standard detail drawings.

The Developer shall be responsible for coordinating with the respective utility companies for the installation of gas, electrical power, street lighting, telephone, and cable TV services, and paying all associated costs as required. Installation and commissioning of these utilities will be a condition of development.

Refer.

8.2 DESIGN STANDARDS

8.2.1 Design and Approvals

To coordinate design of gas, power, street lighting, telephone, and cable T.V. systems, it is necessary to first classify and designate cross-sections for each street (and boulevard) within a subdivision area, in relation to standard utility alignment plans and Utility Line Assignments (ULA). Refer to Section 4 Transportation, Roads and Sidewalks Standard Drawings.

1. Upon approval of a tentative subdivision plan, the Engineering Consultant shall circulate to each utility company two copies of the approved subdivision plan, complete street classifications, and utility line alignments. The utility companies shall indicate on this plan their basic design, complete with all right-of-ways, easements, and public utility lot requirements, and return it to the consultant. After checking for and eliminating potential conflicts, the Developer's consultant shall prepare a servicing plan showing all shallow utilities on a site plan. This site plan will also show the deep underground municipal improvements, as well as surface improvements.
2. A Request for Utility Line Assignment form shall be completed and submitted to Engineering. Refer to Section 2.12.6 Utility Line Assignments for further information.
3. This plan shall then be circulated to and approved by the respective utility companies. The plan will then be included with the other engineering drawings, submitted by the Consultant to the Planning Department, for the approval of the Regional Municipality of Wood Buffalo (Municipality).
4. It shall be incumbent on the Utility Company to design their systems in an efficient manner considering existing infrastructure, future development, planned utility expansion and available technology, and limiting impacted customers in the event of a localized service outage. This may include primary and secondary looping networks.

8.2.2 Location of Utilities

1. Unless otherwise approved by the Engineering Department, all gas, power, telephone, and cable T.V. distribution lines and service connections shall be installed in indicated locations as per the standard details.
2. For all urban and rural hamlet applications, power shall be underground. For isolated rural applications where the installation of buried power may not be practical, above ground power may be acceptable to the Municipality. The requirement for underground power shall also be applicable to re-development projects within the urban area and within rural hamlets.
3. For urban applications that would modify overhead powerlines already existing within allowable locations, the continued use of overhead alignment may be acceptable.
4. All distribution cables for primary and secondary power, telephone, cable T.V., and streetlight feeders, may be installed in one common 1.0 m wide trench at the required alignment. Four-party trenching (one common trench for telephone, cable, gas and electric, and located within a 2.5m easement on property) is the accepted trench configuration.
5. On side yard flankages, shallow utilities may be installed in the boulevard space between the back of curb and the property line. The detailed design of the shallow utilities and line assignments must consider street furniture requirements, other infrastructure (including mailboxes), and sidewalk (whether separate or monolithic). No trees shall be permitted where shallow utilities reside in the side yard flankage boulevard space.
6. Streetlights shall be placed at locations not interfering with proposed driveways and be in line with the extensions of common property lines between two lots.
7. The face of the posts, poles, pedestals, and transformers shall be at least 1.0 m clear of the face of the curb and 0.3 m from sidewalk, and not interfering with the safe site distance consistent with Transportation Association of Canada (TAC) standards.

8.2.3 Depth of Cover

1. Depth of cover shall be as required to meet the applicable codes, subject to consideration for future development, construction, and grading works. Typically, standard cover below finished grade should be between 0.9 m and 1.2 m.
2. Design depth of cover shall be indicated on the Utility Line Assignment drawings. Should installation design grade be more than 2.0m, it is no longer considered to be within the “shallow zone” and will require a deviation request.

8.2.4 Street Furniture

1. Street furniture such as kiosks, transformers and cabinets shall have an anti-graffiti coating or furniture wrap.
2. Electric Transformers require grounding loops, with the loop dimensions depending on the size and capacity of the transformer. Grounding loops are to be protected from other infrastructure, including fence posts, poles, pedestals, and other utilities. The footprint of the transformer and grounding loops is to be accommodated in the subdivision design, as appropriate. Depth of grounding loop is to be shown on the Utility Line Assignment drawings.
3. Contact ATCO Electric or Fortis Alberta or the appropriate utility for site specific requirements.
4. Where required, pocket easements are to be identified on the application drawings and incorporated into the registered subdivision.

8.2.5 Separation from Other Utilities

1. The shallow utilities shall be separated from the deeper municipal utilities (i.e., water and sewer) by not less than 3.0 m laterally.
2. Except in a common (four party) trench installation, a separation of 1.0 m from gas utility to other shallow utilities is required.
3. A lateral separation of 3.0 m from a gas line to a storm service (Section 6.11) is required. Where possible, these services should be located on opposite sides of the lot. This is to minimize the possibility of a gas leak flowing inside the network of storm lines.

8.3 INSTALLATION

8.3.1 Road Crossings

1. Adequate ducts shall be installed under roadways prior to their construction to accommodate the installation of power, telephone, and T.V. cables.
2. Where the road crossings are installed after the construction of road improvements, they shall be augered or drilled to avoid disruption of the surface improvements. Road crossing angle should be 90°.
3. Road crossings shall meet ATCO Electric and ATCO Gas latest standards. Engineering Consultant/Contractor to contact appropriate utility for specifications.

8.3.2 Site Preparation

The Developer shall be required to pregrade all boulevards, lanes, and/or easements, where franchised utilities are to be installed, in accordance with the franchisee’s standards.

8.3.3 Survey

The Developer shall be 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 the construction.

8.3.4 Compaction of Trenches

All trenches located on municipal property or within municipal easements are to be compacted to the following standards:

1. Conduits shall be packed with bedding sand and overlain by suitable backfill material.
2. 95% Standard Proctor Density for trenches in boulevards and landscaped areas. For shallow utility easements across lot frontages, ensure continuous grade and positive drainage is maintained across the easement once the trench backfill is complete.
3. 100% Standard Proctor Density for base materials in roads.
4. Restore to a minimum depth of 120mm of 98% Marshall Density for Asphaltic Concrete Pavement in roads.
5. 0.7 MPa Non-shrink concrete (fillcrete) may be used as a backfill material if native materials are unacceptable.

8.3.5 Rights-of Way, Easements, And Public Utility Lots

1. The Developer shall provide, to the satisfaction of the utility companies, rights-of-way, easements, or public utility lots (P.U.L.'s) to accommodate the utility servicing, 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.

8.3.6 Excavation Permits

Refer to Section 2.12, as applicable.

8.3.7 Record Drawings

The developer shall submit as-constructed drawings showing construction details of all conduits and street furniture installed to comply with the conditions for Construction Completion Certificate.

8.3.8 Warranty Period

Refer to Section 2.27, as applicable.

8.3.9 Landscaping

Tree planting and landscaping works adjacent to shallow utilities shall not commence until all shallow utilities have been notified.

8.4 DISTRICT ENERGY AND DISTRICT HEAT SYSTEMS

The Regional Municipality of Wood Buffalo supports District Energy and District Heat Systems, to be implemented in new and re-developed areas where economically viable and supported as part of regional Green Utility network.

8.4.1 Standards

1. District energy and district heating systems shall conform to “European Standard EN 253 – District Heating Pipes – Pre-insulated bonded pipe systems for directly buried hot water networks – Pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene.”
2. Line assignments for District Energy loop systems shall be determined at the Outline Plan stage for those development areas deemed to be serviced by District Energy systems. Additional ROW shall be identified and allocated as required to accommodate the utility.
3. Expansion joints at maximum 100 m intervals shall be incorporated into the design of the District Energy system. On large-diameter pipes, the footprint of U-shaped expansion bends shall be considered in the ROW requirement and impact on other street furniture and trees.

8.4.2 Design and Implementation

1. A Predesign Report must be prepared and submitted to the Engineering Department for approval. The pre-design report must include the following:
    a. District Heating Network Model and Analysis prepared in accordance with industry best practice.
    b. Identification and quantification of heat loads (demands) and sources.
    c. Line assignments of piping systems within the road ROW, including typical cross-sections.
    d. Signature and seal of the Engineer of Record.
2. Detailed Design drawings must be prepared and submitted to the Engineering Department for approval. The detailed design drawings must include the following:
    a. Material specifications.
    b. Pipe diameters, looping details, valve locations.
    c. Design pipe locations and depths.
    d. Expansion joint details including locations.

e. Service locations and depths.

f. Trenching, backfill and surface restoration details.

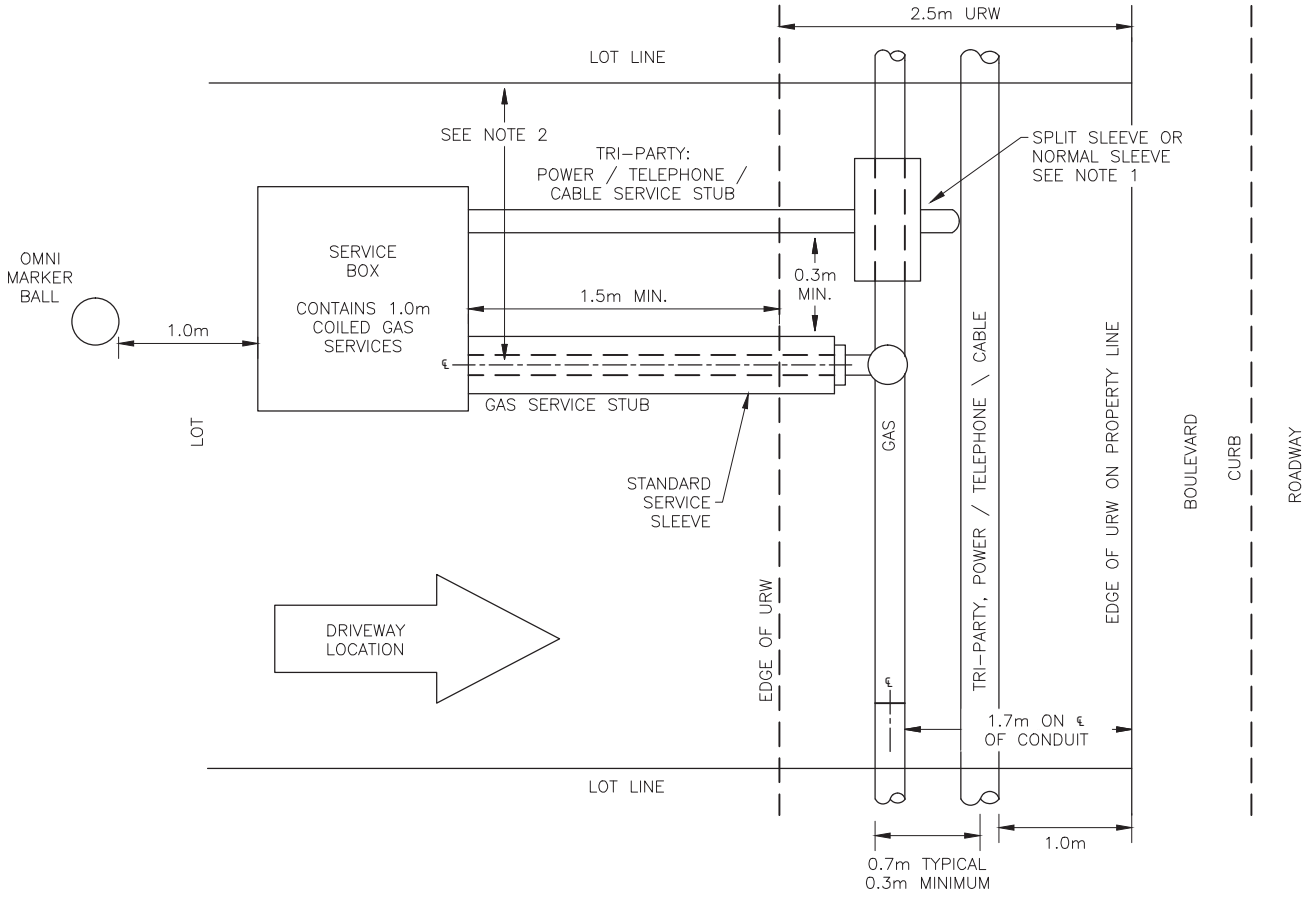
3. All installation and commissioning activities shall conform to the applicable Standard.

4. Submit record drawings in accordance with Section 2.

8.5 STANDARD DRAWINGS – SHALLOW UTILITY STANDARDS

Dwg. No.	Title
8-100	Four Party Common Trench Stub Alignment
8-200	Duct Bank
8-201	Typical Vault Connection and Ground Rod Connection Methods

STANDARD DETAIL:	8-100
DATE: OCT 2016	REV: 0



NOTE:

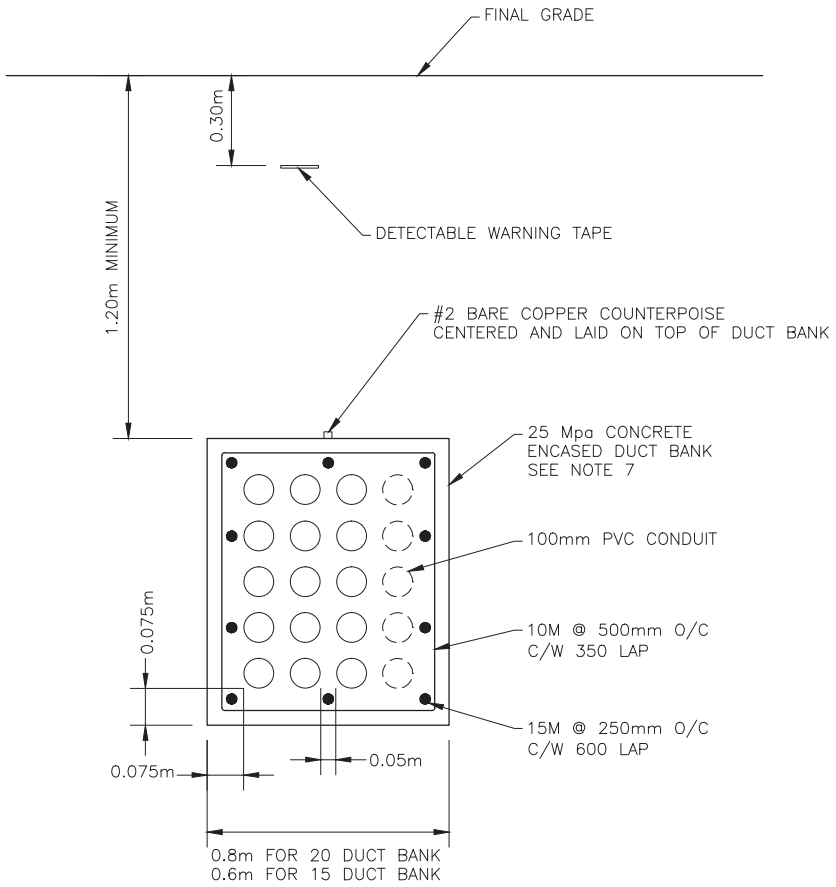
(1) SLEEVES NOT REQUIRED WHEN 0.308m/1.0FT VERTICAL SEPARATION IS ACHIEVED

(2) SIDE YARD OFFSET TO BE SHOWN ON UTILITY LINE ASSIGNMENT DRAWINGS

REGIONAL MUNICIPALITY OF WOOD BUFFALO

FOUR PARTY COMMON TRENCH STUB ALIGNMENT

STANDARD DETAIL:	8-200
DATE: OCT 2016	REV: 1



DUCT BANK SECTION

NOTES:

(1) ALL COMMON DUCT CROSSING WITH EXISTING UTILITIES TO BE AT LEAST 0.5m BELOW EXISTING UTILITY.

(2) ALL VAULTS TO BE TYPE T – 1.8m (W) x 3.8m (L) x 2m (D)NOMINAL. SEE DRAWING 8–201 FOR DETAILS.

(3) CONTRACTOR TO FOLLOW FRANCHISE UTILITY REQUIREMENTS FOR CONNECTIONS TO EXISTING VAULTS.

(4) INSTALL UNDERGROUND DUCT SPACERS SIMILAR TO IPEX @ 1500 mm O/C. SUPPORT BOTTOM SPACER ON PRESSURED TREATED WOOD BLOCKS.

(5) HAND PLACE APPROVED BEDDING/BACKFILL COMPACTED TO 95% SPD.

(6) BACKFILL COMMON DUCT AND VAULT TRENCHES WITH IMPORTED GRANULAR BACKFILL TO BASE OF PAVEMENT STRUCTURE; COMPACT TO MINIMUM 98% S.P.D.

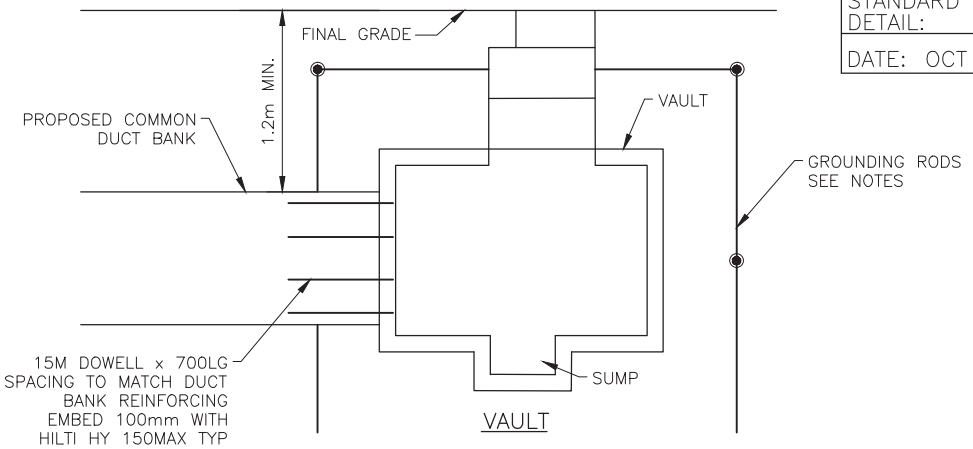
(7) INSTALLATION TO COMPLY WITH CSA C22.3 NO7 UNDERGROUND SYSTEMS.

(8) ALL CONDUITS ARE TO BE INSTALLED WITH A SLOPE GRADED TOWARD ONE VAULT OR THE OTHER.

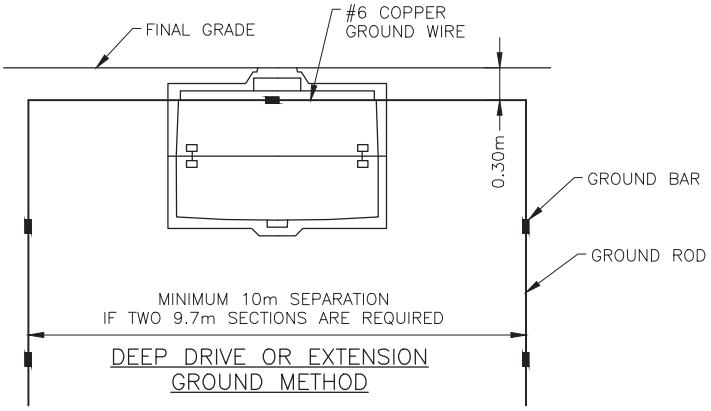
REGIONAL MUNICIPALITY OF WOOD BUFFALO

DUCT BANK

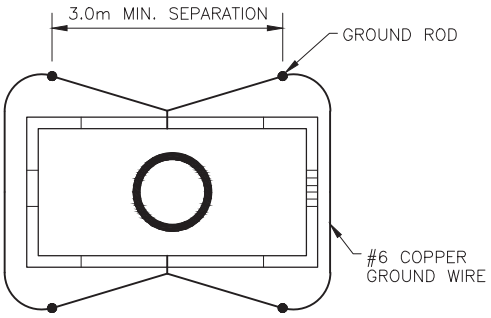
STANDARD DETAIL:	8-201
DATE: OCT 2016	REV: 1



VAULT



DEEP DRIVE OR EXTENSION GROUND METHOD



MULTIPLE SINGLE GROUND ROD METHOD

NOTES:

(1) THE PURPOSE OF GROUNDING A MANHOLE SYSTEM IS TO CREATE A LOW RESISTANCE PATH TO EARTH THEREBY REDUCING THE POSSIBILTY OF DAMAGE TO SYSTEM EQUIPMENT AND INJURY TO PERSONNEL IN THE EVENT OF POWER CONTACT, DIRECT OR INDUCED, AND POWER SURGES SUCH AS LIGHTNING STRIKES ON THE CABLE NETWORK.

(2) THE ACCEPTABLE MEASURED GROUND RESISTANCE OF NEW PRECAST MANHOLE INSTALLATIONS, WITH REFERENCE TO EARTH, MUST BE 5 OHMS OR LESS.

(3) EVERY ATTEMPT MUST BE MADE TO ACHIEVE THE 5 OHM OR LESS READING AT THE TIME OF THE MANHOLE INSTALLATION> THIS WILL ELIMINATE ANY FURTHER PROBLEMS WHICH MAY ARISE IN ATTAINING THE REQUIRED RESISTANCE MEASUREMENT, ESPECIALLY IN PAVED AREAS. GROUND VALVES ARE TO BE RECORDED ON FORM #4166.

(4) THREE METHODS OF PLACING GROUND RODS ARE AVAILABLE FOR OBTAINING THE 5 OHMS OR LESS READING
(a) DEEP DRIVE OR EXTENSION GROUND ROD METHOD
(b) MULTIPLE SINGLE GROUND ROD METHOD (CONNECTED IN SERIES)
(c) MULTIPLE SINGLE GROUND ROD METHOD (CONNECTED IN PARALLEL)

(5) DEEP DRIVE OR EXTENSION GROUND ROD METHOD IS THE FIRST METHOD TO BE USED TO ACHIEVE A 5 OHM OR LESS GROUND. THE METHOD CONSISTS OF USING UP TO 4 2.4 M SECTIONAL GROUND RODS AND DRIVING ONE ON TOP OF ANOTHER FOR A TOTAL DEPTH PENETRATION OF 9.7

- THE GROUNDING MEDIUM MUST BE MEASURED FOLLOWING THE INSTALLATION OF EACH 2.4 m GROUND ROD SECTION. A VIBROGROUND IS USED FOR THESE MEASUREMENTS.
- IF THE OHM 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 MANHOLE GROUND BAR WHICH PROTRUDES FROM THE MANHOLE WALL. TWO GROUND ROD CLAMPS ARE REQUIRED FOR THIS CONNECTION AND ARE IDENTIFIED AS, CLAMP GROUND ROD.
- IF THE 5 OHM RESISTANCE HAS NOT BEEN ACHIEVED AFTER INSTALLING THE FIRST 9.7m 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).

(6) 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 MANHOLE GROUND BAR IS ACCOMPLISHED USING CLAMP GROUND ROD.
- THE GROUNDING MEDIUM MUST BE MEASURED AFTER INSTALATION OF EACH 2.4 m GROUND ROD.

(7) 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 A MANHOLE EACH SEPARATED BY 3 m AND BONDED TOGETHER BY #6 COPPER GROUND WIRE. THE #6 COPPERGROUND WIRE MUST THEN BE TERMINATED TO THE MANHOLE GROUND BARS TO PROTRUDE FROM THE MANHOLE WALL USING CLAMP GROUND ROD.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TYPICAL VAULT CONNECTION AND GROUND ROD CONNECTION METHODS

9 Facilities

9.1 PREAMBLE

This Standard applies to the design and construction of municipal facilities, including recreational facilities, accommodation (office, parking and shop) spaces, and mechanical plants for waterworks, wastewater and storm drainage systems, to be constructed, renovated or re-constructed in the Regional Municipality of Wood Buffalo (Municipality).

General construction requirements, construction materials, and procedures are not alluded to in this section and are left to each consultant to present to the Municipality for approval.

All mechanical plants shall be in accordance with the Alberta Environment and Parks, Standards for Municipal Waterworks, Wastewater and Storm Drainage Systems, and all other relevant Standards and Codes.

Building Infrastructure Management is in the process of developing a set of comprehensive facility standards to supplement this section. Any intended facility related work that includes process and non-process municipal facilities shall be communicated to the branch prior to any design work being initiated.

9.2 GENERAL FACILITIES STANDARDS

9.2.1 General Requirements

1. All equipment to be CSA approved.
2. All Fit and Finish materials to utilize RMWB standards to ensure operational and maintenance efficiencies.
3. The Municipality utilizes specific manufacturers of equipment and accessories common throughout their systems. Therefore, specific standard equipment (make and model) may be requested by the Municipality and shall be supplied by the Developer. A list is included at the end of this Section, but it should not be considered to be exhaustive. Coordinate with the Municipality for specific requirements.
4. Ensure the facility will meet the intended use, and that all services meet demands and loads prior to construction.
5. Include Trade Services and/or Building Infrastructure Management as primary stakeholder in the design review process and in the circulation for drawing reviews, to ensure that maintenance and operational concerns for facility longevity can be raised at the design stage of the project.
6. For rehabilitation of any structures built before 1985, ensure and support with documentation that a Hazardous Material Assessment has been conducted to identify remediation requirements for items such as but not limited to 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. The schedule shall be broken down into (5) categories identified as Architectural, Mechanical, Electrical, Structural and Conveyance. Each piece of building equipment and /or materials must include the make, model, and serial number where applicable and be placed under the appropriate category within the schedule. The schedule must also contain the recommended replacements for all equipment and materials to coincide with the products life cycle. An electronic (spreadsheet or database) format of the schedule shall be turned over to Building Infrastructure Management after IFC drawings are issued and shop drawings are approved.
8. All Hazardous Energy systems shall include in their design lock-out and tag-out devices, in general accordance with CSA Z460-05 (R2010) “Control of Hazardous Energy – Lockout and Other Methods.”
9. Barcode asset management support requirements: All equipment and valves are to be labeled with barcode tags according to existing facility specific Asset Management System. Equipment tagging designation to be provided by the RMWB.
10. Consideration shall be given to include integrated low oxygen and carbon monoxide monitoring systems in confined spaces within facilities.

9.2.2 Site Layout

1. All projects shall have a sediment and erosion control plan for the project site during construction according to RMWB standards and requirements.
2. In the site selection, consider the adjacent land uses, environmental and geotechnical constraints, flood plain risks, transportation access and parking requirements, construction and lay-down needs, snow removal, and the appropriateness of the site regarding the intended purpose of the facility.
3. Conduct a thorough site survey and prepare a detailed site plan as part of the drawing submission.
4. An access road of minimum width 5.5m shall be provided at all facilities. The minimum Standards shall be 75mm asphalt surface, 250mm granular base course, on a 300mm deep scarified and re-compacted subgrade. A more substantial road and parking structure may be required where the facility is subject to heavy wheel loads. Refer to Section 4. Asphalt stabilized base course (cold mix) or gravel surfacing may be approved by the Municipality for isolated rural locations.
5. Adequate provision shall be made at the site to enable vehicles to park, turn and leave the site in a forward direction. A full perimeter road is not required but vehicle access must be available to all points.
6. A site grading plan and drainage management plan is to be provided. The site is to be graded to provide a minimum of 2% slope away from the building for surface water drainage and ensure there are no ponding and icing problems. All slopes and berms must be accessible for mowing.
7. Final elevations of the facility foundations are to be 200mm above the surrounding grade.

8. Roof drains and downspouts are to be designed to not drain onto sidewalks or designated walkways, and to deposit water at least 1.5m from the foundation.
9. Do not plant trees in the vicinity of the facility whose roots may compromise the foundation or foundation drains. Provide appropriate distances between the building facility and any new or existing trees.
10. Parking lots must be designed to meet the intended functional use of the facility. All parking lots intended for public access must meet the Land Use Bylaw, as well as accessibility standards as prescribed by the Alberta Building code.
11. Include in the site planning space for back-up power / genset, as required.
12. 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 practical.

9.2.3 Carpentry and Building Standards

1. All Facilities shall meet the most recent Alberta Building Codes and Standards
2. All foundations to be designed in accordance with the soil bearing strength, frost penetration depth and groundwater table. Foundations for structures larger than $55m^2$ to be approved by a professional engineer licensed in the Province of Alberta.
2. Sulphate resistant concrete and mortar shall be used.
3. Expansion joints shall be incorporated into the design to prevent concrete cracking due to thermal deformations.
4. All structural base plates shall be grouted.
5. Consideration shall be given to in-floor heating in the concrete slabs at main building entrances.
6. Except for monoslab style 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.
7. Prior to the issuance of Final Acceptance Certificate, all concrete slabs near the entrances to the facility will be reviewed for differential settlement. Any potential trip hazards or cracking will be repaired at the Developer's cost.
8. Anti-graffiti coatings shall be applied to external walls of facilities or utilize materials that are historically easy to clean with no permanent damage or discoloration.
9. Use sound-absorbing wall and ceiling finishes for spaces identified for administrative use, acoustical testing may be requested to be performed on site post-construction to verify.
10. Installation of Audio / Video equipment on mechanical chase is to be avoided.
11. All publicly accessed and administrative facilities to adhere to barrier free design standards. Barrier free accessibility must be code compliant.

12. Self-shedding roofs shall not be sloped toward the side of a building with public or staff access. If this is not possible, all entrances on the downward slope side of self-shedding roofs shall have awnings to protect staff and public accessing the facility.
13. Roof access hatches and engineered tie-off points for fall protection shall be incorporated on all roofs.
14. Roof penetrations are to be avoided where possible, and to be substituted with wall penetrations.
15. Roofs shall meet the Alberta Roofing Contractors Association (ARCA) standards and be eligible for an ARCA Warranty. Note that the Municipality will not require projects to purchase an ARCA Warranty. Gravel ballast is to be avoided.
16. Facilities shall include ice cleats on metal roof systems and/or properly installed gutter systems. Heat trace all eaves troughs, downspouts, and gutters.
17. High performance windows and doors shall be specified.
18. Electronic format of key schedule including all pinning diagrams for mechanical keying to be submitted to Building Infrastructure Management.
19. Avoid sky lights and slope glazing whenever possible.
20. Avoid cloth-based ceiling tiles, and other surfaces that are difficult to clean.
21. All public washrooms are to have plywood liners installed behind the drywall.
22. Toilet partitions in publicly accessible facilities shall be built to anti-vandalism standards, such as block walls. Note that this does not apply to administration areas.
23. Below countertop sink designs should be used whenever possible.
24. Exterior stairs with a distance of more than 4m from edge to edge shall have a metal handrail installed in the center if 3 or more steps are provided. All handrails must be skate-board resistant with spaces or weldlets to inhibit travel on these materials.
25. Entrances to parkades are to have a metal bar capable of stopping a 3000kg vehicle 4m before the opening of overhead door. An electrical height restriction system interlocked with the overhead door including a visual alarm beacon is to be installed by the electrical contractor.
26. Parkades must have at least 2.18m (86 inches) clearance for entry of vehicles. All ceiling-mounted mechanical / electrical / plumbing equipment within the parkade is to be at least 2.29m (90 inches) above the finished floor in all driving and parking areas to allow vehicle clearance.
27. All mechanical plants shall be equipped with double metal door structures complete with panic hardware for maintenance and removal of large equipment.
28. All IT server rooms to be equipped with Anti-Static Flooring.
29. Door openings shall be large enough (width and height) as practical to accommodate largest piece of equipment, including installation and extraction, with consideration for minimal disassembly onsite.

9.2.4 Electrical Standards

1. The facility electrical system shall meet Canadian Electrical Code and be designed by a qualified electrical engineer licensed to practice in the Province of Alberta.
2. The Developer shall ascertain from the electric utility the nature of the available power supply and make all necessary arrangements for connection. Power quality must be addressed and where necessary the proper voltage / lightening arrestors and harmonic distortion filters must be effectively incorporated into the electrical system.
3. Wherever practical, there shall be two independent power supply feeders to the facility, with provision for automatic switch-over to the second feeder in the event of a failure of the first. The design, installation, operation, maintenance, and testing of emergency generators and associated equipment for providing backup power supply shall conform to CSA C282.
    a. For Mechanical Plant Facilities (treatment plants, lift stations, pump stations, reservoirs) and any other facility deemed by the Municipality to be of critical importance for which continuous operation is required, an automatic diesel-powered standby generator shall be provided, with sufficient power to operate the facility at full capacity.
    b. Natural gas supply generators may be considered for other non-essential facilities, with sufficient power to operate emergency-only systems.
4. Three phase power shall be used, and each phase shall be monitored using a 3-phase monitor with LED visual indication and report to the telemetry system of each building.
5. Location of electrical switchgear and similar equipment shall be such that it is not subject to below grade flooding. Electrical services (main panels, sub panels) also not to be located in areas or hallways frequented by facility staff or public.
6. The electrical breaker box and meter shall be housed in a secure locking cabinet, with a transparent window to read the meter without the need of opening the cabinet. To prevent theft of these components, the secure locking cabinet is to be supplied and installed at the time of the electrical connection.
7. Adequate lighting shall be provided throughout the entire structure to ensure the safe operation and maintenance of the complete facility. LED (preferred), high-pressure sodium or metal halide bulbs, complete with photocells, shall be installed as all outdoor lighting. A manual / automatic switch bypassing the photocell is to be installed in an accessible vicinity and located on the contactor for manual control of the exterior lighting.
8. Exit fixtures shall incorporate LED lighting. No fluorescent or incandescent type of bulbs will be permitted.
9. Metal Halide lighting (250 W) shall be installed within dry and wet wells. High-pressure sodium and incandescent lighting are not acceptable in the wet wells.

10. Low voltage class II type wiring (security systems, data lines, etc.) shall have proper protection and support. This includes conduit, conventional raceway, basket raceway or properly spaced hook raceway. Where these cables must span hallways, they must have proper raceway support.
11. All discrete electrical components (pumps, motors, machines, heaters, etc.) shall have adequate breaker and/or disconnect installation to allow for positive, lockable isolation as well as local disconnects to enable isolation without having to take the majority of other services down to repair small components.
12. The minimum standard for receptacles is 20-amp, T-prong style. The minimum building wiring gauge is AWG #12
13. All electrical switches, breakers, outlets, and so on are to be numbered and easily traceable from panel to end service. All switches and receptacles are to 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). This includes all parking lot and exterior receptacles. Junction boxes must also be labeled with their voltage & cabinet feeds (for example 347/600VAC Panel 2D). Cabinets must have a lamacoid plaque mechanically fixed to their doors with either rivets or screws.
14. All panel schedules are to be typed, not handwritten. Electronic files capable of modification are to be forwarded to the Municipality.
15. All junction boxes in ceiling spaces are to be painted and marked with appropriate colour code and origin of circuitry.
16. Additional power shall be run to external eaves for installation of electrical heat tracing if required. This shall be calculated as a major electrical load.
17. 115–120-volt outlets on all roofs for servicing units on roofs (weatherproof components).
18. Conduits required to be utilized for future security system to be installed as part of the project scope.
19. Construction project to include all components of security system and monitoring (including elevators) as part of project scope.
20. Short circuit calculation and calibration required for any service of 400 amp 3-phase and over.
21. All wires involving 347/600 volts are to be colour coded Orange / Brown / Yellow for 3-phase systems. Wire size less than and including #10 are to be manufactured with such colours throughout their entire length. This includes wires terminating in the factory installed splice box of electric motors. Where BX armoured cable is used, an identifiable wrap of Orange, Brown or Yellow phasing tape will be acceptable.
22. All control relays must have visual coloured indication or LED illumination as to when they have been energized.

23. Standby engine On-Off-Auto switches are to have the auto function tied into and alarmed to the BMS/BAS. Gen-sets must have the following points wired or networked to the BMS:
    a. Not in Auto Alarm
    b. Low Temperature Alarm
    c. Breaker Open Alarm
    d. Low Battery Alarm
    e. Charger Fault
    f. Loss of utility
    g. Running Status
    h. Fuel level
    i. Low fuel level
    j. Fail to start
24. The UPS systems will have a network alarm alerting the BMS/BAS of “On Battery” status.
25. All 120 volt - 1500VA UPS (minimum) portable power supplies must meet APC (American Power Corporation) specifications. See the Municipality Stores personnel for unit product numbers. Unit to energize all BMS / BAS systems, alarms, and telemetry / phone systems during power failures. Unit must have automatic reset / power restore abilities after prolonged outage. Portable UPS power supply units must be connected to normal 15-amp outlets with quick disconnect cord ends.
26. Engine louvers are to be controlled by the generator run status that will automatically open for when the generator is running for both exhaust and intake. Manual draft operation is not acceptable.
27. Fire hall cord reel capacity shall have a 20-amp minimum circuit capacity. Must also conform to vehicle requirements.
28. All control panels manufactured by the equipment supplier must be CSA approved with no such exposure of live bus bars/lugs of incoming supply voltage. Panels must have reset buttons mounted on the exterior cabinet door.
29. All receptacles and network outlets specific to office equipment rooms are to be mounted a minimum 1.2m above the finished floor.
30. Lunchrooms / kitchens are to have adequate electrical capacity for 2 microwaves (Separate circuits), coffee pot (Separate circuit), kettle, toaster, spare outlet, and a fridge (Separate circuit). Twenty-amp circuit T-receptacles and alternated plugs must be used.
31. Low voltage switching is only required where specified lighting is controlled from more than 3 locations.
32. Indicator lights on all magnetic starters over 1 horsepower for the indication of an overload or single-phase condition. A red LED light is to be installed from the auxiliary contacts of such motor contactors. Alarms to be tied into the BMS.

33. Electronic 3-phase monitors are to be installed for all 3-phase motors in each HVAC AHU.
34. Electronic 3-phase monitors with led visual indication are to be installed for all 3-phase motors involved in the flow of water/sewage.
35. Provide dedicated circuit for all lifting hoist / cranes and overhead doors.
36. Fire alarm, end of line resistors to be wall mounted in an accessible location without the use of a ladder.
37. Fire alarms zones / addressable units are to be clearly identified with wire tags on all wires in every spliced location and device installation.
38. Fire alarm duct detectors regardless of location must incorporate wall mounted identification lamacoids specifying physical location of the detector. In T–bar ceilings, identification mounted on ceiling grid will suffice.
39. Fire alarm identification of the area the duct detectors sample / draw air from is to be stated on the main panel schedule. For this note, room numbers and areas are required and the location of the physical detector.
40. Fire suppression systems in electrical rooms and server rooms are to be dry-chemical, not water.
41. Server rooms are to be temperature controlled. Equipment needs for cooling are to be identified at design stage to specify the temperature control requirements.
42. Provide an eight (8) channel auto dialler inclusive with a dedicated landline phone service.
43. An audible signalling device controlled via the fire alarm panel is to be installed outside of the main entrance of every building requiring a fire alarm system. Signage of the fire alarm is to be supplied and installed via the contractor.
44. All electrical equipment to have arc flash study completed and labelled before turnover. Based on the arc flash study, boundaries are to be marked on the floor and appropriate labels are to be affixed to the equipment.
45. Fire zones shall be properly labeled on the panel with an indication of the location or room (for example ZONE 1 LOBBY).
46. Each photo copier or fax machine will require a dedicated 20-amp T-receptacle.
47. Parking lot receptacles must use an intelligent management system such as Hubble 5252.
48. Washrooms are to incorporate High Efficiency blown air hand dryers. Each hand dryer to be installed on a dedicated 20-amp circuit, or as required to meet manufacture specifications.
49. Whenever feasible, the electric power supply to the facility is to be provided from two or more independent distribution sources.
50. Outdoor lights to be located away from air intakes to mitigate insects from being sucked into the building.

9.2.5 Instrumentation and Control

1. All mechanical plant facilities shall have instrumentation and control systems which will allow the station to run unattended and are fully integrated and compatible with the Municipality's existing central control system.
2. The nature of the instrumentation and control systems will vary depending on the size, type, and function of the station. This shall be decided during discussions between the Developer and the Municipality. The following shall be the minimum acceptable:
    a. Station discharge flow to be measured using a magnetic flow meter. Meter must be installed with a bypass to allow easy repair/replacement.
    b. Water level indicators/controllers to be ultrasonic type 3.
    c. Station discharge pressure indicator.
    d. Dry well flooding alarm.
    e. Intruder alarm for all entrance points.
    f. Pump failure alarm.
    g. Pump auto/hand/off indicator.
    h. Main power failure alarm.
    i. Wet well high and low-level alarm switches using mechanical float switches to provide backup to the ultrasonic indicator/controller.
    j. Standby generator alarms status and alarms (Refer to specific requirements above)
    k. Building HVAC alarms and controls.
    l. A visible alarm light must be mounted outside of the building located close to the main door entrance which turns on when the HVAC has failed and as per applicable codes such as the fire code.
    m. Odour control failure (for systems with odour control).
3. All alarms are to be locally indicated. All the above shall be telemetered by means of digital signals to a remote location determined by the Municipality. The telemetry system shall have a battery-powered backup supply to allow the system to operate for at least four hours after a power failure.
4. All instruments, sensors, and mechanical float switches to be installed in a wet well or limited access area shall be, wherever possible, accessible, and removable without entering the wet well or limited access area. All instruments which have local indication, or which require access for programming should be installed at eye level. All instruments and electrical or control panels which require occasional access must be readily accessible.
5. All powered instruments are to have separate fuses. All Fuses to be labelled.

6. All instruments to be installed in such a way as to be easily accessible for maintenance and programming.
7. All instruments with local indicators to be installed at a standard eye level and with sufficient light to be easily visible.
8. All instruments which may be occasionally removed for maintenance must be easily removable.
9. All instruments and control systems (HMIs & PLCs) to be electrically protected by a surge control system and powered by a UPS.
10. All local controls systems to utilize a local historian to prevent loss of data. Local historians to offload data to the master storage facility twice daily if a master facility exists.
11. All communication equipment to have data line surge protection.
12. ISA Standards may be specified by the Municipality for purchase and installation of instruments.
13. Gas detection shall be considered in all facilities that contain combustion engines (including generators and vehicles). Sensor placement must consider the source of the gas and the locations where gases will likely collect or stratify. The gas detector shall report to the BMS.
14. All water / wastewater facilities shall be tied into the Environmental Services Regional SCADA System. Each remote facility in the urban service area shall have a radio per drawing 9-300. Refer to the SCADA Master Plan for additional requirements. Cellular may be the preferred communication for rural facilities.
15. Dedicated data lines and UPS power are to be provided in the area where such BMS/BAS and network switch systems are located.
16. Proximity switches are to be installed on all check valves involving the control of water and sewer. Signals must be transmitted to control panels with appropriate alarms in no flow conditions during pump operation.
17. All pressure switches are to be identified on the switch with a waterproof label with calibration and date for (max /min) set points.

9.2.6 Plumbing and Heating Standards

1. Heating and ventilation systems that use natural gas as a main fuel source shall be provided for all pumping stations where natural gas service is available. Air conditioning will be required only in unusual circumstances.
2. Ventilation systems shall conform to all existing local and/or provincial codes. Forced ventilation shall be provided for all rooms, compartments, pits, and other enclosures below ground floor and for all areas where an unsafe atmosphere may develop or where excessive heat build-up may occur.
3. In areas where excess moisture could cause safety hazards or damage to equipment, a suitable dehumidification system shall be provided.

4. Heating facilities shall have sufficient capacity to prevent freezing temperatures in any part of the station during the coldest anticipated weather conditions.
5. Where chlorine gas is used, each room shall have an emergency ventilating fan capable of providing one complete air change per minute. Fan suction shall be near the floor, as far from the door and air intake as practical. Air intake shall be through louvres near the ceiling. Switches for fans and lights shall be located outside the room. Chlorinator rooms shall be heated to 15°C and protected from excessive heat. A chlorinator alarm system is required with automatic activation of the exhaust fan upon alarm.
6. Wet well ventilation shall be continuous, and capable of providing at least 6 complete air changes per hour or more as per the building usage requirements. Air shall be forced into the wet well rather than exhausted from it. Odour control on wet well discharge air is required in all residential areas.
7. Ventilation shall have sufficient capacity to provide 6 complete air changes per hour with 21°C discharge air. The system shall be equipped with a modulating burner complete with stainless steel exchanger. A low discharge temperature shut down with no airflow alarm shall be provided in the system. Main heating units may consist of natural gas heaters using aluminized heat exchangers.
8. The vapour / air barrier shall be designed appropriately and inspected before closing in walls.
9. Boilers are to have each, an electronic LED hour meter and electronic LED counter installed independently of factory controls. Counter is to incorporate an external reset.
10. Each thermostat is to have local written identification via a lamacoid as to the unit it controls.
11. Boilers installed in facilities to be less than 750kW (2.6 BTUH). Unit heater units less than 117kW (400K BTUH).
12. No plumbing lines to be located over electrical service panels.
13. All plumbing lines to have adequate valve installation to allow for positive isolation without having to take majority of other services down to repair one small component.
14. No glycol or heating pumps suspended in mid-air. Maximum height not to exceed 1.35m off the floor.
15. Sump pumps, if required, are to be located in areas accessible for maintenance activities (e.g. Not in office spaces where workstations can be located on top of access panels).
16. All plumbing lines, valves, and so on are to be labelled/numbered and easily traceable from source to end service.
17. Facilities that are not tied into municipal supplied water (trucked water) must have above ground, dual tank water storage within shelter. This shelter is to be attached to the facility, heated and secure. In-ground water tanks will not be permitted.
18. Boilers / HVAC units are to have a waterproof lockable isolation switch within visual distance of equipment (all ratings).

19. Washrooms are to incorporate toilet paper dispensers and touch less towel dispensers in accordance with the Municipality's fit / finish standards.
20. Touch less water faucets, urinals and automatic toilet flush-o-meters are to be powered by building power, self-powered via solar or kinetic energy motion activated. Batteries are not acceptable.
21. Air filtration for heating/air conditioning shall not consist of dispensable rolled filters. High efficiency cartridge filters are to be installed.
22. HVAC exterior air filtration shall be incorporated before contact with coils/ ductwork.
23. Roof top units are to be avoided, in consideration of acoustics, fumes, aesthetics and maintenance. If roof top units are installed, they shall be set back 2.4m from the roof edge.
24. Air intakes for make-up air units / furnaces shall not be located above or near loading docks, parking lots or vehicle through-ways.
25. Submersible pumps shall have an emergency float control override in the case where a float control has become inoperable.
26. Provide back flow prevention and odour traps in floor drains as per applicable codes.
27. In-floor plumbing lines must be inspected prior to pouring concrete to verify that they meet code.
28. Air Exhaust systems shall be Hospital Grade and shall be directed away from neighbouring buildings.
29. Mechanical rooms require fresh air returns based on equipment requirements.

9.2.7 Compressed Air Systems

Where compressed air is used in a facility, the air system shall be complete with dual air compressors (one duty, one standby), receiver, dryer, controls, and all necessary appurtenances to supply dry air for all air-operated equipment. Each compressor shall be capable of continuously supplying air at a rate of at least twice the maximum anticipated consumption.

9.2.8 Potable Water Supply

1. A potable water supply line from the Municipality's distribution system shall be provided. Line size shall be determined by anticipated maximum demand and length of run but shall in no case be less than 50mm. Water for potable water pump stations may be drawn from the pump discharge line or other suitable supply point having adequate pressure. Where necessary, a pressure reducing valve capable of maintaining the service line water pressure between 350 and 700 kPa shall be provided. The water service shall be installed inside the building, as per the Alberta Environment Protection Standards and Guidelines.
2. The line supplying water for non-domestic uses such as cooling, gland sealing, hose bibs, and so on shall be provided with an approved reduced pressure backflow preventer. Water for domestic use shall be drawn from a point upstream of the backflow preventer.

3. At least 1 hose bib shall be provided in the wet well area (50mm), in the dry well area (25mm) and on the exterior of the station (25mm, frost free).
4. Where provision of a piped water supply is impractical because of distance or other considerations, potable water holding tank of at least 4500 litres (1000 gallons) capacity and corresponding distribution system shall be provided.

9.2.9 Sump Drainage

Where practical, subgrade facilities that may be exposed to contaminated fluids, such as pump station dry wells, shall be drained by gravity to a sanitary sewer. If gravity drainage is impractical, sumps shall be provided with two sump pumps (one duty, one standby). Pump capacity shall be at least 200L/min. Liquid discharged by the sump pumps shall be considered contaminated and shall be discharged only to a sanitary sewer or other approved wastewater disposal system. The floor shall drain towards the sump with a minimum slope of 1.0%. Pumps must be controlled by use of a mechanical float switch.

9.2.10 Aesthetics and Architecture

1. The Municipality shall be consulted regarding aesthetic and architectural style requirements for the site, to suit the character of the neighbourhood of community. If the site is visible to the public, special architectural treatments, signage, landscaping, etc. are required.
2. Mechanical plants shall be of masonry and metal construction.
3. The installation must conform to the Municipality's landscaping requirements.

9.2.11 Personnel Considerations

1. In larger mechanical plants, the Municipality may require offices, telephones, storage areas/rooms and workshop facilities.
2. Non-slip safety floors shall be used whenever possible (i.e. in mechanical rooms).

9.2.12 Lifting Equipment

1. Lifting equipment (cranes / hoists / I-beams / monorails) intended for the lifting and repair of operational equipment for transport on service vehicles shall have a capacity of 1.5 times the heaviest load anticipated, with allowance for impact. I-beams / monorails shall extend beyond the exterior of the building by a minimum of 2m, with sufficient distance and reach to directly load onto delivery vehicles. Doors shall be manufactured to accommodate the I-beams / monorail, with appropriate neoprene weather stripping. The lifting device to be centered over the equipment.
2. If an I-beam / monorail are not used, an engineered lift point must be installed so heavy equipment can be safely removed / installed from its location using a lifting device.
3. All lifting equipment to meet provincial (i.e. Occupational Health and Safety) and federal (i.e. Canadian Standards Association) standards.
4. Elevators shall conform to AEDARSA standards.

9.2.13 Security

1. Station design shall be such that the potential for vandalism is minimized. A chain link security fence complete with locking double gate shall perimeter the site. Adequate outside lighting shall be installed with light sensitive switches.
2. All external doors and access hatches shall be provided with security locks to a standard approved by the Municipality. Wherever possible, locate access hatches within the associated building structure. Intruder alarms for all entrance points shall relay to the Municipality's Central Control System.
3. Contact the Municipality for specific requirements for the keying of all locks.

9.3 COMMUNICATION TOWERS

This policy applies to all new communication towers greater than 15 m in height, within a 3 km radius of existing and proposed urban development and hamlet areas within the Regional Municipality of Wood Buffalo.

9.3.1 Policy

1. All applications for new Communication Towers shall comply with Industry Canada CPC-2-0-03 “Radio communication and Broadcasting Antenna Systems”, or the latest issued update thereof, as appropriate.
2. Further to requirements outlined in Industry Canada CPC-2-0-03, the Municipality may have additional public engagement and consultation requirements. Contact the Municipality for the most recent policy statements.
3. All Communication Towers also require approval from Transport Canada and NAV Canada.
4. In general, guy-wired towers will only be permitted in rural areas; new towers that are proposed in developed or developable urban and hamlet areas are to be free-standing.
5. All new towers must contemplate co-location between municipal communication requirements (SCADA, Emergency Services, Transit, etc.) and private telecommunication companies, as appropriate.
6. Communication Tower setbacks from highways and roadways shall meet TAC requirements.

9.3.2 Submission Requirements

1. All applications must include scaled engineering drawings, including the following:
    a. Location Plan, indicating the site location with respect to adjacent urban or hamlet areas and geographic features. Proposed tower location coordinates (latitude / longitude) and land ownership details are also to be included.
    b. Detailed site plan, including all existing and proposed features, in particular property lines and easements, top of bank setbacks, clearing limits, drainage courses, access roads, fences, buildings and structures and guy wire locations (as appropriate).
    c. Two perpendicular cross-sections clearly indicating tower height, antenna heights, and relative height of existing adjacent structures, trees and geological features.
2. All applications must include a Geotechnical Report.
3. Submit final record drawings to the Municipality to be attached to the appropriate property file.

9.4 WATER PUMPING STATIONS

9.4.1 Terminology

The Municipality uses pump stations to pressurize transmission and distribution mains as a means of conveying water to different locations at typically higher elevations that cannot be reached by gravity.

Pump Stations 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.

In locations where there is no reservoir, the pump station is referred to as a Booster Station. In these locations, the pump station operates in-line from a dedicated transmission main. Booster Stations connected to distribution networks are generally discouraged due to the potential for fluctuation in water pressure in the influent lines.

For clarity, pumping stations that handle sanitary wastewater are referred to as Lift Stations.

9.4.2 Hydraulic Design Parameters

1. The need for a pumping facility shall be determined during preliminary discussions between the Developer and the Municipality. The Developer should refer to the latest version of the Water Master Plan.
2. The design flows and pressures for water pumping stations shall be based on parameters and computation methods outlined in Section 7 – Water Distribution Systems.
3. The design period for sizing pump stations shall be 25 years minimum. If the initial capacity of the proposed stations is to be less than the 25-year design capacity, the station shall be designed so that the capacity can be easily increased in stages when required without 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 current edition of the Hydraulics Institute Standards.
2. Minimum submergence shall not be less than the pump manufacturer's recommendations.
3. 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. Provision shall be made to allow over-pumping or bypassing the pump station.

9.4.4 Pump and Driver Selection

1. Service pumps shall be vertical turbine or horizontal split case centrifugal pumps. Fire pumps shall be FM/UL approved, unless otherwise approved in writing by the Municipality. Pump shafts and line shafts shall be stainless steel.
2. Pumps shall have their maximum efficiency within the normal operating range. Maximum pump speed shall be 1800rpm. Slower speed pumps are preferred where available. Spare parts as recommended by the pump manufacturer shall be provided.
3. Pumps shall be variable speed or soft start. Service pumps shall be driven by open drip proof, NEMA Design B, CSA approved electric motors with 1.15 service factors in rush current with the power utilities. Fire pumps shall be driven by diesel engines or standby diesel generators with an exterior fuel tank and interior day tank.
4. Service pumps shall be sized so that the station can meet the peak hour demand with the largest pumping unit out of service. High flow pumps shall be sized for the fire flows given in Section 7. Jockey pumps can be utilized to meet average day demands.
5. In-line booster pumps may be canned vertical turbine or horizontal split case pumps. Vertical turbine pumps with threaded suction connections may be considered for in-line booster pumps if the inlet arrangement complies with the pump manufacturer's recommendations.
6. 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.
7. Intermittent type pumping systems including pumps, bladder type pressure tanks may be used when the average flow is less than 0.25 L/s.

9.4.5 Valves and Fittings

1. Magnetic type meters shall be installed on all discharge headers.
2. Check valves shall be installed in each pump discharge line between the pump and the discharge isolating valve. They shall be the tilting disc type with dashpot controlled closing or globe style silent checks. All pump discharge check valves will have an external arm to allow for position monitoring with a proximity style limit switch.
3. Isolating valves shall be installed on each pump suction and pump discharge line. They shall be AWWA Standard C504-06 short body flanged butterfly valves. In booster stations, isolating valves must be provided 10 diameters upstream.
4. Motorized or hydraulic pump control valves shall be installed to reduce water hammer during pump start and stop. 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. Air 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 adequately supported, tied down by commercially available supports or concrete pillow blocks, spaced in accordance with the manufacturer's design data and 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. The isolating valve shall allow the facility to continue to operate during removals.
8. Process pipe material shall be type 304 stainless steel or AWWA C900-81 PVC where PVC will meet lifecycle functional requirements. Epoxy coated ASME B31.3 A53 standard wall, carbon steel process piping shall only be permitted if exceptional circumstances preclude use of other materials.
9. Pipework may be painted, and colour coded to WHMIS Standards and the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Facilities.

9.4.6 Chemical Systems

1. The need for a chlorination system will depend on circumstances and shall be determined during discussions between the Municipality and the Developer. Where a chlorination system is deemed necessary, the installation shall in all respects comply with recommendations given in the "Chlorine Institute Manual" and with the requirements of the Municipality.
2. The need for additional systems to feed other chemicals will arise on relatively rare occasions. In such cases, the installation(s) shall be as required by the Municipality and as recommended by the equipment supplier(s).
3. Refer to AEP Guidelines for chemical containment and for design of chemical storage facilities. Occupational Health and Safety requires safety showers when operators are exposed to hazardous chemicals.
4. Chlorine injection systems to meet AWWA B300-18. Chemical systems meet to meet all OH&S requirements not just safety shower & eyewash.

9.4.7 Prefabricated Pumping Stations

The use of prefabricated pumping stations is not acceptable.

9.5 TRUCK FILL STATIONS

Truck fill stations are required for rural and regional water supply systems that rely on truck haul. The Municipality will only approve new truck fill stations if it can be demonstrated that a piped water supply system would be cost prohibitive. The cost-benefit analysis must take into consideration the cost of trucking over the life of the project, and the socioeconomic costs of truck traffic on local roads.

For rural communities, consideration shall be given to incorporating the truck fill into the local pump station and reservoir site.

9.5.1 General

1. The truck fill supply shall have a minimum pumping capacity of 1,000 L/min to minimize the truck fill time. If required, separate supply shall be provided for barrel (portable container) fill supply. All water supplied from the fill points shall be metered independently from the distribution system supply.
2. An exterior overhead truck fill arm shall be provided minimum 5.2m from ground level to centre of arm and project a minimum distance of 2.5m into the drive lane.
3. The design shall be such that there will be no cross-contamination during or after filling a truck or barrel. At minimum, an air gap is required.
4. A “Computrol” card lock system shall be provided to activate the fill station.
5. Truck filling stall shall have heated pads and positive drainage. System shall have provisions to protect against chlorinated water leaving the site. Truck fill must be suitable for temperatures of -50 to 40 C
6. Suitable drainage will be provided to accommodate overfill, and proper access to the station will be provided.
7. Complete signage indicating fill station, coinage rates (if applicable), and safety precautions shall be provided.

9.6 WATER RESERVOIRS

9.6.1 Hydraulic Design Parameters

Reservoirs are provided in a water supply system to satisfy the following criteria:

- To balance hourly or daily peak demand variations.
- To provide storage of water to meet fire flow demand.
- To maintain supply in the event of a source failure.

The storage volume required to balance peak daily flow variations shall be determined from analysis of the daily demand variations.

The storage volume to meet fire flow demands shall be assessed in accordance with the recommendations contained in "Water Supply for Public Fire Protection - A Guide to Recommended Practice" published by the Insurance Bureau of Canada.

The storage volume required to maintain supply in the event of a source failure shall be determined from considerations of the reliability of sources and the consequences of supply failure. Generally, a storage volume of the peak day demand plus fire demand is considered acceptable but each case should be individually determined.

1. **Demand** - The total system demand shall be determined as outlined in Section 7 of these Standards. Future demands shall be determined from consideration of past trends and known planned developments.
2. **Design Period** - The design period for reservoir sizing shall be a minimum of 25 years.
3. **Optimum Location** - The optimum location for a reservoir is between the supply source and the distribution system to ensure that all stored water is in a fresh condition. In addition, locating reservoirs as close as possible to the centre of demand, to minimize the size of distribution mains, is recommended.
4. If topography permits, reservoirs shall feed the distribution system by gravity, subject to maintaining a minimum system pressure during peak demand of 280 kPa.
5. Connection to Distribution System - The outlet main from the reservoir should be sized to pass the peak hourly flow or peak day flow plus fire flow - whichever is greater.
6. Where reservoirs are located within the distribution system, a combined inlet/outlet main may be used. However, separate metering of flows is required, and short circuiting is to be prevented.

9.6.2 Operating Philosophy

1. **Gravity Feed** - Gravity feed reservoirs shall be constructed where local topography permits their location at a sufficient elevation to adequately pressurize the distribution system. These offer the advantage of not requiring a separate pumping plant sized to meet peak hourly flow demands.
2. **Pumped Feed** - Where it is necessary to pump from the reservoir into the supply system the pumps shall be sized to meet the peak day flow, plus fire flow or peak hour whichever is greater, and the pump station shall be designed in accordance with Section 7 and Section 9.
3. **Stagnation** - The design of reservoirs shall be such that stagnation caused by the retention of water for long periods is minimal.
    a. The reservoir inlet shall be located at the opposite end as the outlet to ensure adequate turnover. In addition, the use of baffles or barrier walls is to be utilized to ensure water circulation.
4. **Fill Control** - All reservoirs shall be equipped with an electric operated control valve located on the inlet main. The valve shall be designed to close when the reservoir level is 150mm below overflow level.
    a. Where it is required to maintain a minimum upstream pressure within the fill line, a mechanism will be added to the valve to achieve this.
    b. All fill control valves shall be sized in accordance with the manufacturer's recommendations.
5. **Isolation** - All inlet and outlet mains shall be fitted with valves to permit isolation of the reservoir. The reservoir shall be divided into two or more sections and the pump wet well into two sections to permit cleaning of one section while maintaining service to the distribution system, unless approved otherwise by the Municipality.

9.6.3 Reservoir Types

The following are acceptable reservoir types:

1. Buried reinforced concrete
2. Circular pre-stressed

The optimum form should be determined for each application, taking into account serviceability, maintenance, and economic considerations.

Other types may be considered if they can be used to advantage in a particular situation.

9.6.4 Structural Considerations

1. **Foundations, Geotechnical Evaluation** - A detailed geotechnical evaluation shall be carried out at each proposed reservoir location by suitably qualified and experienced geotechnical consultants. The reservoir foundations and yard piping shall be designed and constructed in accordance with their recommendations.
2. **Structural Design** - Structural design shall be in accordance with CSA CAN3-A23.1, CSA CAN 3-A23.2, and CSA CAN 3-A23.3. Reference may also be made to BS 337 "The Structural Use of Concrete for Retaining Aqueous Liquids," published by the British Standards Institution.
3. **Under Drainage** - A 150mm weeping tile drain shall be provided around the entire perimeter of the reservoir at a minimum depth of 500mm below reservoir floor level. The effluent from the drain shall be disposed by gravity or pumping to prevent surcharging of a weeping tile drain.

   All exposed above-grade surface shall have insulation equivalent to at least RSI-7 steel clad to protect the insulation and include electrical heat tracing cables. Below grade surfaces with less than 0.6m of earth cover shall have insulation equivalent to at least RSI-3.5.
4. **Construction Joints** - All construction joints located beneath overflow level shall be cast with integral extruded ribbed PVC waterstops of approved size and manufacture. Waterstops shall be continuous with pre-welded corner and intersecting pieces.
5. **Environmental Impact** - The environmental impact of the reservoir at the proposed location shall be carefully considered and a consultation with all relevant authorities and affected parties will be conducted to achieve an acceptable appearance to all structures. The site shall be landscaped as required by the Municipality.

9.6.5 Other Considerations

1. **Drawdown/Drainage of Reservoir** - Provision shall be made to permit the drawdown or drainage of the reservoir with discharge to a suitable surface drain or stream. The reservoir floor shall have a minimum slope of 1:400 to the drain pipework or sump. Vacuum breakers shall be provided.
2. **Overflow** - The reservoir shall be provided with an emergency gravity overflow system designed to pass the maximum possible reservoir inflow rate. The overflow system shall be protected against ingress by insects, birds, or small animals and backflow from storm system by using a check valve placed in a location where it is accessible and serviceable.
    a. The overflow system shall discharge into a suitable surface drain, stream, or soakaway capable of accepting the discharge flow at all times.
3. **Venting** - Each reservoir cell shall be provided with air vents sized at a rate equivalent to one 100mm diameter vent per 1000m3 of reservoir capacity.
    a. Where possible the vents should be designed to discharge within any associated pumphouse.
    b. All vents shall be fitted with insect screens.
4. **Instrumentation** - All reservoirs shall be provided with an ultrasonic type level indicator/controller. In critical applications, a float backup may also be required.
    a. The discharge pipe and the fill line shall be provided with a magnetic type flow meter to balance consumption flows.
    b. Where pumps are provided to draw directly from the reservoir, low level shutdown controls shall be provided.
    c. Where a reservoir is required to provide fire storage in addition to normal balancing storage, controls shall be provided to prevent depletion of the fire storage by normal system demands.
    d. For additional instrumentation requirements, refer to Section 9.2.5.
5. **Testing** - For testing of reservoir, refer to Section 11.
6. Reservoir and Pumphouse design to include accessibility for underwater maintenance.
7. Each water storage cell shall have sump to collect water when draining the storage cell.
8. Reservoir cells shall be arranged so they can be isolated without the need to shut down the pumphouse when a single water storage cell is taken out of service.
9. Design shall include a 100 mm sample port into each clearwell.
10. The reservoir access hatches shall have curbs.
11. Buried reservoir roof cover shall have positive drainage away from the roof to mitigate the potential for water to collect on top of the buried reservoir roof.

12. Operation controls shall include dual pressure transmitter, turbidity, and total chlorine. The telemetry from these instruments shall be connected to SCADA and site landline alarm dialer.
13. Each reservoir cell shall have float style level indicator transmitters (LIT) to annunciate low low level conditions.
14. Pump stations in the urban centre shall have can style vertical turbine pumps.
15. Pressure sustaining valve is recommended with a service 50mm or larger.

9.7 SANITARY SEWAGE LIFT STATIONS

9.7.1 General

The Regional Municipality of Wood Buffalo has established specific design criteria for sanitary lift stations. Contact the Wastewater Branch of the Environmental Services Department for further information.

1. All lift stations shall be designed with a wet well/dry pit configuration as illustrated in Drawings 9-100 to 9-102. The dimensions of the facility are scalable based upon the physical size of the process and building equipment that needs to be placed inside the facility, as well as the required gravity inlet depth and wet well sewage storage requirements.
2. Lift Station name to be approved by the RMWB Wastewater Branch of Engineering and Environmental Services. Lift Station name should be representative of the location.
3. All tags shall be lamacoid standard black lettering on white background, not metal.
4. A list of all spare parts included in the specifications is to be provided to RMWB maintenance prior to tendering.
5. Allow a minimum of 2 weeks for each design review in the design schedule.
6. Pre-Design report to be provided for RMWB approval before commencing with the Detailed Design.

9.7.2 Hydraulic Design Parameters

The need for a lift station shall be determined during preliminary discussions between the Developer and the Municipality. Lift stations with flows less than 50 L/s should be avoided. Lift stations will not be permitted if a gravity main of reasonable depth can be used.

The design flow shall be based on the parameters and computation methods described in Section 5 - Sanitary Sewer Systems.

The design period for sizing lift stations shall be a minimum of 25 years. Growth projections shall be determined during discussions between the Developer and the Municipality. If the initial capacity of the proposed pumps is to be less than the 25-year design capacity, the station shall be designed so that the capacity can be easily increased when required without significant changes to the existing structural, architectural, mechanical, electrical, or instrumentation systems.

9.7.3 Influent Structures

1. Detailed engineering calculations are to be provided in the Pre-Design Report, outlining the sizing of the wet well per the following requirements of this section.
2. Wet well shall be designed in accordance with the current edition of the Hydraulic Institute and the recommendations of the pump manufacturer.
3. Sizing of the wet well shall be determined after consideration of all relevant factors, including average day, peak dry hour and peak wet weather flow, pump cycle time, pump capacity, and storage capacity. Pump starts per hour not to exceed 15. In general, the usable wet well volume should be at least equal to two (2) minutes of maximum pumping capacity.
4. Total retention time in the wet well and force main shall be kept to a minimum (generally less than four (4) hours) to avoid anaerobic fermentation and the resultant production of odourous, hazardous and corrosive gases. Otherwise, provisions must be made to control anaerobic conditions such as odour control. It is desirable to have a wet well with sufficient active volume so that all sewage within the discharge force main will be replaced during one pumping cycle, especially if sags exist in the force main profile.
5. Only one sewer connection shall be provided into a wet well to convey sewage from the collection system. 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. Appropriate stubs shall be provided for future connections. The inlet sewer shall be sized to accommodate the maximum lift station design capacity. The inlet manhole shall have high level monitoring which is connected to the Programmable Logic Controller (PLC) and Supervisory Control and Data Acquisition (SCADA) system for annunciation.
6. Excessive entrainment of air in the flow stream entering the wet well should be avoided to prevent entrained air from reducing pump performance or causing loss of prime. Provisions necessary to address this may include drop tubes inside wet wells of small facilities, grade adjustments or a drop manhole upstream of the lift station. Influent flow shall not enter the wet well at an elevation lower than the normal high liquid level for the ultimate design capacity flow rate.
7. An influent shut off valve shall be provided on the inlet to the wet well so that inflow to the wet well can be stopped. A shut off valve or slide gate shall be installed in the lift station. The shut off equipment shall be of a type and materials for raw sewage service. Provisions must be made for operating the influent shut off valve from the main floor of the operating room.
8. Wet well shall be designed so as to minimize dead areas where debris may accumulate. Benching is required with a minimum slope of 1:1 in the direction of the suction inlets. The cross-sectional area and shape of the wet well above the benching is to be constant.

9. Suction inlets shall be of the bell-mouth (flared) type to minimize vortexing and accumulation of solid material. To minimize dead storage volume, the depth from the “pump off” level to the floor of the wet well shall be kept to a minimum. The required depth will be dictated by suction pipe inlet conditions, pump manufacturer’s requirements, net positive suction head, priming requirements and vortex control.
10. If a grinder is deemed necessary by the RMWB at the time of design, it will be installed in the main channel, otherwise make provisions for the future installation of a grinder. There must be provisions within the inlet channel arrangement to isolate and bypass the grinder. The bypass must be fitted with provisions for manual screening, drying and debris removal.
11. Inlet channel shall be inclined and have benching sufficient to maintain minimal hydraulic velocity and regular scouring velocity in the channel.
12. One removable extrication pipe shall be installed in the wet well with a camlock for sucking out the grit from wet well sump.
13. The dry pit sump pump discharge pipe shall be installed above HWL and have a quality check valve.
14. Overflows to storm drainage sewers, storage facilities, natural water courses or surface outfall points are not permitted.
15. The critical flood line shall be identified in drawings and permanently marked on the walls of the wet well. The critical flood line is defined to be the water level at which surcharge in gravity mains will result in sewer backup into utility service customer’s property.

9.7.4 Civil Site

1. Consideration shall be given to the location of lift stations relative to existing or proposed adjacent development, in order to minimize the aesthetic impacts in terms of visibility, odour and noise. The location of lift stations in the immediate proximity of school sites and playgrounds shall be avoided.
2. Lift stations are to be located outside of the limits of any area subject to surface ponding or inundation by surface water flow during major runoff events, so that they are accessible in all weather conditions. The building finished floor is to be a minimum of 300 mm above the 1:100 year flood elevation and 1:5 year major drainage flood elevation. The building is to be designed to remain in operation during a 1:25 year rainfall event.
3. A paved road shall be provided to the site, with extensions as appropriate to provide access for maintenance vehicles, the electrical transformers, and for the removal and delivery of station equipment.
4. The lift station parking lot shall be paved. If deemed practical cover site with gravel to allow ground to settle, then pave within 2 years of commissioning of station.

5. The parking lot geometry shall meet the following two requirements:
    a. The site is to be designed so that a HSU Tridem vehicle (8.5 meter wheel base 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.
    b. The parking lot shall be designed so that a 3-ton flatbed service truck can back up to the service doors and park perpendicular to the door. Truck access needs to be flat.
6. Two parking stalls suitable for ½ ton trucks shall be provided. The location shall not expose the users of the parking stall to public road traffic while in or around the vehicle.
7. Bollards are to be installed on the door apron to protect against damage from vehicles backing into the building. The bollards shall not inhibit vehicle access to the doors for equipment removal.
8. All lift station sites shall be fenced. Fences shall typically be zinc coated industrial grade steel chain link security type and material shall conform to the Canadian General standards Boards Specification CAN 2-138.1.1 and 2. Fence height shall be 2.4 m in overall height.
9. The fence shall have a double swing gate for entry of vehicles and an additional man gate. All gates shall be lockable with an RMWB supplied lock. Gates shall be located far enough off the street to allow for a ½ ton truck to park off the street when the gate is being opened.
10. Landscaping is required where the proximity to residential areas, public lands or other uses dictates the need for screening to conceal the facility and/or to make it blend into the surroundings or to enhance the appearance.
11. Further details for the landscaping requirements for facilities are detailed in Section 10 of the Engineering Servicing Standards and Development Procedures and RMWB bylaws.

9.7.5 Architectural

1. The lift station shall be designed with the following area designations:
    a. Operating Room (over wet well)
    b. Wet Well Platform
    c. Wet Well Sump
    d. Pump Room
    e. Electrical Room
    f. Washroom
    g. Meter Platform
    h. Dry Pit
    i. Generator Room

2. The generator room shall be independent from the electrical room. The operating room is to be covered by the building envelope. There must be provisions in the lift station structure to securely store site specific spare parts and operational storage. A steel storage cabinet is to be located in the generator room. Wall space must also be provided for lockout board station, broom, mop, and squeegee.
3. The operating room, wet well platform and wet well sump will be separate from all other areas complete with separate entrance from outside.
4. All heating and ventilation equipment and valves are to be housed in the building.
5. Brick work shall be full split face and shall have two (2) coats of clear graffiti sealant applied to the outside face only. Bricks shall be grey, or a colour approved by the RMWB. Interior walls shall be painted white.
6. Building shall be insulated with an R 30 factor for walls and an R 40 factor for roofs or according to the National Energy Code of Canada for Buildings, whichever is more stringent.
7. Lift station roofs are to be peaked roofs. The roof shall be standing seam metal roofing with a manufacturer stated minimum 25-year service life. Wooden truss roof structure and ceiling is preferred, but other roofing systems may be acceptable.
8. Roofs, flashing, soffits, downspouts and exterior doors shall be colour “Energy Blue” or an equivalent colour approved by RMWB. Down spouts shall have splash pads installed under the outlet.
9. Roof penetrations are undesirable and venting penetrations shall be made through walls as codes and regulations permit.
10. Doors shall be heavy duty tamper resistant insulated hollow metals doors complete with high quality door seals, where one leaf of double doors is pinned at the top and bottom. Doors shall be located so that open doors do not unduly inhibit access walkways. Use Medeco locks on exterior doors.
11. The Pump room shall be provided with an insulated roll up door that will accommodate the removal of pumps and other equipment from the building.
12. Run a conduit from the PLC to the site perimeter fence gate to accommodate power and controls for security and swipe card system.
13. Lift station shall have one 600 mm by 3000 mm or as specified, seamless aluminum panel of 3mm thickness on a 50mm x 50mm x 6mm aluminum tube frame with square corners. The panel colour shall be Charcoal Grey (Benjamin Moore Graphite 1603) matte finish, high quality outdoor paint for metal surface or similar. Lettering to be 6mm thick brushed aluminum cut-out letters, matte finish, 100mm for Large lettering and 64mm for small letters or as specified. Lettering font shall be Avenir LT Std. Sign shall include RMWB logo 460mm wide or as specified. Pin mounted letters and log, frame mount as required. Sign shall be located on the side of the building that faces the driveway.

9.7.6 Structural

1. Both the dry pit and the wet well shall be equipped with stairs and safety landings regardless of the space classification, including minimum 2100 mm headroom. Stairways shall be sized to allow for emergency services to attend to and remove stricken personnel from the space the stairway is servicing. Wet well stairs will stop at the wet well platform and an extendable ladder will be provided from the wet well platform down to the floor of the wet well sump.
2. Wet wells shall have a platform located above the sewage inlet to allow access to the wet well for inspection, repairs and maintenance. Platform grating shall have removable sections to allow for the removal and servicing of wet well equipment and cleaning. Cut-outs in platform will include sections for level bulbs, level sensor, hydrovac hose access for clean out of sump, grinder removal and ability to wash down wet walls. Cut-outs to be covered with removable or hinged section if hole is a tripping hazard or large enough to step into.
3. Stairs, ladders and platforms are to be constructed from FRP material with stainless steel fasteners. As with any ancillary structures inside the lift station, these installations are not permitted to unduly restrict walkways and access for operation and service of equipment. FRP grating to be clipped or secured in place to ensure that it does not float if station is flooded. The perimeter sections of grating are to be hinged to facilitate cleaning below the grating.
4. There shall be handrails around all openings and hatches that present a fall safety hazard. The handrails around hatches shall be removable with a swing gate on one side.
5. Dry pits shall be equipped with a sump covered with removable grating. A keyway trench is required at the base of the walls that is sloped to direct liquid to the sump.
6. The dry pit layout shall be such that all equipment and valves are easily accessible. There shall be a minimum 1 m horizontal clearance on two sides and 1 m vertical clearance. Vertical clearance between monorail and floor shall take into consideration height of future equipment, truck bed and hoist. Sufficient clearance room must be provided around piping to allow access to flange bolts and a laydown area next to equipment.
7. The pump removal monorail shall be an extendable type and shall extend minimum 1 meter beyond the building exterior wall.
8. Lifting hook or eyelet to be installed over heavy equipment such as valves to allow maintenance to secure a strap to support equipment during removal.
9. Hatches are required in floors to facilitate removal of equipment and materials from spaces below ground floor level. Hatches shall be flush design, and no hatch appurtenances shall protrude above the finished floor. Hatches shall have a latch that securely fixes the device closed. Hatch openings in the electrical room and operating room shall have a secondary safety grate that is closable separate from the main hatch. Hatches shall be made of aluminum and shall be designed to withstand the loads they are likely to encounter during their service life in the lift station, such as a sewage grinder.

10. An engineered fall arrest system is required at any floor penetrations or fixed ladders where there exists a fall hazard over 10 feet or a hazard exists that could cause injury.
11. All subsurface structures will be made of cast in place concrete with appropriate additives to protect against water seepage and sulfate attack. The wet well surface shall receive a two-part white coating specifically designed to protect concrete from the deleterious effects of sewage.
12. Concrete floors shall be treated with Lithochrome colour hardener in “Platinum Grey” colour or an equivalent colour approved by RMWB, and non-slip surface.
13. All floor and walkway surfaces should have an adequate slope to a point of drainage.
14. Lifting Equipment:
    a. Lifting Equipment to be per Section 9.2.12 unless specified differently here.
    b. Permanent hoist equipment shall be provided to permit the removal and/or replacement of sewage pumps and grinder.
    c. The capacity of all lifting equipment shall be clearly posted on the equipment. Eyebolts in the walls and ceilings shall be provided for rigging chain hoists or come-alongs.
    d. Powered hoist is required, and manual gear driven trolley is acceptable except for applications where anticipated operation is less than annually. In such cases, a manual hoist is acceptable. Rust resistant chain hoists complete with chain baskets are required over cable hoists.

9.7.7 Pumps

1. A minimum of 2 pumps are to be installed in the station. When only 2 pumps are installed each must be capable of meeting the maximum design flow. For larger stations, the number of units should be selected so that the range of inflow can be met without starting and stopping pumps too frequently and without requiring excessive wet well storage capacity.
2. Sewage pumps shall be of the centrifugal, non-clog type and shall have been designed specifically for use with wastewater. Pumps must be self-priming and include a method for removing air from the system.
3. Pumps shall have their maximum efficiency within the normal operating range. Maximum speed shall be 1800 rpm, with lower speeds preferred where possible. Pumps shall be constant speed, drip proof, squirrel cage motors, unless operational, maintenance, or economic advantages would result from the use of variable speed drives. Motors shall be sized to handle the maximum load anticipated under adverse conditions.
4. Pumps shall be sized so that the station is able to handle the maximum anticipated flow with the largest pump out of service.
5. Pumps must be engineered to be removable without dewatering or entering the wet well. Full details of the proposed pumps and station layout shall be submitted to the Municipality for approval.

6. If seal water is used for the sewage pumps, the dry pit sump pump shall be sized to handle the maximum sewage pump seal water discharge flow rate which would occur in the event of a pump seal failure.
7. Acceptable Products: Additional standards are available from Wastewater branch.

Product	Acceptable Manufacturer(s)
Sewage Pumps	Flygt N-series
Sump Pump	Flygt

9.7.8 Piping, Valves and Fittings

1. All bolts, nuts, other fasteners, and piping used in the wet well areas shall be stainless steel. Washers and bushings to be used if fasteners used on a dissimilar metal.
2. Piping shall be sized to give average velocities of between 0.76 and 1.5 m/s in the suction piping and between 0.9 and 2.5 m/s in the discharge piping. Future capacity increases shall be considered when sizing piping. Recirculation pipes shall be provided for aeration and suspension of grit and solids in the wet well. Sewage from the discharge header will be piped to the wet well and discharge near the bell mouth suction. Valves on recirculation piping will be manual and normally closed.
3. The wet well shall be equipped with a fixed pipe where one end terminates above the wet well platform, and the other end terminates on the exterior of the operating room. This pipe will facilitate regular extrication of solids from the wet well by a hydrovac truck without having to extend hoses into the wet well. Both ends of the pipe shall be equipped with 100 mm Camlock connections and caps. It shall also have a removable extension that extended into the wetwell active water zone.
4. Provision for pumping into a hydrovac truck will be provided by a pipe off the discharge header to outside the building complete with isolation valve, 100 mm Camlock, cap and drain valve.
5. The minimum diameter of piping for all pump suction and discharge piping shall be 100 mm nominal except for the flow meter which is to be sized based on design flow.
6. Each pump shall have its own suction line from the wet well.
7. Suction lines require a wall casting with flanges on both sides of the concrete wall and a water stop cast into the wall. Suction lines shall be kept as short as possible and shall incorporate an isolating valve. Valve design shall be such that the interior is free of obstructions which could accumulate debris that may prevent tight shutoff.
8. Pipe material shall be steel, AWWA C-200-05, standard wall thickness. Pipes located in the wet well shall have the exterior surface of the pipes and fittings coated both internally and externally with coal tar epoxy, and in the dry pit with polyethylene or epoxy type coating. Schedule 10, 316 stainless steel process piping is acceptable if it meets the pressure requirement of the facility. All flange bolts within the wet well shall be stainless steel.

9. 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.
10. Discharge lines shall be designed to withstand the maximum pump discharge pressure, plus anticipated surge pressure. Pressure rating for piping within the lift station shall have a minimum pressure rating of 900 kPa.
11. Flush connection shall be located on each pump discharge with a 25 mm ball valve and Camlock.
12. The sump pump is to discharge into the wet well at a point above the maximum high-water level. A check valve shall be provided in the discharge pipe to prevent backflow of wastewater into the sump.
13. Refer to Xylem design recommendations to reduce vibrations from piping.
14. Piping within the lift station shall be labeled and colour coded per Alberta Environment & Parks Colour Code Standard. Pipe service and flow direction to be clearly marked with pipe markers.
15. In general, isolation valves over 100 mm in diameter shall be full port plug valves with a top mounted wheel operator. Valves smaller in diameter shall be ball valves with a handle operator.
16. Shut off valves shall be included on the discharge lines from each pump between the check valve and discharge header. This shall allow isolation of each pumping unit and check valve for repair or replacement.
17. Non-slam flapper check valves to be installed horizontally on pump discharges. Limit switch is required on valve to identify when valve is open.
18. Combination air valve is required on the force main discharge header. Air relief valves shall be provided at all high points on the discharge piping.
19. Drain valves shall be provided at all low points with a 50 mm camlock to connect a hose to drain to the sump.
20. Flexible connections must be installed at key locations in the pump discharge piping and discharge header to protect the equipment and structure from premature failure. Install between pump discharge and isolation valve and after flow meter run before leaving station. Flexible connections to be non-metallic and accessible for maintenance.
21. Victaulic couplings shall be installed around the discharge check valves and flow meter.
22. Provide a flanged wye after the discharge header for launching pigs for cleaning of the force main.

9.7.9 Building Mechanical

1. Ventilation shall be provided to all rooms as required by applicable regulations and building codes. Separate ventilation systems shall be provided for areas with a different hazard rating, such as wet and dry wells. Where ductwork is required to penetrate walls separating wet and dry well areas (rated and derated), an automatic shut-off damper shall be provided to prevent migration of hazardous gases when the air system is not operating.
2. A general requirement of the HVAC system is that it must return to service automatically following a power interruption.
3. Noise from HVAC shall not exceed 42 db(A).
4. Suitable equipment shall be installed to provide for continuous ventilation. Refer to the NFPA 820. The system shall be configured to revert to lower air volumes as allowed by NFPA 820.
5. As H2S is heavier than air, the fresh air, heated and thermostatically controlled, shall be forced into each area at a point higher than and sufficiently separated from the exhaust. The exhaust shall be 150 mm above the floor in dry pits and 150 mm above the high-water level in wet wells. In wells with a depth greater than 4.5 m, consider multiple inlets and outlets in the design.
6. HVAC make up air units (MUA) shall alarm upon unit failure and the alarming shall be connected to the facility PLC and control system SCADA.
7. Mechanical dampers, louvers, ventilation, exhausts shall be arranged to minimize the impact to neighbouring properties.
8. Provision shall be made to detect and actuate an alarm if the ventilation system should fail. A buzzer shall be located inside the building and a red pilot light shall be located on the outside of the building. This alarm shall also be connected to the overall lift station control system for annunciation.
9. Heating systems shall be designed to minimize heating costs. Consideration shall be given to the use of high efficiency furnaces or makeup air units and the provision of heat recovery units to recover waste heat from exhausted air. The entire facility shall be designed considering energy conservation. The HVAC heating and ventilation equipment must be placed to allow for ease of service without the use of portable ladders or other temporary facilities. Fixed ladders with tie off points above ladder to be provided as required.
10. Special care must be taken in placing the heaters and directing ventilation to mitigate the buildup of ice around the exterior doors in the wintertime.
11. Unit heaters must be located to facilitate regular servicing. The units must be electric and sized so that they will prevent the facility from freezing should the primary makeup air unit (MUA) heating unit fail.
12. A potable water service shall be provided for the washroom and hose bibs. There shall be no physical connection that might under any circumstances cause contamination of the potable water

supply. Backflow prevention and cross-connection control shall comply with the most current National, Provincial and Municipal regulations. Water meter will be supplied by the RMWB.

13. The water heater in the facility may be a gas fired tankless unit. Water heater location must accommodate ease of operation, service, and maintenance. Electrical water heaters are not permitted.
14. Service water is to be supplied to both the wet well platform and the dry pit c/w 50 mm diameter hose bib, local check valve, and a wall mounted hose hanger. A pressure sustaining valve may be required in areas of low average day flow due to risk of dropping pressure too quickly in the distribution main.
15. Running trap or trap primers to be provided for floor drains.
16. Acceptable Products:

Product	Acceptable Manufacturer(s)
Make Up Air Unit	Engineered Air
Modulating Actuator	Belimo
Temperature Controller	Johnson

17. Gas detection shall be provided as follows: LEL and H2S in dry and wet well, CO in generator room with beacons inside respective rooms. Color as follows: Green-normal operation, Amber-general fault, Blue-H2S. Red-all other conditions.

9.7.10 Electrical

1. All electrical equipment and wiring located within the wet well shall be Class 1, Zone 2 as per the Canadian Electrical Code. The required voltage for lift station pumping gear is 600 VAC, with 240 VAC and 120 VAC for the stepped down voltages.
2. The Motor Control Centre (MCC) and lighting panel shall be equipped with minimum 20% spare capacity.
3. Electrical design shall minimize Arc Flash exposures where possible.
4. Electrical equipment to be labelled with Arc Flash & Shock Hazard according to the RMWB Electrical Safety Program and CSA.

5. A diesel generator is required for emergency backup power.
    a. The diesel 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 12 hours without refueling.
    b. Backup generator shall be equipped with louver controls (fresh air, outside vent and re-circulate) and automatic transfer switch. Generator shall be sized to accommodate future loads according to the pumping capacity staging plan.
    c. The generator shall be designed to power the full building loads and all duty pumps running concurrently. The fuel tank must have both a manual fuel indicator on the tank, and a fuel indicator that is connected to the lift station control system that can alarm at a pre-set low level.
    d. The generator power transfer switch shall be designed to automatically power the facility when line power is lost, and automatically return to line power once it returns.
    e. 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 level indication. The fuel fill cabinet shall be located to allow for a fuel truck to park within 5 meters of the cabinet, and there must be a sidewalk or parking lot available to access the cabinet.
    f. Generator exhaust silencer shall be “Hospital Grade” where generator engine exhaust noise is abated by no less than 40 dB(A). The noise level from the generator shall not exceed 104 dB when measured 1 meter from the generator engine inside the building. The noise generated by the lift station when measured at any point 3 meters from the building shall not exceed 80 dB and at the property lines shall not contravene the RMWB noise bylaw.
6. Main pump motors shall operate on 600-volt, 60 Hz, 3 phase power. Pump drives shall be equipped with appropriately sized harmonic power filters for all process pumps. Pumps shall be powered by constant speed drives complete with pilot lights (run, fault), hour meters, amp meter and Hand-Off-Auto switch. Soft starter shall be supplied for each pump drive.
7. Pump power and control cable junction box shall be located above the highest anticipated flood elevation in the dry pit but remain accessible. Junction boxes may not be located below the flood elevation. 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. There shall be an Emergency Shutoff in a location that is visible from the pumps but not below the flood elevation.

8. 120 V receptacles shall be provided as a minimum at the following locations:
    a. Generator Room
    b. Electrical Room
    c. Pump Room
    d. Meter Platform
    e. Dry Pit
    f. Operating Room (explosion proof)
    g. Outside building by doors
9. Lighting
    a. All lighting shall be Light Emitting Diode (LED).
    b. Lighting in the operating room/wet well side shall be explosion proof.
    c. The wet well and dry pit design lighting level shall be 1000 lux. Lights must be fast return to on, and fixtures must be installed above the anticipated flood level, and accessible for service.
    d. One light shall permanently stay on and be located by the entrance in both the operating room and electrical room.
    e. Emergency backup lighting shall also be provided. Emergency backup wall packs shall be connected to their respective room's lighting circuit. Emergency lighting shall be on a dedicated circuit(s) with no other connections.
    f. Exterior lighting shall be provided on all 4 sides of building. Lights by building entrance areas shall come on when dark, all other to come on at night with motion detection. All lights to be supplemented with manual switches inside building. Exterior lighting shall be designed to not create a nuisance to any nearby neighbours. Exterior lighting shall be operated by photocells unless otherwise approved by the RMWB.
    g. Four pilot lights shall be placed at the entrance to the operating room. All pilots shall be push to test. Colour as follows: Green - normal operation, Amber - ventilation fault, Blue - H2S, Red-all other conditions. Label each above the light and provide a shade so lights are visible in direct sunlight.
    h. All lighting shall be accessible for maintenance without scaffolding or removal of other equipment.
    i. Site yard lighting fixtures are to be located on the building, rather than light poles. Lights are to be located on all sides of the building. At locations where there is a door, the lights are to illuminate automatically when it is dark, based on photocells. All other exterior lighting will be operated by photocell and motion detection with supplemental manual switches located inside the building.

j. Lighting fixtures in below grade applications shall be watertight.

10. Cables and wires shall be labeled at all junctions, junction boxes and terminal boxes. Labeling to be referenced on drawings.

11. Acceptable Products:

Product	Acceptable Manufacturer(s)
Power Supplies	Allen Bradley 1606XLS series power supplies, Omron S82K series DC power supplies
Relays	Omron -MY2N & MY4N indicating relays
Timers	Omron - H3YN & H5BR Indicating timers
Terminal Strips	Weidmuller - WDU 2.5, WTR 2.5, WPE 1.5
Fuse Holders	Weidmuller - ASK 1 with blown fuse indicator
Wire	AWG 16 (4-20mA analog signals) and 14 (digital signals) or smaller within control cabinets where allowed by the Electrical Code.
Solenoid	Asco 2, 3, and 4 port and time delay
Generator	Cummins
Soft Starter	Benshaw
Motor Control Centre	Schneider

9.7.11 Instrumentation

1. A magnetic flow meter is required on the discharge header with a bypass line around the meter. Lift station discharge flow metering and trend logging is required. Metering arrangement and flow trend logging must allow for individual pump performance measurement. Metering accuracy shall be no less than actual flow plus or minus 1%.

2. Pressure

   a. 12 mm pipe taps with shut off valves suitable for quick connect pressure gauges shall be provided on each pump suction and discharge. The location of these taps shall be such that the locations are suitable and easily accessible and shall be isolated from the sewage by an Isolation ring.

   b. Pressure gauges shall be a compound pressure/vacuum type, equipped with a diaphragm seal and isolation valves. Gauges provided for discharge lines shall be liquid filled with a maximum range of at least twice the operating pressure. Gauges shall be stainless steel with dual units of kPa/psi.

   c. Pressure Transmitter with valve manifold to be installed on discharge header. Transmitter to have HART capability.

3. Level

    a. An ultrasonic level instrument is required. The level control Instruments are to be installed so that it can be activated or removed from the wet well platform for testing and servicing. Water level control sensing devices should be located so that performance is not unduly affected by turbulent flows entering the well or by the turbulent suction of the pumps and so that cables do not get tangled; submersible level elements shall be installed in stilling wells to mitigate sensor anomalies. Level elements require intrinsic safety, either through design or intrinsically safe barriers mounted in non-hazardous rated environments, and level transmitters shall be installed in non-hazardous rated areas.

    b. In some cases, a pressure level transducer may be chosen instead of an ultrasonic. This is recommended for area where foaming is expected in the sewage.

    c. Four (4) backup level bulbs are required. Each level bulb is to be installed such that it can be removed from the wet well platform level for cleaning and servicing. All level bulbs installed in hazardous rated areas are required to be rated for the area of installation or be connected to intrinsically safe barriers. The redundant level control bulbs are to be connected to a supplemental pump Zelio control system that will automatically take over control of the pumps should the lift station main level controller fail.

        i. High-High (bulb)

        ii. High (bulb)

        iii. High (LIT)

        iv. Low (LIT)

        v. Low (bulb)

        vi. Low-low (bulb).

    d. The duplicate High and Low signals (one from each of bulb and LIT) should be set to approximately the same height and both start and stop the pumps.

    e. The control sequence is as follows:

        i. 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

        ii. 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 (default 3 minutes, configured during commissioning).

        iii. The delay timers on the pump starts are configured to automatically start the pumps if the PLC fails to do so, without the need to detect if the PLC has failed. The timers shall be set such that the Zelio will not start a pump if the PLC is

operating correctly. The dry pit sump shall be equipped with a flood detection level bulb that is connected to the PLC and SCADA system for annunciation.

f. A lamp on the front of the control panel shall be installed and will illuminate when the Zelio is actively running a pump.

g. The dry pit sump shall be equipped with a flood detection level bulb that is connected to the PLC and SCADA system for annunciation.

h. Level instruments shall be terminated in junction boxes located above the wet well sump in an area above the flood zone and connected to intrinsically safe interfaces. A minimum of 100 mm is required between each level set point.

4. Smoke and/or heat detector to be located in the electrical and generator room.
5. The exterior doors shall be equipped with switches that will be used for intrusion alarms.
6. Transmitter displays should be remotely located on the main level of the operating room or electrical room as applicable.
7. All cables to have a tag at the instrument and junction box identifying the instrument. Laminated labels to be on both ends of all wires inside the PLC, junction box or instrument terminals.
8. Acceptable Products:

Product	Acceptable Manufacturer(s)
Ultrasonic Level	Transducer: Siemens Milltronics Echomax XPS series Controller: Simens Milltronics MultiRanger/HydroRanger Plus
Pressure Level	Transducer: Endress+Hauser WaterPilot FMX21 Controller: Endress+Hauser RIA46 Field Meter
Level Bulb	Flygt ENM-10 level bulb
Flow Meter	Endress+Hauser Proline Promag or Rosemount 8700, ABB or Siemens.

9.7.12

9.7.13 Controls

1. General
    a. A Control Philosophy is to be prepared by the Engineering Consultant and included in the Operations & Maintenance Manual. Current and future operating parameters to be included in the philosophy.
    b. For on/off colour designation for MCC lights, pushbuttons, and HMI interfaces, Red means run, Green means off, Amber means fault or trip.
    c. The duty/standby pump shall be automatically switched after each run cycle.
2. Onsite Control System
    a. The control panel and electrical equipment shall be located so that it cannot be flooded under any foreseeable circumstances.
    b. PLC shall have a minimum spare capacity of 20%.
    c. On site control system should be housed inside a prefabricated CSA approved electrical panel, equipped with an Uninterruptible Power Supply (UPS) battery backup that is sized to provide a minimum of thirty minutes of backup power to all connected loads running at full capacity.
    d. Maintenance Mode to be included in programming of PLC to avoid nuisance alarms when maintenance is being done. For example, cleaning of level bulbs.
    e. Human Machine Interface (HMI) will be mounted on the PLC panel and provide an onsite control system.
    f. HMI screen size shall be a minimum of 250 mm, with colour.
    g. HMI interface should as a minimum include all items listed on the Tag List.
    h. All PLC/HMI equipment, software, shop drawings, schedule, and the site-specific program files shall be reviewed by RMWB prior to installation. The supplier shall conduct a test bench for all equipment to be installed. The test bench results shall be documented and provided to RMWB.
    i. PLC to be supplied with a memory card for application backup and data storage. Memory card to formatted by PLC manufacturer and installed in the PLC.

3. Supervisory Control and Data Acquisition (SCADA)
    a. On site control system shall be able to communicate with the Fort McMurray Wastewater Treatment Plant iFix SCADA systems via Modbus TCP/IP through an Ethernet radio and the RMWB SCADA backhaul network communication.
    b. On site parameters that require monitoring and/or controlling by SCADA system should include as a minimum, items indicated on the Tag List.
    c. The station must have an industrial Ethernet switch near the PLC controller with one port for the controller and another for the radio equipment. A 1 m wide x 1 m high x 0.6 m deep space must be provided on the wall near the PLC for installation of radio network hardware.
    d. All SCADA equipment, software, record drawings with schedule, site specific program files, license and warranty agreements, and all relevant documentation shall be transferred to RMWB in hardcopy and electronic file format.
4. An 8 channel Alarm Dialer is required and will be an independent back-up to the PLC alarms. Alarms and messages to be programmed into the alarm dialer will be specified by the Wastewater Branch of Environmental Services.
5. Alarm Telemetry – General Requirements
    a. Automated remote sensing and telemetry equipment shall be provided at each wastewater lift station. 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 RMWB.
    b. The following systems shall be monitored by the controller and are further detailed in the alarm telemetry list:
        i. Smoke detection and/or heat detection
        ii. Wet well level
        iii. Generator
        iv. Power phase and surge detection
        v. Dry pit flood detection
        vi. Amps and Hz from sewage pumps
        vii. Redundant wet well level
        viii. Sewage & sump pump
        ix. HVAC equipment
        x. Flow meter
        xi. Utility and Automatic Transfer Switch
        xii. Exterior doors status

xiii. Hazardous atmosphere detection (if gas detectors)

xiv. Building temperature

xv. Discharge check valve position

xvi. Pressure

xvii. UPS status

c. The control system shall be able to display the graphical trends of the following items as a minimum.

i. Wet well level

ii. Discharge flow of each Sewage pump

iii. Discharge pressure of each Sewage pump

6. Acceptable Products:

Product	Acceptable Manufacturer(s)
PLC	Schneider Modicon M580
HMI software	Vijeo Designer, latest version
PLC software	AME/EcoStructure (formerly Unity Pro), latest version
Alarm Dialer	ProTalk Plus with battery backup

7. Detailed controller telemetry list and HMI standard is available from Wastewater branch.

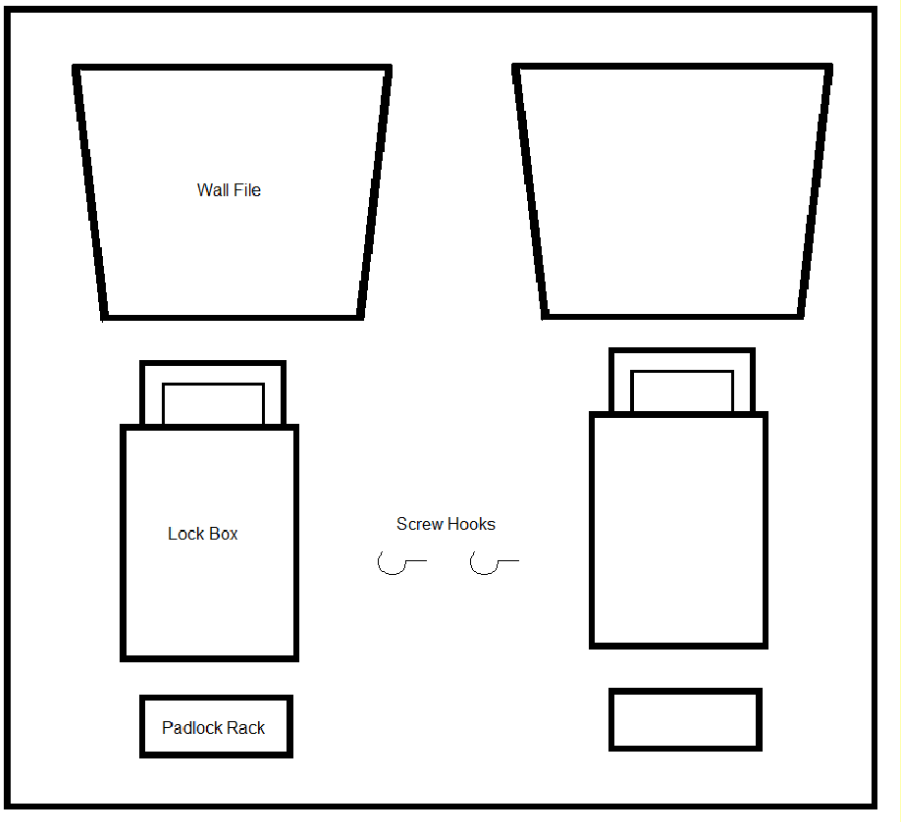
9.7.14 Health & Safety

1. A two-piece washroom is required complete with:

a. a large utility sink

b. space for a medium size garbage container

2. The following Safety Equipment shall be provided with each lift station
    a. Wall mounted holders for box of disposable gloves and box of ear plugs
    b. Fire Extinguisher located near egress and according to applicable codes and regulations
    c. Provide Cederroth Eye wash bracket for 500mL bottle including Sterile Eye Wash bottle and instructional sign to be mounted next to bracket. Two eyewash locations to be provided, one in the electrical room and one in the operating room.
3. Provide Lockout Station board in lift station with two of each of the following components:
    a. Latch Tight Red Group Lock Box Wall Mount, Master Lock Model # 503RED
    b. Padlock Rack, Master Lock Model # S1506
    c. Screw hooks
    d. Vertical orientation wall files, Deflecto Model 63001RT
    e. Refer to figure for layout



9.8 SPRAY / SPLASH PARKS

In general, Spray / Splash Parks shall meet the Alberta Regulation 204/2012 Public Health Act, Public Swimming Pools Regulation.

A Development Permit is required for Spray / Splash parks. All works require trade inspections as appropriate. (For example, drain lines are to be inspected prior to pouring concrete splash surfaces.)

Further specific requirements are described below:

9.8.1 Water Service

1. Must be a potable water source. Minimum service size to be 50 mm.
2. Recirculation systems will only be permitted at the approval of the Municipality and Alberta Health. Recirculation systems must recirculate 100% of the volume of water every 2 hours, provide 2.0 mg/L free chlorine residual at the point of contact with the bather, and meet any other requirements as per provincial and federal guidelines through a variance if approved.
3. Water usage must be within the constraints of the existing and planned future demands of the water system.
4. The water system must include details for winterization.
5. The water service for the spray park must be separate from the irrigation service of adjacent park space.
6. Designer to demonstrate the hydraulic of the distribution system will not be negatively impacted by the operation of the spray heads.

9.8.2 Sanitary Service

1. A sanitary service line must be provided. Minimum service size to be 150 mm.
2. Drainage from the spray park into the storm system is not permitted.

9.8.3 Electrical Service

A 100-amp electrical service must be provided.

9.9 COMMISSIONING AND OPERATOR TRAINING

The procedures outlined in this section are general only and more detailed requirements may be needed depending on the type and complexity of the system.

9.9.1 Requirements

Commissioning will follow these steps:

1. **Pre-Commissioning Preparation**
    a. Drawing Submissions
    b. O&M Manual Submissions
    c. Pre-test all individual items individually and as a process to ensure they are ready for operation
    d. Initial inspection by the Municipality to ensure facility is ready to proceed to commissioning stage
    e. Provide a minimum 2 weeks' notice to the Municipality of training and commissioning schedule
2. **Commissioning**
    a. Provide an electronic schedule of Building Life Cycle components, per Section 9.3.1.7.
    b. Provide operator training for municipal staff
    c. Lubrication and Spare Parts
    d. Provide 20 days of uninterrupted operation of the facility
3. **Turn-over of the Facility**

9.9.2 Pre-Commissioning Preparation

1. Develop a written detailed procedure and appropriate schedule(s) with timelines for training, construction, and commissioning activities.
2. Submit the schedule to the Municipality for pre-commissioning activities a minimum of two weeks' prior for review and approval.
3. Make prior arrangements for any specialty testing, competent for the task and certification personnel. Confirm dates, type of training and summary with the Municipality.
4. Provide all instruments required to safely test, adjust, balance, and verify operation of all equipment and processes.
5. Inspect all equipment to ensure all equipment, processes and infrastructure are safe, complete, work as intended and are secure.

6. Ensure Manufacturer's instructions have been complied for lubrication, cooling fluids, and other requirements throughout pre-commissioning and commissioning.
7. Provide a list for all warranty required and recommended inspections and maintenance for the facility.
8. Provide competent, experienced and if necessary, factory trained personnel to supervise the installation, inspection, testing, verification, training, and commissioning.
9. Provide a list of all recommended spare parts and chemicals.

9.9.2.1 Drawing Submissions

1. A complete set of as-constructed record drawings to be provided to the Municipality in electronic AutoCAD, electronic PDF, and hard copy, prior to final acceptance and closeout of project. Refer to Building Infrastructure Management CAD Standards.
2. Electronic files must not be restricted or locked with any digital copyright access.

9.9.2.2 Operations and Maintenance Manuals

Three (3) complete bound sets and one electronic PDF copy of the Operation and Maintenance Manual (O&M Manual) shall be provided to the Municipality before Commissioning.

1. The O&M Manual must include a Process Functional Specification completely describing the design and operational philosophy of the facility, including:
    a. Process schematic diagram
    b. PLC Ladder logic printouts
    c. Unrestricted Electronic copies of PLC controller programs
2. The O&M Manual must include all components/units/systems of the facility. The design consultant shall provide an electronic spreadsheet (in Microsoft Excel format) containing the schedule of all of the manufacturers' recommended maintenance activities for these components/units/systems.
3. The electronic PDF copy must not be restricted or locked and must be searchable and indexed with headings.

9.9.3 Commissioning

1. Commissioning shall generally include the Developer's personnel operating the complete system for a 20-day period and the Municipality's personnel operating for the following two (2) week period under the Developer's supervision. These operating times will fluctuate depending on the complexity of the facility.
2. Operation of existing facilities shall be performed by the Municipality. The contractor is to provide a parallel, temporary system during construction and commissioning or provide for 24/7 monitoring and emergency repairs of the facility.
3. During the commissioning period, the Developer shall continually demonstrate that the operation of the entire facility, as well as individual components, is correct and in accordance with the Manufacturer's performance criteria.
4. All equipment 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.
5. All alarm conditions and monitoring, including malfunctions, safety devices, interlocks, remote alarm reporting and annunciations shall all be confirmed to the Municipality.
6. During the Developer's period of operation, the Municipality's operators shall observe the operation and receive appropriate instruction.
7. During the following period, the Developer shall observe the Municipality's personnel operating the equipment and provide any necessary guidance.
8. Constructor may be billed for operator time if there are excessive commissioning issues.

9.9.3.1 Training

1. Contractor to provide acceptable training, proactive maintenance schedules, and a list of recommended tools and procedures for the Municipality's maintenance personnel.
2. Based on the contractor's recommendations, the Municipality will provide maintenance personnel fitting their recommendations. The contractor shall then provide training for the appropriate Municipal maintenance staff to maintain the facility.

9.9.3.2 Testing Systems

1. Each individual item of equipment shall be tested by itself and in combination with related items to ensure: (a) initially that the equipment is installed and ready for operation and (b) the sub system the equipment is attached to be 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 Supervisory Control and Data Acquisition (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 maintenance personnel.

9.9.3.3 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. All lubricants must be supplied with WHMS documentation. Identify lubricants furnished by brand, grade, and item of equipment for which it is intended. Operate, drain, and flush out bearings and refill with a new change of oil before completion. Type of lubricants shall be as recommended by the Manufacturer and in consultation with the Municipality's Operation Personnel.
2. Provide all spare parts as deemed necessary by the Manufacturer and the Municipality for 12 months of operation. Identify spare parts furnished by brand, grade, and item of equipment for which it is intended. In addition, provide all special tools required for servicing and maintaining the equipment.

9.9.4 Turn-over

The Municipality will assume complete responsibility for operation of the facility 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 Trade Services staff), repair of any deficiencies, and submission of manuals and Record Drawings.

9.10 EQUIPMENT

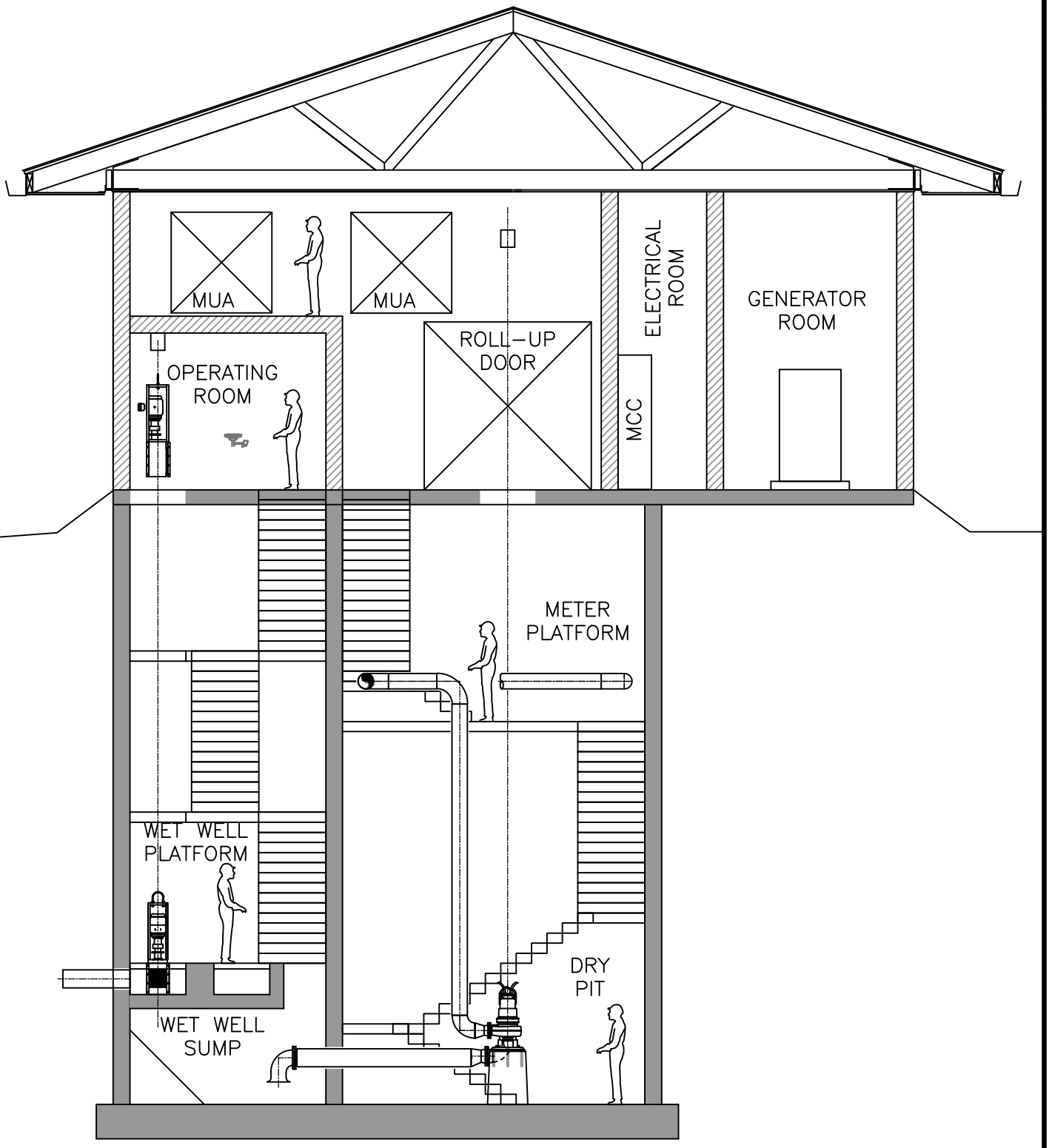
The Municipality utilizes specific manufacturers of equipment and accessories common throughout their systems. Therefore, specific standard equipment (make and model) may be requested by the Municipality and shall be supplied by the Developer. The list provided below covers most equipment categories. Coordinate with the Municipality for project-specific requirements.

Level Controllers	▪ Milltronics - Hydroranger Plus Monitors ▪ Milltronics - XPS-10 or XPS-15 Plain or submersible transducers ▪ Flygt - ENM-10 Switch
Pressure Switches	▪ Foxboro Pressure & D.P. Transmitter
Flow Meters	▪ ABB Bailey/Fisher & Porter Magnetic Flow meter ▪ Controlotron Clamp on ultrasonic
Chlorine Gas Metering	▪ Capitol Controls
Chlorine Metering	▪ Capitol Controls - CL1000 Analyzer
Chemical metering pumps (small)	▪ Seepex - Remote control signals to be 4-20 mA where possible or to Municipal standard. ▪ ProMinent - Remote control signals to be 4-20 mA where possible or to Municipal standard. ▪ PLC Modicon - Quantum Series Model, Modules and Programming are dependent on location, size and function. Consult Municipality for requirements. ▪ Solenoid Valve - Asco - 2, 3, and 4 port, and time delay
Power Supplies	▪ Omron S82K series DC power supplies
Relays	▪ Omron - MY2N & MY4N Indicating relays ▪ Omron - All other relays required if the above relays are not adequate.
Timers	▪ Omron - H3YN & H5BR Indicating timers ▪ Omron - All other timers required if the above relays re not adequate.
Terminal Strips (in control cabinets)	▪ Weidmuller - SAK 2.5 Polymide
Fuse Holders	▪ Weidmuller - ASK 1 c/w blown fuse indicator where available.
Wire	▪ AWG 16-26 or smaller within control cabinets where allowed by the Electrical Code. All wires (other than short jumpers) must be labelled at both ends and the labels must be referenced on the drawing.

9.11 STANDARD DRAWINGS – FACILITIES

Dwg. No.	Title
9-100	Lift Station Wet Well/Dry Pit Elevation
9-101	Lift Station Wet Well/Dry Pit Plan
9-102	Lift Station Standard Wet Well/Dry Pit Process and Instrumentation Diagram
9-300	Remote Site Radio Backhaul Connection Diagram

STANDARD DETAIL:	9- 100
DATE.: FEB. 2021	REV: 2

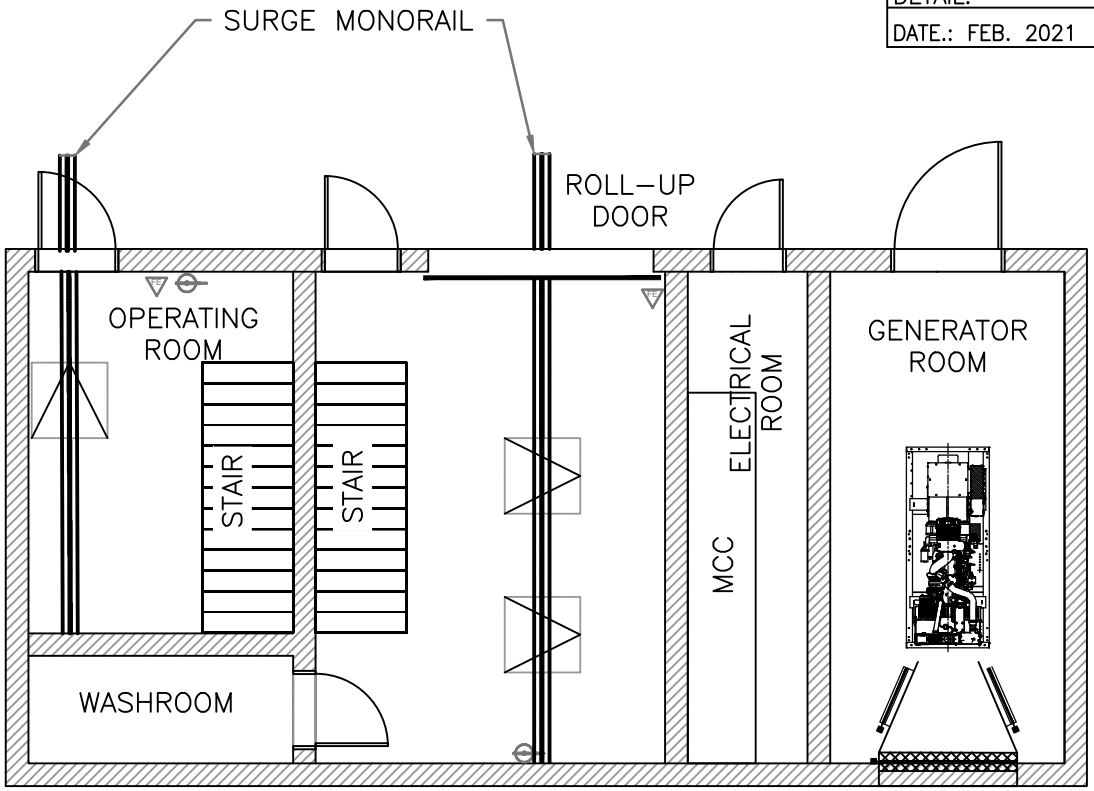


BUILDING SECTION

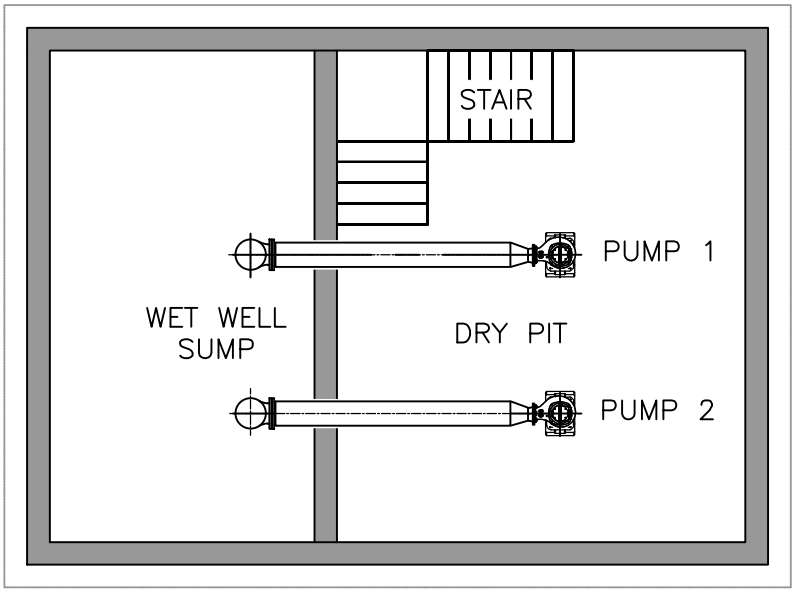
REGIONAL MUNICIPALITY OF WOOD BUFFALO

LIFT STATION WET WELL/ DRY PIT ELEVATION

STANDARD DETAIL:	9- 101
DATE.: FEB. 2021	REV: 2



MAIN FLOOR PLAN



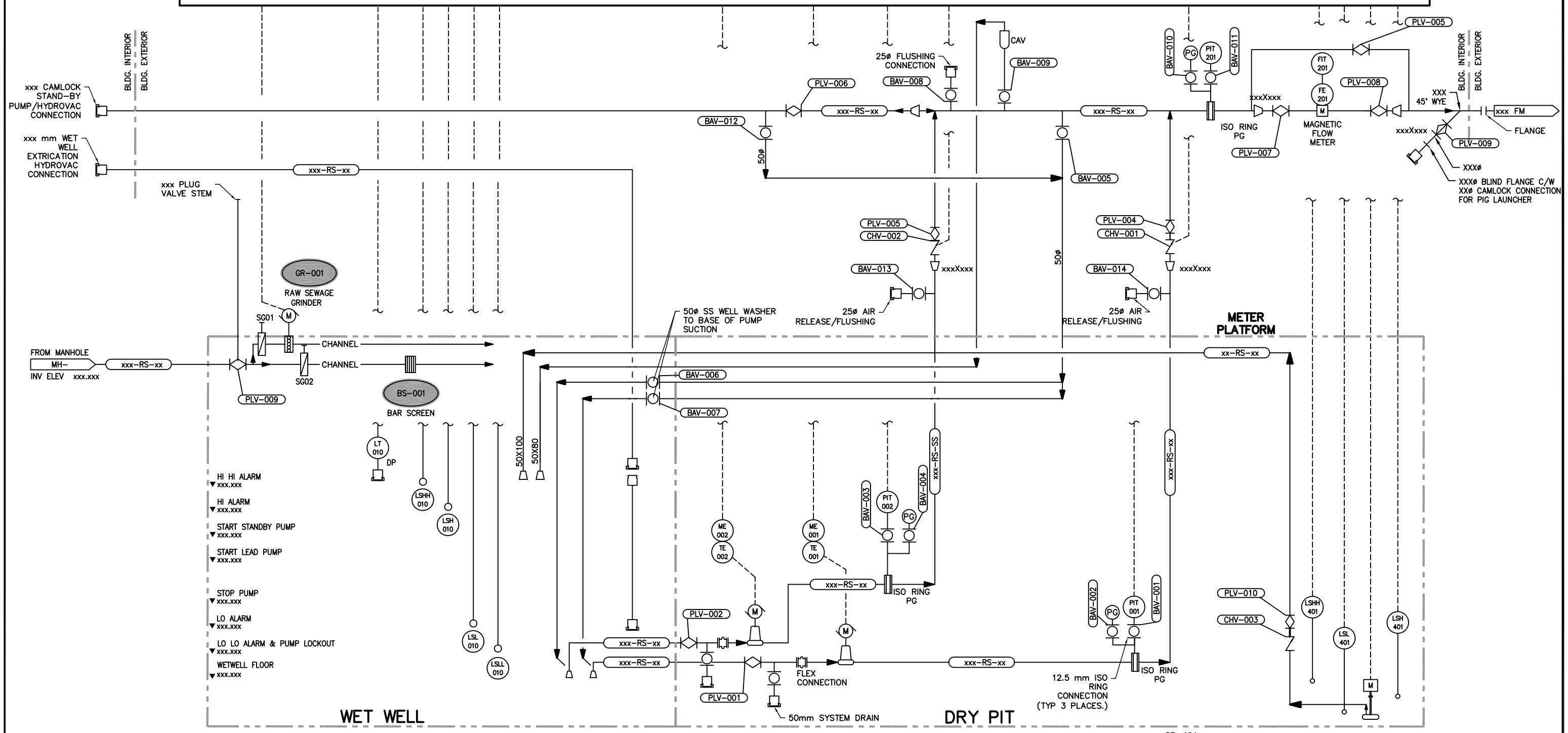
WET WELL/DRY PIT PLAN

REGIONAL MUNICIPALITY OF WOOD BUFFALO

LIFT STATION WET WELL/ DRY PIT PLAN

STANDARD DETAIL:	9-102
DATE: FEB. 2021	REV: 2

PLC & INSTRUMENTATION CONTROLS



GR-001
RAW SEWAGE GRINDER
CAPACITY: XX L/s
DRIVE MOTOR: X HP

RSP-001, 002
SUBMERSIBLE RAW SEWAGE PUMP
CAPACITY: XX L/s
TDH: XX m
DRIVE MOTOR: XX hp
IMPELLER: XXX mm

RSP-002 RAW SEWAGE PUMP

RSP-001 RAW SEWAGE PUMP

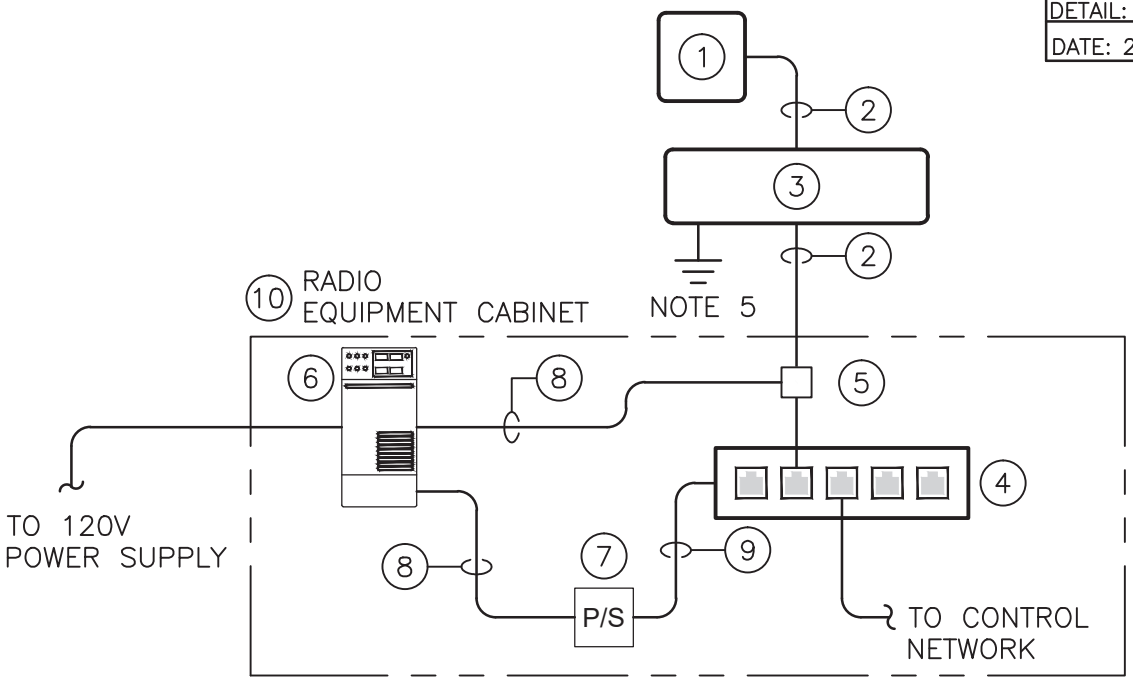
SP-401
SUBMERSIBLE SUMP PUMP
CAPACITY: XX L/s
TDH: XX m
DRIVE MOTOR: XX hp

SP-401 SUMP PUMP

REGIONAL MUNICIPALITY OF WOOD BUFFALO

LIFT STATION STANDARD
WET WELL/DRY PIT PROCESS AND INSTRUMENTATION DIAGRAM

STANDARD DETAIL:	9-300
DATE: 2017/01/30	REV: A



NOTES:

1. SEPARATE ANTENNA MOUNTING DRAWINGS SHOULD BE PROVIDED BY THE TOWER CONTRACTOR.
2. ANTENNA ARRANGEMENT WILL BE FINALIZED AFTER FINAL TOWER DRAWINGS ARE SUBMITTED TO TOWER CONTRACTOR.
3. CABLE LENGTHS SHALL BE FINALIZED BASED ON FINAL TOWER AND EQUIPMENT LOCATIONS.
4. ANTENNA ELEVATIONS ARE COMPUTED ON THE MINIMUM HEIGHTS REQUIREMENTS USING FIELD PATH STUDY.
5. PROVIDE DEDICATED GROUND CONNECTION TO GROUND GRID OR MCC GROUND BUS.
6. CSA RADIO TOWER TO BE PROVIDED FOR RADIO AS REQUIRED.
7. PROVIDE FUSING AND TERMINALS AS REQUIRED FOR 24 VDC POWER SUPPLY.

BILL OF MATERIALS

ITEM	EQUIPMENT	DESCRIPTION
1	OUTDOOR UNIT	CAMBIUM PMP450 3.55–3.8 GHz SUBSCRIBER MODULE RADIO
2	CABLE	OUTDOOR TYPE CAT5E CABLE
3	LPU	LIGHTNING PROTECTION UNIT
4	ETHERNET SWITCH	SIXNET SLX–5MS–1
5	POE INJECTOR	CAMBIUM POWER OVER ETHERNET INJECTOR
6	UPS	120 V UPS, MIN SIZE 1000 VA
7	24 VDC POWER SUPPLY	SIXNET ET–PS–024–02 OR EQUAL
8	120 V POWER CABLE	120 V POWER CABLE
9	24 VDC POWER WIRES	#12 AWG WIRING FOR 24 V POWER. SEE NOTE 7
10	RADIO EQUIPMENT CABINET	TRIPPLITE 12U WALL–MOUNT RACK ENCLOSURE CABINET OR EQUAL

REGIONAL MUNICIPALITY OF WOOD BUFFALO

DRAWN:	RJN
CHECKED:	LB
APPROVED:	SJ
DATE:	2017–JAN–30
SCALE:	NTS

URBAN SERVICE AREA REMOTE SITE RADIO BACKHAUL CONNECTION DIAGRAM

10 Landscape and Park Development Standards

10.1 GENERAL

These standards outline general minimum requirements for the landscape development in the Regional Municipality of Wood Buffalo. The following outline the requirements for the development of open space, parks, playgrounds, sports fields, boulevards, buffer strips, amenity areas, utility lots, walkways, medians, public service land, including other open space and / or recreation facilities.

Refer to previous sections 1, 2 and 3 for overall development requirements and procedures.

The Parks Branch ("Parks") shall refer to the Municipal department responsible for the review, approval, operation and maintenance of parks and landscaping facilities.

10.1.1 Definitions

Term	Meaning
Appropriate Maintenance	Shall mean maintenance, which is suitable to the time of year, soil conditions, weather conditions, or condition of the plant material, to ensure it is capable of sustaining healthy and vigorous growth.
Approval by the Parks Branch	Shall mean after receiving the developers written requests for the approval, the Parks Branch within the Public Works Department will review and / or inspect the request and respond in writing.
Collected Plants	Shall mean any plants dug from native stands, wood lots, orchards or neglected nurseries and which have not received proper cultural maintenance as advocated by the Canadian Nursery Landscape Association.
Environmental Reserve – ER	Shall mean land owned by the municipality to be preserved in its natural state as defined in the *Municipal Government Act*.
Intensive Use	Shall mean an area of high use such as, class 1 trails, trail intersections and entrances/exits, play equipment areas, spray parks, sportsfields, or other areas defined by the Parks Branch
Maintained Parks	Shall mean parks that require on-going maintenance such as; grass cutting, irrigation, trash removal and regular inspections.

Term	Meaning
Municipal Reserve – MR	Shall mean land owned by the municipality for the development of parks and school grounds as defined in the *Municipal Government Act*.
Open Space or Public Open Space	Shall mean any parcel of land or water, which is set aside and/or designated as reserve for public use including Municipal Reserve, Environmental Reserve, and Public Utility Lots designated by Parks.
Recreation Facilities	Shall include, but are not limited to tennis courts, play structures/ equipment, sports fields, outdoor ice rinks, spray parks, skate parks, multi-purpose pads, and trails.
Temporary Protection	Shall mean fencing, barricades, signage, and other adequate means of protection for a particular area such as, newly seeded or sodded areas, partially constructed playgrounds, existing plant material to be preserved, and any other construction area Parks deems necessary.
Tree Wells / Beds	Shall mean an excavated area around a tree or trees that provides additional topsoil and water retention.
Landscape Development	Shall mean all landscaping, outdoor recreation elements, and/or its protection in public open spaces and boulevards as per Section 10 Landscape and Park Development Standards.
Landscape Consultant	Shall mean a Landscape Architect or Technologist who is a member, in good standing, of the Alberta Association of Landscape Architects.
Public Utility Lot /Utility Lanes – PUL.	Shall mean land designated for utilities, accesses, or other engineered facilities as defined in the Municipal Government Act.
Urban Forestry	Shall mean the care and management of individual trees and / or groupings of tree populations within the urban environment for the purpose of improvement to urban settings.
Urban Forest Management Strategy	Shall mean the ongoing methods of planning, protection, maintenance, and care of trees, forests, greenspace and other related areas within the urban environment to promote environmental, social, economic, and public health benefits.
Canopy/Canopy Cover	Shall mean land covered by tree/shrub crown (area of leaves and branches) as viewed from above.

Term	Meaning
Diameter at Breast Height (DBH)	Shall mean the standard measurement for trees at 1.3m above the ground.
Tree Preservation	Shall mean the process of protecting trees from construction activity. This requires planning and should be part of the beginning steps in the design process.
Fire Smart	Shall mean a development and planning resource with resources and programs designed to reduce the likelihood of uncontrollable wildfires near urban areas and increase neighbourhood resilience to wildfires.
Mulch	Shall mean a layer of material applied to surface soil around plant material to prevent weed growth. Organic mulch refers to bark, shredded wood chips, and other natural elements that provide and aesthetic as well as insulate and enrich soil. Inorganic mulch refers to decorative elements like rock that provide a landscape aesthetic.
Tree Caliper	Shall mean the diameter of a tree trunk as measured at DBH (diameter at breast height).
Root Flair	Shall mean the outwardly curving area at the base of a tree where the tree transitions from trunk and bark tissues to root system tissues.

10.1.2 Maintained Parks

The following outlines the components of the Municipality's Maintained Park Spaces.

10.1.2.1 Neighbourhood Park

1. Close to high-density housing and/or senior citizen housing.
2. Adjacent to local roadway.
3. Can be combined with a community park, but not a school site.
4. To service an area within a 0.5km radius.
5. Minimum size of +/- 0.4 hectares.
6. Constitutes 15-20% of municipal reserve in new community.
7. Minimum grassed area of 800m2.
8. Accessible play area and equipment located in visible areas for safety, security and public awareness.
9. High degree of accessibility for all users regardless of ability.
10. Passive recreation area for sitting or picnics.
11. 75mm irrigation or water service required.
12. All plant material more than 30m from road right of way shall be drought tolerant if Parks determines water service is not required.

10.1.2.2 COMMUNITY PARK

1. Accessible to the population by walking and bicycling.
2. Located adjacent to a local or collector roadway.
3. Can be combined with elementary and/or junior high school facilities.
4. To service an area within a 1km radius.
5. Minimum size of +/- 2.4 hectares. See Land Assembly for additional land requirements for school sites.
6. Constitutes 40-60% of municipal reserve in new community.
7. Minimum 100mm water service required.
8. Accessible play area and equipment located in visible areas for safety, security, and public awareness.
9. High degree of accessibility for all users regardless of ability.
10. Open space play area for structured or unstructured sport / active recreation.

11. Stormwater management facilities may be incorporated into new community park space, where required and as appropriate.
12. Parks shall determine appropriate additional site amenities and may include some or all the following:
    a. Minimum of a multi-purpose pad for tennis courts, basketball courts, portable skate park, boarded outdoor rink.
    b. Sports Fields.
    c. Spray park - Refer to Section 9 for servicing requirements.
    d. Public art.
    e. Other park amenities.

10.1.2.3 ELEMENTARY OR JUNIOR HIGH SCHOOL GROUNDS

1. Accessible to the population by walking and bicycling.
2. Located adjacent to a local or collector roadway.
3. Can be combined with Community Park.
4. To service an area within a 1km radius.
5. Minimum size of +/- 2.4 hectares. See Land Assembly for additional land requirements for school sites.
6. Constitutes 40-60% of municipal reserve in new community.
7. Minimum 100mm water service required.
8. Accessible play area and equipment located in visible areas for safety, security, and public awareness. One playground per school.
9. High degree of accessibility for all users regardless of ability.
10. Open space play area for structured or unstructured sport / active recreation.
11. The Parks Branch shall determine appropriate additional site amenities and may include some or all the following:
    a. Minimum of a multi-purpose pad for tennis courts, basketball courts, portable skate park, boarded outdoor rink.
    b. Sports Fields.
    c. Public art.
    d. Other park amenities.

10.1.2.4 DISTRICT PARK

1. Located adjacent to a collector street.
2. Can be combined with high school, recreation, or sports facility.
3. High degree of accessibility for all users regardless of ability.
4. To service an area within a 3km radius.
5. Minimum size of +/- 5.5 hectares. See Land Assembly for additional land requirements for school sites.
6. Constitutes 40-60% of municipal reserve in new community.
7. Minimum 100mm water service required.
8. Accessible play area and equipment located in visible areas for safety, security, and public awareness.
9. Parks shall determine appropriate additional site amenities and may include some or all the following:
    a. Minimum of a multi-purpose pad for tennis courts, basketball courts, portable skate park, boarded outdoor rink.
    b. Athletic track or Class 1 Sports fields.
    c. Spray park - Refer to Section 9 for servicing requirements.
    d. Public art.
    e. Off-leash dog area.
    f. Other park amenities.

10.1.2.5 HIGH SCHOOL GROUNDS

1. Located adjacent to a collector street.
2. Can be combined with district park, recreation, or sports facility.
3. High degree of accessibility for all users regardless of ability.
4. To service an area within a 3km radius.
5. Minimum size of +/- 5.5 hectares. See Land Assembly for additional land requirements for school sites.
6. Constitutes 40-60% of municipal reserve in new community.
7. Minimum 100mm water service required.
8. Play areas and equipment accessible to all levels of ability, including wheelchair accessibility, when combined with District Park, recreation, or sports facility.

9. Parks shall determine appropriate additional site amenities and may include some or all of the following:
    a. Minimum of a multi-purpose pad for tennis courts, basketball courts, portable skate park, boarded outdoor rink.
    b. Athletic track or Class 1 Sports fields
    c. Public art
    d. Other park amenities

10.1.2.6 LINEAR PARK

1. An identified municipal reserve that provides a green space linkage between defined parks and / or environmental preservations.
2. Minimum width of 20m and minimum size of +/- 0.2 hectares
3. Constitutes a maximum of 10% of municipal reserve in new community.
4. High degree of accessibility for all users regardless of ability.
5. Minimum grassed area of 800m2.
6. Passive recreation area for sitting or picnics.
7. All plant material more than 30m from road right of way shall be drought tolerant.

10.1.2.7 REGIONAL PARK

1. Located adjacent to an arterial or collector street.
2. Combined with recreation facility, sports facility, or environmental reserve whenever possible.
3. High degree of accessibility for all users regardless of ability.
4. To service an area within a 10km radius.
5. Minimum size of +/- 20 hectares. May be combined with existing MR or ER to provide minimum size. MR credit will be given for the portion of MR contributed by a developer for the regional park.
6. Constitutes a maximum of 60% of municipal reserve in new community.
7. Minimum 100mm water service required
8. Play areas and equipment accessible to all levels of ability, including wheelchair accessibility.

9. Site amenities – some or all the following:
    a. Minimum of a multi-purpose pad for tennis courts, basketball courts, portable skate park, boarded outdoor rink.
    b. Athletic track or Class 1 Sports fields
    c. Public art
    d. Interpretive trails
    e. Picnic Areas
    f. Off-leash dog area
    g. Other park amenities
    h. Indoor facility (i.e. community/interpretive centre, or clubhouse).

10.1.3 Land Assembly

1. In new and existing communities, parks will be part of the municipal reserve, which may not be less than 10% of the developable land (refer to the Statutes of Alberta Municipal Government Act).
2. In existing communities, additional parkland may be acquired, or recreational facilities expanded through the collection of a re-development fee.
3. Land required for school sites are as follows:

Elementary / Junior High	1.5ha per school	2.4 ha for MR	3.9 ha total
Senior High	3.0ha per school	5.5 ha for MR	8.5 ha total
Shared (two schools) Elementary / Junior High	1.5ha per school	3.6 ha for MR	6.6 ha total
Shared (two schools) Senior High	3.0ha per school	8.25 ha for MR	14.25 ha total

4. A minimum of thirty percent (30%) of maintained parks perimeters must abut public roadways to ensure identity and exposure for the park and public accessibility.

10.1.4 Developer / Contractor Responsibility

1. Each park site is to be fully landscaped, including but not limited to all site preparations, grading, topsoil, turf, trails, site fixtures, and other park amenities, as specified in this section.
2. Each park site requires a water service for irrigation:
    a. 75mm service for neighbourhood parks,
    b. 100mm service for school grounds and, community and district parks.
3. Each water service is to include, but not be limited to:
    a. Water Valve located in road right of way 1m from park property line, see Section 7 for additional information,
    b. Terminal City self-draining standpipe installed 3m inside the park property line, with 1.5m x 1.5m minimum drainage pit, installed below grade in a,
    c. Heavy duty, lockable, valve box, sized to fit the application, installed as per manufacturer's recommendations.
    d. Electrical heat tape and tracing wire on service pipe.
    e. Water meter and vault per RMWB Standards.
4. Each park requires electrical service and separate electrical meter for future automated irrigation system and lights. Developer / Contractor to apply for and cover all costs for the electrical service and meter installation. The Municipality will assume responsibility for electric utility charges upon issuance of CCC. Lights will be required in all intensive use areas and the following areas:
    a. Regional Trail Network
    b. Seating Nodes/Landscape features
    c. Solar powered lighting will be considered as an alternative and must be approved by the Parks Branch prior to installation.
5. Storm/sanitary services will be required for regional and district parks, school sites and as required by the Regional Municipality of Wood Buffalo in neighborhood, community, and linear parks.
6. Off-street parking is required as per the following Table. Also note that:
    a. Parks may reduce parking requirements for park sites with two or more recreation uses listed above.
    b. Additional parking, as directed by Planning and Development, may be required for amenities not listed above.

7. Consideration is to be given to incorporating hard surfacing and fencing for parking areas.

Off-Street Parking						
Amenity Type	Neighbourhood Park	Community Park	District Park	Linear Park	Regional Park	School Grounds
Playground Area	N/A	1 stall / 10m2 of play area	1 stall / 10m2 of play area	N/A	1 stall / 10m2 of play area	N/A
Sports Fields	N/A	15 stalls / field	20 stalls / field	N/A	20 stalls / field	N/A
Athletic Track	N/A	N/A	20 stalls / track	N/A	20 stalls / track	N/A
Courts	N/A	4 stalls / court	4 stalls / court	N/A	4 stalls / court	N/A
Outdoor Rink	N/A	15 stalls / rink	15 stalls / rink	N/A	15 stalls / rink	N/A
Skate Park	N/A	1 stall / 50m2 of skate area	1 stall / 50m2 of skate area	N/A	1 stall / 50m2 of skate area	N/A
Spray Park	N/A	1 stall / 10m2 of spray area	1 stall / 10m2 of spray area	N/A	1 stall / 10m2 of spray area	N/A
Open Space	N/A	N/A	1 stall / hectare of maintained open space	N/A	1 stall / hectare of maintained open space	N/A
Picnic Sites	N/A	N/A	1 stall/table	N/A	1 stall /table	N/A
Off-leash Dog Area	N/A	N/A	1 stall/ 0.3 hectare of off-leash area	1 stall/ 0.3 hectare of off-leash area	1 stall/ 0.3 hectare of off-leash area	N/A
Spectator Facility	N/A	1 stall / 4 seats	1 stall / 4 seats	N/A	1 stall / 4 seats	N/A

8. Bicycle parking provided as follows:
    a. The number of bicycle parking spaces shall be no less than 5% of the required off-street parking spaces, with a minimum of 5 bicycle parking spaces provided for each park type, except for a Linear Park.
    b. Within Linear Parks, bicycle parking spaces shall be provided in conjunction with each seating node.
    c. Bicycle parking spaces and bicycle racks shall be in accordance with 10.7 Site Furniture.
    d. All improvements are to be designed and constructed in accordance with these standards and be completed within the first year of the development or when the number of lots/units occupied reached 15%, whichever comes first. Refund of Subdivision Security Deposit is conditional on completion of development requirements.

10.1.5 Greenspace Corridors

10.1.5.1 Description

The Greenspace Corridor System consists of the following items:

1. Trail Systems
    a. Trails are to provide access and linkages to recreational opportunities, commercial areas, and/or education facilities throughout the community.
2. Public Utility/Lots and Rights-of-Way
    a. These areas provide passive recreation opportunities and pedestrian linkages.
3. Boulevards and Medians
    a. These areas provide aesthetically pleasing streetscapes, pedestrian linkages, visual screens, and/or sound abatement.

10.1.5.2 Site Considerations

1. Trail Systems
    a. Pedestrian routes are to be incorporated into the Area Structure and Outline Plans, prior to development.
    b. New trails connecting to existing trails are to match the existing trails surface and width, unless otherwise directed by Parks.
    c. Trails developed in environmental reserves shall be designed to minimize any disturbances to landform or vegetation.
2. Public Utility/Lots and Rights-of-Way
    a. Minimize clearing widths for underground utility lines to mitigate unsightly cut lines through existing vegetation. Connect Public Utility Lanes/Lots to park areas where possible to create continuous greenspace corridors.
3. Boulevards and Medians
    a. Planting and grading in boulevards should blend in with adjacent natural vegetation.
    b. Use existing vegetation, slopes, and topography to buffer views, when possible.

10.1.5.3 Land Assembly

1. Trail Systems
    a. Trails and pathways can be located in Municipal Reserves, Environmental Reserves, building or environmental setbacks, Public Utility Lanes/Lots, utility rights-of-way, road right-of-way and boulevards.
2. Public Utility Lots and Rights-of-Way
    a. Public Utility Lanes may receive MR credit for land that is functional and safe for recreation purposes, has a minimum width of 20m, and a maximum slope of 2%. The percentage of MR credit the area will receive shall be negotiated on a site-by-site basis with Parks. Negotiation of MR credit will be based on factors such as:
        i. Access and connectivity within the open space and trail network.
        ii. Provided amenities and facilities.

b. Storm water management facilities may receive MR credit for land that is functional and safe for recreation purposes, has a minimum width of 10m, and a maximum slope of 5%, and has some form of recreational or community amenity, such as a trail, gazebo or seating node. The percentage of MR credit the area will receive shall be determined a site-by-site basis with Parks, however the following principles will apply:

   i. 100% MR Credit for areas above the 1:100-year High Water Level

   ii. 50% MR Credit for areas between the 1:25 year and the 1:100-year High Water Level

   iii. No credit for areas below the 1:25 year water level.

3. Boulevards and Medians

   a. Boulevards and buffers along all roadways shall be part of the road right-of-way and not constitute a part of the municipal reserve dedication. Landscaped islands or medians are to be developed as a low or no maintenance landscape.

10.1.5.4 Developers Responsibility (Private Development)

All Developer requirements are to be designed and constructed in accordance with these standards and be completed within the first year of the development or when the number of lots/units occupied reaches 15%, whichever comes first. Refund of Subdivision Security Deposit is conditional on completion of development requirements.

10.1.6 Environmental Reserve

10.1.6.1 Description

1. Natural areas are an important component in the overall open space system. They provide areas for passive recreation, as well as nature-oriented recreation, such as bird and animal watching, hiking, biking, and cross-country skiing.

10.1.6.2 Site Considerations

1. Preserve all areas of diverse or unique natural resources such as lakes, streams, marshes, vegetation, or topography.
2. Development in these areas shall cause minimal damage to the environment. The protection and management of the natural or historical environment is of primary concern; recreational use is a secondary objective.

10.1.6.3 Land Assembly

1. Recreational enhancements of environmental reserves will not receive credit towards the municipal reserve dedication; however, it is encouraged by the Municipality to take advantage of these areas with items like trails, bench nodes, viewing platforms or educational / historic signage.

10.1.6.4 Developers / Contractors Responsibility

1. With the exception of approved works to support those items above, at no time shall encroachment into any natural area occur without the express written consent of Parks. Environmental reserves shall be temporarily fenced and otherwise protected from adjoining construction.
2. Any natural areas that are damaged during construction must be rehabilitated and re-vegetated to the satisfaction of Parks.

10.1.6.5 Inspections, Approvals and Warranty

1. All landscaping and recreational amenities in Municipal Reserves, Environmental Reserves, public utility lots, boulevards, medians, and entry features will require inspections and approvals by Parks and/or any other municipal department/agency as deemed necessary by Parks.
2. Growing season is considered to be approximately May 15 to October 15 annually, weather permitting.
3. Any third-party test and/or inspection required prior to issuance of CCC or FAC inspections shall be completed at the developer's / contractor's expense.
4. Parks requires a written request 14 days prior to all inspections.
5. 72-hour written notice shall be given to Parks prior to any tree planting.
6. Landscaping must be 95% complete prior to the CCC inspection of any landscape development.
7. All tests, inspections certificates, operations or maintenance manuals, and construction technical specifications will be required prior to the CCC being issued.
8. CCC and interim inspections are to take place between May 15 and October 15, weather permitting. The Municipality reserves the right to inspect developments at any time.
9. All deficiencies noted in a CCC inspection are to be repaired, replaced, and/or completed within 30 days, unless otherwise agreed. If weather or seasonal constraints do not allow for the deficiencies to be repaired and inspected, they will be inspected the following season.
10. The minimum warranty and establishment period of 24 months will commence on the date the CCC was issued and end with issuance of the FAC.
11. The Developer/Contractor will be responsible for all maintenance (including snow clearing), repairs, and warranty, including third party damages, until the FAC is issued. Third party damages will include but not be limited to vandalism, traffic accidents, and random acts of nature. Replacements completed prior to FAC inspection are subject to a 60-day growing period.

12. Plant material that requires replacement upon FAC inspection because it has died or failed to grow satisfactorily, will be subject to an extended warranty period equal to the original warranty period. Such replacement and warranty extensions shall be continued until plant material is acceptable.
13. Refund of Subdivision Security Deposit is conditional on completion of development requirements. Security reduction can be requested by the developer once the CCC has been issued.
14. FAC inspections are to take place between June 1 and September 15.
15. No FAC approval will be granted if there are outstanding deficiencies.
16. Major deficiencies for any landscaping, exceeding 10% of the total quantity will result in the Maintenance / Warranty period being extended six (6) months.
17. Sign-off of FAC will indicate plant material has passed field inspection with Parks, is thriving in form and health, and will be accepted into the Urban Forest Maintenance Program.
18. Record drawings will be required prior to the FAC being issued and will include two printed copies and one digital version on USB in the current version of AutoCAD utilized by the Municipality (unless otherwise approved). All Record Drawings are to be clearly marked or stamped as “AS-BUILT DRAWINGS”.
19. Failure to notify Parks of key construction milestones outlined in this section may require work to be exposed for an inspection at the Developer’s/Contractor’s expense.
20. The Developer/Contractor shall be subject to the “Request for Landscaping Inspection” fees as outlined in the most current revision of the Municipality’s Land Use Bylaw.

10.2 CLEARING, GRUBBING AND GRADING

10.2.1 Erosion and Sediment Control

Refer to Section 12 for Erosion and Sediment Control requirements.

10.2.2 Clearing and Grubbing

1. Locate and protect all utilities, survey control monuments, plant material and root systems that are designated to remain, including natural features, pavement, concrete and structures.
2. Plant material shall not be removed from any Municipal or Environmental Reserve without written approval from Parks.
3. All designated plant material to be removed shall be disposed of offsite in an environmentally friendly manner acceptable to the Parks Branch and / or any other Municipal Department / Agency as deemed by Parks. No burning will be permitted.
4. All roots and stumps shall be removed to a minimum depth to 0.6m below rough grade.
5. Root systems shall not be disturbed within 10m or the drip line of any plant material to remain, whichever is greater.
6. All areas disturbed during the development process must be rehabilitated to its original state or better, as directed by Parks.

10.2.3 Plant Material Protection

1. Plant material to be preserved on the site shall be of high quality and worthy of preservation.
2. All plant material to be preserved shall be clearly indicated on a Clearing and Protection Plan that is to be submitted to Parks for approval prior to the commencement of any construction and / or demolition.
3. Plant material to be preserved shall be protected by a Plant Material Protection Zone (PMPZ). The PMPZ shall extend a minimum of 1.0m or 15cm for every 1cm DBH, whichever is largest, past the drip line of trees to be preserved.
4. The PMPZ will be protected by orange safety fencing, 2400mm minimum height, secured with iron stakes or wood posts minimum 2400mm OC. The final extents of the PMPZ and its protection set out in the field shall be inspected and approved by the Parks Department prior to construction.
5. Fencing must remain in good condition and must not be removed or altered without permission from RMWB Parks Department.
6. Only close cut (hand clearing) will be permitted within the PMPZ. Any work within the PMPZ will require approval by Parks and may require Parks Staff onsite for monitoring.
7. No excavation, grubbing, raising or lowering of elevations is permitted within the PMPZ.

8. No vehicular traffic, soil compaction, storage of any materials or equipment, or disposal of any liquid or other substance is permitted within the PMPZ.
9. Safety fencing must remain in good condition and must not be removed or altered without written direction from the Parks Branch.
10. Prior to issuance of FAC, all plant material in preserved areas that has died or suffered as a result of construction or grade changes shall be replaced.

10.2.4 FireSmart

1. All existing vegetation to remain inside or within 100m of the development shall receive treatment and consideration in accordance with the Wildfire Risk Assessment prepared for the development and/or the FireSmart – Protecting Your Community From Wildfire (FireSmart Canada).
    a. Priority Zone 1 (Fuel Removal) – Remove all highly flammable vegetation as outlined by FireSmart Canada's "*FireSmart Guide to Landscaping*", within 10m of any permanent structure. This defensible zone is to help prevent a fire from being carried toward or away from the building.
        i. This area is to be graded, top-soiled and seeded. Seed mix will depend on the application.
        ii. Additional tree clearing may be required, as directed by the Municipality, to accommodate drainage.
    b. Priority Zone 2 (Fuel Reduction) – This area between the property line up to a minimum 30 m is to be developed to reduce the wildfire threat. Topographical considerations can be made upon approval of Parks representative.
        i. Thin coniferous trees to a minimum of 3.0 m crown spacing.
        ii. Remove all dead standing and fallen trees.
        iii. Prune all ladder fuels (low branches) up to a minimum of 2.0 m above ground level at the lowest point.
    c. Priority Zone 3 (Fuel Management) – This area extends beyond 30 m to 100 m from a structure. Vegetation management in this area may only be necessary where interface hazard is extreme due to fuel types and/or slope. In those instances, apply fuel reduction as outlined for Zone 2.
2. Clean-up: Chip the material to be removed back onto the forest floor, no greater than 50 mm thickness.
3. All FireSmart protection clearing is to be approved by Parks prior to commencement.

10.2.5 Rough Grading

1. Sub-grade preparations shall include trimming of any irregularities in the sub-grade. All roots, stones larger than 50mm in diameter, vegetation and other foreign matter, which is wholly or partly exposed, shall be removed from the surface of the sub-grade.
2. In case of bedrock, a minimum of 750mm of clean fill shall be placed.
3. The sub grade shall be established parallel to the finished grades within 50mm unless shown otherwise and shall be graded to ensure positive drainage away from private property and buildings. All water must be managed on site.
4. Any sub-grade that has been disturbed shall be compacted to 95% Standard Proctor Density, prior to any landscaping, unless otherwise approved.
5. Rough grading shall be carried out without damage to the root and branch systems of existing plant material to be retained.
6. All sites requiring topsoil shall be rough graded to accommodate the appropriate depth of topsoil for each area, with a tolerance of 50mm.
7. At the toe of slopes and banks, grades shall be smoothly rounded to a maximum slope of five (5) horizontal units to one vertical unit (5:1). All slopes, banks and disturbed areas are to be feathered with smooth transitions to meet existing grades.
8. Parks requires notice when rough grading is complete and additional work shall not proceed until rough grade has been approved by Parks. Parks will be inspecting these grades for maintainability and transitions, not drainage.

10.2.6 Fill

1. Supply and spread sufficient fill materials to raise existing grades to the final grades as designated.
2. Scarify the existing grade to a minimum depth of 100mm prior to placing fill.
3. Place fill material in loose layers not exceeding 200mm in depth. Each layer shall be compacted to 95% Standard Proctor Density, before placing subsequent layers.
4. All fill shall be free of sticks, stones and debris greater than 50mm, as well as any other material which is subject to rot or corrosion and shall be approved by Parks prior to installation.

10.2.7 Finished Grade

1. Amend the rough grades to eliminate uneven areas, low spots and to ensure positive drainage.
2. Ensure all finished grades meet flush with adjacent surfaces and are within 25mm of the approved grades.
3. The maximum allowable slope shall be three (3) horizontal units to one (1) vertical unit (3:1).
4. Park sites shall be graded to provide positive drainage throughout. The minimum grade for all grassed areas shall be 2%, unless otherwise approved.
5. The minimum grade for grass swales shall be 2.0%
6. No park sites shall drain onto private property.

10.3 TOPSOIL AND SURFACE TREATMENT

10.3.1 Topsoil

1. Provide two soil analysis reports, one for the original soil and one for the amended soil, to the Parks Branch. All soil is to be approved by Parks prior to installation.
2. Soil analysis is to include the source location, soil deficiencies, amendments and recommendations. Topsoil shall be tested for particle size, organic matter (volume), Nitrogen, Phosphorus, Potassium, electrical conductivity (salinity) and pH value.
3. Acceptable minimum levels for general use in landscape developments are as follows:

Particles Sizes	40% Sand, 35% Silt, 25% Clay
Organic Matter	10%
Nitrogen – N	90lbs/acre
Phosphorus - P	140lbs/acre
Potassium - K	250lbs/acre
Electrical conductivity	4 (MAX.)
pH	6.0 – 7.5

4. Amend the topsoil to meet or exceed the minimums, noted above. Any deficiencies indicated by the soil analysis report shall be rectified by the application of the appropriate fertilizers and additives.
5. Topsoil shall be free of any material (stones, sticks, or others) larger than 25mm in diameter, shall contain no toxic materials, shall be free from non-native weeds or seeds or parts thereof, and shall be capable of sustaining vigorous plant growth.

6. Every effort shall be made to preserve and re-use existing topsoil on site.
7. If organic material is required to meet the minimum standard, peat moss shall be added in the field and mixed with cultivation equipment. The peat moss shall meet the following specifications:
    a. Shall be free of any foreign and toxic material, live plants, roots and seeds, lumps, ice, clay, soil, stumps, rocks, quack grass, and noxious weeds.
    b. Shall be delivered in a pulverized condition and pass through a 33mm screen.
    c. when tested shall meet the following limits:

• Soil reaction (ph)	• 4.5 – 6.0
• Conductivity (mm hos)	• maximum 2.0
• Sulphates max.	• 200 maximum ppm
• Lime	• None

    d. Parks shall approve the peat moss source prior to mixing with the topsoil.
8. Scarify the sub-grade to a minimum depth of 100mm prior to placing topsoil. Re-cultivate sub-grade compacted during hauling or spreading.
9. Topsoil shall be placed over prepared sub grade and shall be allowed to compact by light rolling such that it is firm against deep footprints. Do not over compact. Scarify and compact again if area is over compacted. Topsoil shall be free of tire ruts and large equipment tracks.
10. Do not handle topsoil while in wet or frozen condition or in any manner that may adversely affect the soil structure.

11. Topsoil shall be applied to a compacted depth of no less than 150mm for seeded areas, 100mm for sodded areas, and 500mm for shrub beds. Trees shall be planted with sufficient soil volume to thrive at mature size referencing the table below and the approved tree species list for minimum volume guidelines.

CONIFEROUS TREES		
CATEGORY (as per selected plant list)	HOLE DIAMETER	SOIL VOLUME RANGE (m3)
Small Trees (<5.0m spread)	1.5m or 3X rootball (whichever is larger)	7
Medium Trees (5.0-15.0m spread)	2.5m or 3X rootball (whichever is larger)	21
Large Trees (>15.0m spread)	3.5m 3X rootball (whichever is larger)	28

DECIDUOUS TREES		
CATEGORY (as per selected plant list)	HOLE DIAMETER	SOIL VOLUME (m3)
Small Trees (<4.0m spread)	2.0m or 3X rootball (whichever is larger)	7
Medium Trees (4.0-9.0m spread)	2.5m or 3X rootball (whichever is larger)	21
Large Trees (>9.0m spread)	3.5m or 3X rootball (whichever is larger)	28

12. Soil volumes can be reduced by approximately 1/3 if trees are placed in contiguous, shared soil trenches.
13. Topsoil depth, finished grades, and seedbed are to be approved by Parks prior to sodding, seeding or hydro seeding.

10.3.2 Bioswales

1. A two-layer soil structure with a total preferred depth of 0.45m is recommended for vegetated swales (bioswales), including:
2. A top layer (rooting zone) approximately 0.10 to 0.15 m deep and composed of 15-30% compost and 70-85% topsoil.
3. A bottom layer (percolation zone), approximately 0.30 to 0.35 m deep, extending from the top layer to the drain rock, and composed of 100% topsoil.
4. The soil structure shall not be over-compacted and be firm against deep foot-printing.
5. An underdrain / drain rock layer including perforated drainpipe may be required where specified in the engineering drawings.
6. Refer to Section 6 Stormwater Management for additional information relating to bioswales.

10.3.3 Sodding

1. All areas to be sodded shall be given a layer of topsoil as specified in Section 10.3.1 Topsoil.
2. Finished grade shall be free of all pebbles, stones, roots and debris larger than 25mm, prior to sodding.
3. Sodding is required in all areas of intensive use, grass swales, boulevards, and patchwork in established turf.
    a. Extend sod 4.5m beyond intensive use areas (playgrounds, tot lots, spray parks, multi-purpose pads, etc.)
    b. Extend sod 1.5m beyond trail edge (each side), in maintained parks and greenspace corridors,
    c. Extend sod 2m from center line (each side) in grass swales.
4. Sod to be installed for general use shall be a northern grass mix and shall be of No. 1 Nursery Sod consisting of a uniform mixture in the following proportions:

Touchdown Kentucky Bluegrass	30% by weight
Kentucky Bluegrass	40% by weight
Creeping Red Fescue	30% by weight

5. The sod shall be:
    a. A minimum of eighteen (18) months old;
    b. Free of noxious weeds and debris;
    c. 30mm – 50mm in thickness;
    d. Cut in strips of uniform width;
    e. Shall be sufficiently moist;
    f. Freshly cut and healthy with a strong fibrous root system;
    g. Cultivated in a nursery field as turf crop containing maximum 2% of other grass species.
6. Schedule delivery of sod such that it is delivered within 24 hours of being lifted and lay sod within 36 hours of being lifted.
7. Sod shall be evenly laid with sides tight and ends staggered.
8. Sod shall be laid at right angles to all slopes. Sod to be secured with pegs on slopes. Pegs shall not protrude above the surface of the sod. Any potential trip hazards caused by pegs are to be removed prior to FAC.
9. Provide and maintain adequate barricades and signs to protect freshly sodded areas until the turf is established.
10. Cut and water all sodded areas until FAC has been issued.

10.3.4 Seeding

1. All areas to be seeded shall be given a layer of topsoil as specified in Section 10.3.1 Topsoil.
2. Finished grade shall be free of all pebbles, stones, roots and debris larger than 25mm, prior to seeding.
3. Seeding will be acceptable beyond areas requiring sod, as specified in section 10.3.2 Sodding, depending on its size, accessibility, and terrain.
4. For areas such as creeks, ponds and riparian zones, a wetland seed mix shall be approved by Parks prior to installation. Approval must also be obtained from the appropriate government body prior to disturbing, re-landscaping and re-vegetating any preserved or protected areas.
5. Grass seed shall be certified Canada #1 Grade Seed, meeting the requirements of the Seed Act of Canada.

6. Upon request, provide a copy of the Certification of Compliance with the Canadian Wheat Board Act (Seeds Act). The seed is to be delivered in the original containers giving the following information:
    a. Analysis of seed mixture;
    b. Percentage of pure seed production;
    c. Year of seed production;
    d. Net weight;
    e. Date when bagged and location;
    f. Name of supplier.
7. Composition of Seed Mixture shall be as described in the following table:

Parks/Boulevards	Rural Roadside
• 30% Brooklawn Kentucky Bluegrass • 30% com1 Kentucky Bluegrass • 30% Creeping Red Fescue • 10% Perennial Ryegrass • Application Rate of 75kg/hectare	• 35% Slender/Awned Wheatgrass • 20% Rocky Mountain Fescue • 10% Ticklegrass • 10% Fringed Brome • 10% Canada Wildrye • 10% Tufted Hairgrass • 5% Fowl Bluegrass • Application Rate of 75kg/hectare
Sports Fields - Irrigated	**Sports Fields – Dry Land**
• 20% Award Kentucky Bluegrass • 20% Bedazzled Kentucky Bluegrass • 20% Brooklawn Kentucky Bluegrass • 20% NuDestiny Kentucky Bluegrass • 20% Perennial Rye Grass • Application Rate of 75kg/hectare	• 20% Brooklawn Kentucky Bluegrass • 20% Bedazzled Kentucky Bluegrass • 20% Midnight Kentucky Bluegrass • 20% Tomcat Tall Fescue • 20% Perennial Ryegrass • Application Rate of 75kg/hectare

Natural Areas (tall growing mix)	Natural Areas (low growing mix)
• 30% Rocky Mountain Fescue • 25% Indian Ricegrass • 20% Hairy Wildrye • 10% Junegrass • 10% Canada Bluegrass • 5% Canada Wildrye • Application Rate of 35kg/hectare	• 35% Sheeps Fescue • 30% Rocky Mountain Fescue • 15% Junegrass • 15% Canada Bluegrass • 5% Tufted Hairgrass • Application Rate of 35kg/hectare
Salt Tolerant Mix	
• 40% Fults Alkali Grass • 20% Tomcat tall fescue • 20% Midnight Kentucky Bluegrass • 20% Perennial Ryegrass	

8. Seed must be capable of producing a minimum germination rate of 75% in germination test and minimum purity of 97%.
9. The type and application rate of starter fertilizer (high in phosphorus and low in nitrogen, i.e. bone meal or monoammonium phosphate) shall be determined by a soil test.
10. The seed shall be evenly applied with a Brillion or slit seeder in two intersecting directions.
11. After seeding, the area is to receive a light watering with a fine spray to a depth of not more than 25mm to avoid washing.
12. Provide and maintain adequate barricades and signs to protect freshly seeded areas until the turf is established.

10.3.5 Hydro Seeding

1. All areas to be seeded shall be given a layer of topsoil as specified in Section 10.3.1 Topsoil.
2. Finished grade shall be free of all pebbles, stones, roots and debris larger than 25mm, prior to hydro seeding.
3. Hydro seeding will be acceptable beyond areas requiring sod, as specified in section 10.3.2 Sodding, depending on its size, accessibility, and terrain.
4. Water used for hydraulic and wood cellulose fiber mulching shall be free of any impurities, which would inhibit germination or otherwise adversely affect the growth.
5. The material used for mulching shall be specially prepared wood cellulose fiber or an equal substitute, approved by Parks. It shall contain no growth or germination inhibiting factors and shall form, after application, a blotter like ground cover, which will allow absorption and percolation of water.

6. The tackifier shall be an approved non-toxic product, easily diluted with water with no detrimental effects on germination or existing plants.
7. Seed mix shall be applied evenly at a rate as specified in Section 10.3.3 Seeding.
8. The type and application rate of starter fertilizer (high in phosphorus and low in nitrogen, i.e. bone meal or monoammonium phosphate) shall be determined by a soil test.
9. Grass seed and fertilizer shall be thoroughly mixed and uniformly distributed by means of an approved hydraulic seeder over the area to be hydro seeded.
10. The work shall be done only in good weather with minimal wind and on ground free of frost, snow and ice or standing water. Over spray shall be removed from site furniture or other park elements within 12 hours.
11. Provide and maintain adequate barricades and signs to protect freshly seeded areas until the turf is established.

10.4 PLANT MATERIAL

10.4.1 General

1. All plant material shall meet the Canadian National Standards for nursery grown plant material as set out in the “Canadian Standards for Nursery Stock” latest edition, unless otherwise approved by Parks.
2. The use of ‘collected plants’ will not be permitted unless approved in writing by the Parks Branch, prior to installation. See section 10.1.1 for a collected plants definition.
3. Plants shall be true to type and structurally sound, well branched, healthy and vigorous and free of disease, insect infestations, rodent damage, sunscald, frost cracks and other abrasions or scars to the bark. They shall be densely foliated when in leaf and have a healthy, well developed root system. Upright coniferous plants must have one healthy dominant leader.
4. Only plant material hardy to the Fort McMurray region shall be planted. Plant material must be sourced from and growing in similar Hardiness Zones (defined by Natural Resources Canada) for a minimum of 18 months prior to planting. Plant materials from nurseries in Hardiness Zones 4 and higher will not be permitted.
5. Parks will reject any plant material from a specific source if there is a concern related to the spread of any disease or pests. For a list of currently quarantined plant materials contact Parks.
6. All plants shall be measured when the branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to root base or from branch tip to branch tip. Where trees are measured by caliper, it will be in accordance with the Canadian Nursery Landscape Association specifications for Nursery stock.

7. Preservation of existing mature trees within the road right-of-way or park space can fulfill all or a portion of the tree planting requirements depending on the size, health, and quality of the existing trees. Consult with Parks to verify suitable trees for this purpose.

10.4.2 Planting Design, Quantities and Sizes

The following quantities are required for all new development and/or offsite upgrades.

1. Maintained park quantities are as follows:
    a. In park areas less than 1ha provide one tree per 100m^2.
    b. In park areas larger than 1ha provide one tree per 150m^2.
    c. Provide shrubs covering not less than 1% and not more than 6% of the overall site area.
    d. In park areas that consist mostly of sports fields, tree quantities and sizes may be reduced at the discretion of the Parks and Outdoor Recreation Branch.
2. Constructed Wetlands, Storm Water Management Facilities (wet ponds), and Dry Pond quantities as follows:
    a. In park areas less than 1ha provide one tree per 100m^2.
    b. In park areas larger than 1ha provide one tree per 150m^2. In wet ponds this area shall be calculated as the area above the normal water line.
    c. Provide shrubs covering not less than 1% and not more than 6% of the overall site area.
3. Off-street Parking area quantities as follows:
    a. One tree per five parking stalls.
    b. One shrub per stall.
    c. Plant material to be placed around perimeter of parking area and in parking islands.
    d. Parking islands to be located at the ends of all isles and a maximum of every 15 consecutive stalls.
4. Urban Local Roadway quantities as follows:
    a. One tree every 10m or one tree per residential lot, whichever is greater, on each side of the roadway.
5. Urban Collector Roadway quantities as follows:
    a. One tree every 10m on each side of the roadway.

6. Urban Arterial Roadway quantities as follows:
    a. The equivalent of a row of trees at 10m spacing, on each side of the roadway. Trees may be placed in shrub beds, as directed by Parks.
    b. The equivalent of a row of shrubs at 1.2m spacing, in a shrub bed, on each side of the roadway.
    c. The equivalent of a row of trees at 10m spacing for medians. Trees may be placed in shrub beds, as directed by Parks.
    d. Shrubs may be placed in medians, as approved by Parks.
7. For boulevard tree locations see Roadway Details in section 4.
8. Plant sizes are as follows:
    a. Minimum coniferous tree size is 2m height.
    b. Minimum deciduous tree size is 50mm caliper.
    c. Minimum coniferous shrub size is 600mm spread
    d. Minimum deciduous tree size is 600mm height.
    e. Plant sizes may be reduced, at the discretion of Parks, depending on the species and application.
9. Bioswales:
    a. Vegetation is a crucial component of vegetated swales and shall consist of grasses, rushes, and sedges in addition to shrub and tree plantings along the edge of the swales.
    b. Native grass species are recommended in an effort to enhance biodiversity and wildlife habitat.
    c. Selection of larger, sturdy species is recommended as they remain upright during storm events, provide year-round cover, and prevent pedestrian movement through the swale.
    d. If located along a roadway, plant species selection shall be salt tolerant.
    e. Mulch is subject to erosion and not recommended for use in vegetated swales. Covering the bottom of the Bioswale with rock is NOT acceptable as planting is essential for the proper function.
10. Plant selection and species diversity:
    a. The Parks Branch discourages monoculture planting and encourages planting design incorporating a diversity of tree species hardy to the region in order to reduce the spread of pests and disease and the potential loss of a single species within a localized area.

10.4.3 General Planting

1. Plant only during periods that are normal for such work as determined by local weather conditions, to ensure success with the plant material.
2. After utility locates have been completed, tree locations shall be staked and approved by Parks prior to installation.
3. Plant material shall be faced to give the best appearance or relationship to adjacent structures, walkways or park features.
4. All containers shall be removed.
5. Damaged or broken roots should be cut cleanly back with a sharp tool, at a 45-degree angle, to living parts remaining.
6. Shrub and tree bed edges shall be spade cut with a clean 90-degree vertical edge, 100mm deep, around the perimeter of the shrub or tree bed.
7. Trees shall be planted with a slow release fertilizer that has significant amount of insoluble nitrogen, such as Plant Product 30-8-8, or approved equal.
8. Tree wells and planting beds must be set back from non-mowable surfaces, private property, private fencing, and/or other site fixtures. These setbacks are from the edge of the tree well, mulched area or planting bed edge (15m for poplar, 2m for other deciduous trees, and ½ the maximum spread for conifers).
9. Dispose of all excess material, offsite in an approved disposal site.

10.4.4 Tree Planting

1. Coordinate locates for all underground obstructions such as electric, gas, water, communication and irrigation lines, prior to installation.
2. Where necessary, holes dug by a mechanical tree spade shall be scarified to ensure that they do not have glazed sides.
3. Trees shall be installed in the centre of the pits and the point where the root flare meets the top of the root ball must be at finished grade.
4. When the tree is placed in the hole, the top 1/3 of wire basket, burlap, and all lacing must be cut away and removed from the hole. The tree must be in an unhindered, free growing state upon completion.
5. Backfill shall be firmly tamped in place around the bottom of the root ball in such a manner that the plant retains its vertical position. The remainder of the backfill shall only be tamped lightly as the hole is filled. Particular care shall be taken to ensure that no air pockets remain under or around the roots.

6. If soil conditions are predominately clay, amend with organic material (no more than 25-30% by volume, depending on the material), otherwise use parent material for backfilling. Roughen sides of the hole to prevent glazing.
7. The topsoil shall be thoroughly watered to the point of saturation immediately after tamping.
8. Bare-root plants are to be placed on a cone-shaped mound of soil at the bottom centre of the hole; roots must not be doubled over, crowded or crossed. Spread roots out gently and evenly in the planting pit.
9. Trees shall be set back a minimum distance, measured from the center of the tree trunk, to above and below grade utilities and property lines as outlined in the table below. Setbacks are established by the respective utility provider and Developers and/or Contractors are encouraged to review and confirm all setbacks prior to design and / or construction.

Utility/Installation	Minimum Distances (m)	Utility / Installation	Minimum Distances (m)
Storm & Sanitary Mains	1.5	PUL Easements	No trees
Storm & Sanitary Services	1.5	Driveways	1.5
Fire Hydrants	3.0	Street Corners	10.5
Valves, Water Mains & Services	1.5	Yield & Stop Signs	3.5
Street Lights	3.5	Bus Stop Signs	3.5
Power Hardware	3.5	All Other Signs	1.8
Underground Power, Telephone, Cable	1.0	Overhead Power Lines	7.5
Telephone Pedestals	1.5	From Private Property Lines	1.0
Gas Lines	1.5		

10. Trees shall be set back a minimum distance taken from the center of the tree trunk, to walkways and roadways as follows:

Description	Minimum Distance (m)	Description	Minimum Distance (m)
Arterial Road Boulevard Curb face	3.0	Arterial Road Median Curb face	2.0*
Collector Road Boulevard Curb face	2.0	Collector Road Median Curb face	3.0*
Local Road Boulevard Curb face	2.0	Distance from Sidewalks	1.0
		Distance from Driveways	1.5

a. *Smaller distances are at the discretion of Engineering Services or the appropriate utility company.

11. Trees shall be set back a minimum distance taken from the centre of the tree trunk to site amenities and features as follows:

Description	Minimum Distance (m)	Description	Minimum Distance (m)
Playgrounds and Splash Parks	5.0	Playgrounds and Splash Parks (trees with large canopies and/or suckering root system)	10.0
Playgrounds and Splash Parks (shrub beds)	3.0		

12. For boulevard tree locations see Roadway Details in section 4.
13. See Section 10.4.9 for a list of “Recommended Boulevard Trees”. Alternate boulevard trees must be approved by Parks.
14. The following process for street tree installation shall be followed:
    a. Inform the Franchised Utilities of the intent to plant boulevard trees at the time they request the preliminary utility design for the subdivision. Preliminary boulevard planting plans shall be provided to the Franchised Utilities prior to the commencement of utility designs.

b. A Boulevard Tree Planting Plan, which will illustrate the location of trees in relationship to the above-mentioned services and street furnishings, shall be provided as part of the Final Engineering Drawing Package for the Development Agreement.

c. Prior to installation, the landscape contractor shall request utility locates to determine the location of all underground utilities.

d. Should the edge of the tree well be closer than 1m from the staked utility, the tree pit shall be excavated by hand. The involved utility must be contacted for approval and/or specific safety procedure requirements.

e. Wherever possible, continuous soil trenches free of utilities shall be provided within boulevards and medians to accommodate appropriate setbacks and provide sufficient soil volume to promote vigorous tree growth.

15. Soil volumes for trees shall be provided at the following rates:

    a. Large Trees (9.0m canopy spread and greater): $28m^3$.

    b. Medium Trees (4.0 – 9.0m canopy spread): $21m^3$

    c. Small Trees (4.0m canopy spread and less): $7m^3$

16. Soil volumes can be reduced by approximately 1/3 if trees are placed in contiguous, shared soil trenches.

10.4.5 Staking and Tying

1. Standard size trees shall be braced upright in position by two (2) metal stakes and guy wires. Larger trees (100mm caliper and 3.5m height) will require three (3) metal stakes and guy wires.
2. Tree stakes shall be metal “T-bar” rail or wooden 50mm x 50mm stakes, and 2.4m long. All exposed portions of the tree stakes are to be painted and the top 200mm are to be color coded. Refer to Tree Planting Detail 10-500 for installation and color codes.
3. Stakes shall be placed outside of the tree pit, and inserted 900mm into the ground.
4. Ties shall be installed in the top one third of the tree above the first strong branches. Ties shall be placed around the trunk to provide adequate support and prevent damage.
5. New 2 ply, reinforced, black rubber hose, and galvanized, #12 AWG wire shall be used to secure the new tree. An alternative is a soft polypropylene material that ensures rounded edges at all times (e.g. ArborTie).
6. Stakes and ties shall only be required up until the time of FAC; all staking material must be removed at that time to prevent girdling of the tree.
7. Tree stakes are to be removed after one year.

10.4.6 Mulch

1. Random-sized wood chips collected from a woodchipper being fed disease free tree limbs, branches and brush is acceptable. Wood chips should sit for minimum of 6 months before use to ensure the chips are free of any pathogens and to lower acidity. Sawdust, peat moss, twigs, and leafy material should not exceed 5% of the total mulch volume.
2. There shall be 75mm of mulch placed in planting beds and tree wells. Mulch shall be pulled back a minimum 50mm from the shrub or tree trunk and shall not bury any branches.
3. Entire surface area of the excavated hole shall be covered with mulch.
4. Thoroughly water mulch after it has been installed.
5. Non-wood type mulches must be approved by Parks, prior to installation.

10.4.7 Watering

1. Trees shall be watered-in thoroughly as soon as the tree is planted and watered each week thereafter throughout the growing season. Refer to section 10.9.3 for maintenance standards.
2. Water Maintenance schedule shall be submitted prior to issuance of FAC.

10.4.8 Naturalization

1. Existing natural and restored areas affected by development must be restored with native plant material while having regard for the surrounding environment, existing and new drainage patterns, soil conditions, and ecological rehabilitation.
2. Erosion control methods shall be identified, detailed, and approved by Parks.
3. The naturalization program shall provide an appropriate mix of trees, shrubs, ground covers, and wildflower seed mixes. Site characteristics including slope, drainage, and soil shall be taken into consideration when specifying species and sizes. A minimum of 25% of the plant material shall be of larger sizes (minimum 50 mm caliper). 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. All plant material shall be nursery grown stock with the exception of collected plants. The use of collected plants must be approved by Parks.
5. Any donor sites and areas to receive collected plants must be identified and approved, in writing, prior to installation.
6. Acceptable levels of shrub survival, at FAC, shall be 80% with a minimum density of one plant per square metre.
7. Naturalization requirements may be increased at the discretion of Parks depending on the sensitivity of the area.

10.4.9 Recommended Plant List

CONIFEROUS TREES					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
LARGE TREES (>15.0m spread)					
MEDIUM TREES (5.0-15.0m spread)					
Picea glauca	White Spruce	2	5.0	15.0	X
Picea pungens 'Glauca'	Colorado Blue Spruce	2	5.0	15.0	X
Pinus sylvestris	Scots Pine	3	5.0	12.0	X
SMALL TREES (<5.0m spread)					
Abies balsamea	Balsam Fir	2	3.0	10.0	
Abies sibirica	Siberian Fir	2	3.0	10.0	
Picea glauca 'Densata'	Black Hills Spruce	2	3.0	7.0	X
Picea glauca ‘Pendula’	Weeping White Spruce	2	4.0	12.0	X
Picea pungens ‘Bakeri’	Bakeri Blue Spruce	2	2.0	6.0	X
Picea pungens 'Fastigiata'	Columnar Blue Spruce	2	2.0	6.0	X
Picea pungens ‘Fat Albert’	Fat Albert Blue Spruce	2	4.0	10.0	X
Picea pungens ‘Hoopsii’	Hoopsii Blue Spruce	2	2.0	12.0	X
Picea pungens 'Pendula'	Weeping Blue Spruce	2	3.0	5.0	X
Pinus aristata	Bristlecone Pine	2	2.0	4.0	X
Pinus banksiana	Jack Pine	2	3.0	12.0	X
PInus cembra	Swiss Stone Pine	3	4.0	12.0	X
Pinus contorta latifolia	Lodgepole Pine	2	3.0	15.0	X
Larix laricina	Larch/ Tamarack	2	3.0	12.0	
Larix sibirica	Siberian Larch	2	3.0	12.0	X

CONIFEROUS SHRUBS					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Abies balsamea 'Nana'	Dwarf Balsam Fir	3	1.0	1.0	
Picea abies 'Pumila'	Dwarf Norway Spruce	3	1.5	1.0	X
Picea abies 'Nidiformis'	Bird's-Nest Spruce	3	1.5	0.8	X
Picea pungens 'Glauca globosa'	Globe Blue Spruce	2	2.0	2.0	X
Picea pungens 'Montgomery'	Montgomery Blue Spruce	2	1.0	3.0	X
Pinus mugo	Mugho/ Swiss Mountain Pine	1	3.0	3.0	X
Pinus mugo mughus	Mugho Pine	2	3.0	4.0	X
Pinus mugo 'compacta'	Compact Mugo Pine	2	2.0	1.0	X
Pinus mugo pumilo	Dwarf Mugo Pine	2	1.5	1.0	X
Juniperus communus 'Effusa'	Effusa Common Juniper	2	2.0	0.3	X
Juniperus horizontalis 'Bar Harbor'	Bar Harbor Juniper	2	2.0	0.3	X
Juniperus h. 'Prince of Wales'	Prince of Wales Juniper	2	2.0	0.2	X
Juniperus h. 'Plumosa'	Andorra/Youngstown Juniper	2	2.0	0.3	X
Juniperus h. ' Blue chip'	Blue Chip Juniper	2	2.0	0.3	X
Juniperus h. 'Blue Prince'	Blue Prince Juniper	2	2.0	0.2	X
Juniperus h. 'Blue Rug'	Blue Rug Juniper	2	2.0	0.2	X
Juniperus h. 'Hughes'	Hughes Juniper	2	2.0	0.4	X
Juniperus sabina (Zone 2 cultivars)	Spreading Juniper	2			
Juniperus scopulorum (Zone 2 cultivars)	Rocky Mountain Juniper	2			

DECIDUOUS TREES					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
LARGE TREES (>9.0m spread)					
Acer negundo	Manitoba Maple/Boxelder	2	10.0	12.0	X
Celtis occidentalis	Hackberry	2	12.0	15.0	
Fraxinus pensylvanica	Green Ash	2	10.0	20.0	X
Fraxinus pensylvanica (Zone 2 cultivars)*		2			
Populus balsamifera	Balsam Poplar	2	12.0	25.0	
Populus x 'Brooks #6'	Brooks #6 Poplar	2	12.0	20.0	
Populus x 'Northwest'	Northwest Poplar	2	12.0	15.0	
Tilia americana	American Linden	2	10.0	16.0	
Ulmus americana 'Brandon'	Brandon Elm	2	12.0	15.0	X
Ulmus pumila	Siberian Elm	2	10.0	12.0	
MEDIUM TREES (4.0-9.0m spread)					
Acer ginnala	Amur Maple	2	5.0	6.0	X
Acer negundo ‘Baron’	Baron Manitoba Maple / Baron Box Elder	2	9.0	12.0	X
Acer x 'DUR1'	Ventura Maple	2	5.0	6.0	
Betula papyrifera	White Bitch	2	9.0	12.0	
Betula pendula 'laciniata'	Cutleaf Weeping Birch	2	8.0	12.0	
Crataegus x mordensis 'Snowbird'	Snowbird Hawthorn	3	5.0	5.0	X
Crataegus x mordensis 'Toba'	Toba Hawthorn	3	5.0	5.0	X
Elaeagnus angustifolia	Russian Olive	2	6.0	6.0	X
Fraxinus nigra	Black Ash*	2	7.0	14.0	
Fraxinus nigra ‘Fallgold’	Fallgold Black Ash	2	5.0	13.0	
Crataegus succulenta	Fleshy Hawthorn	2	4.0	5.0	X

DECIDUOUS TREES					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Fraxinus mandschurica 'Mancana'	Mancana Ash	3	7.0	12.0	
Fraxinus x 'Northern Gem'	Northern Gem Ash	2	9.0	13.0	X
Fraxinus x 'Northern Treasure'	Northern Treasure Ash	2	7.0	13.0	X
Malus baccata	Siberian Crabapple	2	4.0	5.0	
Populus x 'Assiniboine'	Assiniboine poplar	2	8.0	18.0	
Populus x 'Hill'	Hill Poplar	2	6.0	18.0	
Prunus maackii	Amur Cherry	2	5.0	7.0	
Quercus macrocarpa	Bur Oak	2	8.0	10.0	X
Salix alba 'Sericea'	Silky White Willow	2	7.0	16.0	
Salix acutifolia	Acute Leaf Willow	2	7.0	16.0	
Salix pentandra	Laurel-Leaf Willow	2	7.0	16.0	
Sorbus americana	American Mountain Ash	2	5.0	8.0	
Sorbus decora	Showy Mountain Ash	2	6.0	8.0	
Tilia x flavescens 'Dropmore'	Dropmore Linden	2	7.0	12.0	
Tilia mongolica 'Harvest Gold'	Harvest Gold Linden	2	8.0	12.0	
SMALL TREES (<4.0m spread)					
Crataegus arnoldiana	Arnold Hawthorn	2	3.0	4.0	X
Malus x (Zone 2 cultivars)	Crabapple	2			
Populus x canescens 'Tower'	Tower Poplar	3	2.0	15.0	
Populus tremula 'Erecta'	Swedish Columnar	2	2.0	10.0	

DECIDUOUS SHRUBS					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Acer ginnala 'Fireball'	Fireball Amur maple	2	1.3	1.3	
Caragana arborescens	Common Caragana	2	2.5	4.5	X
Caragana arborescens (Zone 2 cultivars)	Caragana	2			X
Caragana frutex 'Globosa'	Globe Caragana	2	0.9	0.9	X
Caragana pygmea	Pygmy Caragana	2	1.3	0.9	X
Cornus alba 'Gouchaultii'	Gold Variegated / Mottled Dogwood	3	2.0	2.0	
Cornus alba 'Aureo-Marginata'	Silver Leaved Dogwood	2	2.0	2.0	
Cornus alba 'Sibirica'	Siberian Coral Dogwood	2	1.5	1.8	
Cornus alba 'Morden Amber'	Morden Amber Dogwood	2	1.8	2.5	
Cornus alba 'Siberian Pearl'	Siberian Pearl Dogwood	2	1.8	1.8	
Cornus sericea	Red Osier Dogwood	2	3.0	3.0	
Cornus sericea 'Flaviramea'	Golden Twig / Yellowtwig Dogwood	2	2.0	2.0	
Corylus americana	American Hazlenut	2	2.0	3.0	
Cotoneaster integerrimus	European Cotoneaster	2	1.5	1.5	
Cotoneaster lucidus	Hedge Cotoneaster	2	1.5	2.5	X
Elaeagnus x 'Jefmorg'	Silverscape Olive	2	1.5	1.8	
Halimodendron halodendron	Siberian Salt Bush	2	2.0	2.0	X
Hippophae rhamnoides	Sea Buckthorn	2	4.0	4.0	X
Hydrangea arborescens 'Annabelle'	Annabelle Hydrangea	3	1.3	1.3	
Hydrangea paniculata 'Grandiflora'	Peegee Hydrangea	3	1.3	1.3	

DECIDUOUS SHRUBS					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Lonicera caerulea 'Edulis'	Sweetberry Honeysuckle	3	1.3	1.3	
Lonicera tatarica	Tatarian Honeysuckle	3	4.0	4.0	
Lonicera tatarica 'Arnold Red'	Arnold Red Honeysuckle	3	3.0	3.0	X
Lonicera xyleostoides 'Claveyi'	Clavey's Dwarf Honeysuckle	3	1.5	1.5	
Lonicera x brownii	Dropmore Scarlet Honeysuckle	2	Vine	-	
Lonicera x 'Mandarin'	Mandarin Honeysuckle	2	Vine	-	
Pachistima canbyi	Cliff green Pachistima	2	0.6	0.9	
Philadelphus lewisii 'Waterton'	Waterton Mockorange	2	1.5	2.0	X
Philadelphus lewisii 'Blizzard'	Blizzard Mockorange	2	1.5	1.5	X
Physocarpus opulifolius 'Dart's Gold'	Dart's Gold Ninebark	2	1.8	1.8	X
Potentilla fruticosa (Zone 2 cultivars)	Potentilla	2			
Prunus besseyi	Western Sandcherry	2	1.0	1.0	
Prunus x cistena	Purple-Leaf Sandcherry	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	
Ribes aureum	Golden Currant	2	1.5	1.5	

DECIDUOUS SHRUBS					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Rosa rugosa 'Hansa'	Hansa Rose	2	1.3	1.4	X
Rosa x 'Therese Bugnet'	Therese Bugnet Rose	2	1.5	1.8	
Rosa x rugosa (Zone 2 cultivars)	Explorer series Roses				
Rosa foetida 'Harrisons Yellow'	Harrisons Yellow Rose	2	1.5	2.0	
Rosa x arkansana (Zone 2 cultivars)	Parkland series Roses				
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	Silverleaf 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	
Spirea x bumalda (Zone 2 cultivars)	Spirea	3			X
Spirea trilobata	Three Lobed Spirea	2	0.9	0.9	
Spirea trilobata 'Snowhite'	Snowhite Spirea	2	1.3	1.5	
Spiraea vanhouttei	Bridal Wreath Spirea	2	2.0	2.0	
Syringa x prestoniae (all cultivars)	Preston Lilac	2	2.0	3.0	
Syringa x hyacinthiflora (all cultivars)	Hyacinth Flowered lilac	2	2.0	3.0	X
Syringa vulgaris	Common Lilac	2	3.5	4.5	
S. vulgaris Zone (Zone 2 cultivars)	Lilac	2			X
Syringa villosa	Villosa/Late Lilac	2	1.8	3.0	X
Viburnum lentago	Nannyberry	2	2.5	4.0	

DECIDUOUS SHRUBS					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Viburnum opulus 'Nanum'	Dwarf European Cranberry	3	0.6	0.6	
Viburnum trilobum	Highbush Cranberry	2	1.75	3.0	
Viburnum trilobum (Zone 2 cultivars)	Compact Cranberry	2			

GRASSES					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Bromis inermis 'Skinners Golden'	Skinners Golden Brome Grass	2	0.5	0.5	
Phalaris arundinacea	Ribbon Grass	2	0.5	0.9	

NATIVE PLANT MATERIAL					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Alnus crispa	Green Alder	2	2.0	3.0	
Alnus tenuifolia	River/Mountain Alder	2	4.0	6.0	X
Amelanchier alnifolia	Saskatoon / Serviceberry	2	2.0	3.0	X
Arctostaphylos uva-ursi	Bearberry / Kinnikinnick	2	1.3	0.2	
Betula pumila	Swamp Birch	2	1.5	2.0	
Betula glandulosa	Dwarf Birch	2	2.0	2.0	
Corylus cornuta	Beaked Hazelnut	2	2.0	3.0	X
Elaeagnus communta	Wolf Willow/Silverberry	2	1.8	1.8	X
Juniperus horizontalis	Creeping Juniper	2	2.0	0.3	X
Juniperus communis	Common ground Juniper	2	2.0	0.3	

NATIVE PLANT MATERIAL					
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)	Drought Tolerant
Ledum groenlandicum	Labrador Tea	2	0.2	0.6	
Lonicera involucrata	Bracted Honeysuckle	2	1.5	3.0	X
Potenilla fruticosa	Shrubby Cinquefoil	2	1.5	1.5	
Ribes oxyacanthoides	Wild Gooseberry	2	1.0	1.3	X
Rosa acicularis	Prickly Wild Rose	1	1.0	1.0	X
Rubus idaeus	Wild Red Raspberry	2	1.0	1.5	X
Salix discolor	Pussy Willow	2	4.0	5.0	X
Shepardia argentea	Silver Buffaloberry	2	3.0	3.0	X
Shepardia canadensis	Buffalo Berry	2	3.0	3.0	
Symphoricarpos albus	Snowberry	2	1.5	1.5	X
Symphoricarpos occidentalis	Buckbrush/Coralberry	2	1.0	0.8	
Vaccinium myrtilloides	Common blueberry	2	0.5	0.5	
Vaccinium vitis-idaea	Bog Cranberry / Lingonberry	2	0.5	0.2	
Viburnum opulus	High Bush Cranberry	2	2.0	3.0	
Viburnum edule	Low Bush Cranberry	2	1.0	1.0	

RECOMMENDED BOULEVARD TREES				
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)
Acer negundo	Manitoba Maple/Boxelder	2	10.0	12.0
Acer negundo 'Baron'	Baron Manitoba Maple/ Baron Boxelder	2	9.0	12.0
Fraxinus nigra	Black Ash	2	7.0	14.0
Fraxinus nigra ‘Fallgold’	Fallgold Black Ash	2	5.0	13.0
Fraxinus pensylvanica	Green Ash	2	10.0	20.0

RECOMMENDED BOULEVARD TREES				
Botanical Name	Common Name	Zone	Sp.(m)	Ht.(m)
Fraxinus pensylvanica (Zone 2 cultivars)		2		
Prunus maackii	Amur Cherry	2	5.0	7.0
Tilia americana	American Linden	2	10.0	16.0
Tilia x flavescens 'Dropmore'	Dropmore Linden	2	7.0	12.0
Tilia mongolica 'Harvest Gold'	Harvest Gold Linden	2	8.0	12.0
Ulmus americana 'Brandon'	Brandon Elm	2	12.0	15.0
Ulmus pumila	Siberian Elm	2	10.0	12.0

MUNICIPALITY QUARANTINE LIST	
Botanical Name	Common Name
Prunus padus commutata	Mayday
Prunus pensylvanica	Pin Cherry
Prunus virginiana ‘Shubert’	Shubert Chokecherry
Prunus virginiana ‘Melanocarpa’	Chokecherry

*Contact Parks for a current list of quarantined plants.

10.4.10 Substitution

1. All plants shall be supplied as specified on the plant list. Substitutions for species or size will not be allowed unless approved in writing by the Parks Branch.

10.4.11 Warranty

1. All plant materials found dead, diseased, damaged, unhealthy, not showing satisfactory growth, improperly planted, or that do not meet the requirements of the approved drawings, shall be replaced within 30 days of notification. Replacement dates may be extended, at the discretion of Parks, depending on planting conditions.
2. All required replacements shall be with plants of the same size and species as specified on the Plant List and shall be supplied and planted in accordance with the approved drawings and specifications.
3. The Developer / Contractor will be responsible for all plant material replacements until the planted area has been issued FAC.

10.5 TRAIL DEVELOPMENT

All trail alignments shall be staked and approved by Parks prior to construction.

10.5.1 Class 1 Trails

1. Description:

   Class 1 trails provide the spine of our overall trail system and where possible, uninterrupted access along its entire length. It will provide two-way traffic for the broadest range of use. Summer use will include full disabled access where possible. This classification includes Multi-Use Trails adjacent to roadways in Arterial and Collector roads, and other trails where designated as part of the Active Transportation network. Trail surface must be asphalt, concrete, paving stones, or other approved equal.

2. Location:

   Provide access to and extend existing Class 1 trails in conjunction with the new development, particularly along top-of-bank areas abutting creeks, rivers and ravines. Class 1 trails are to be located in all primary pedestrian routes, Municipal Reserves, Public Utility Lots, and areas that are not environmentally sensitive. Primary pedestrian routes shall be defined by Parks but will generally be located along the perimeter of development areas.

3. Aesthetics and Alignment:

   Class 1 trails are used to buffer undesirable adjacent land uses and should be aligned with existing or supplemental plantings that will enhance aesthetics and aid in screening. Bench nodes will be required every 500m; see Section 10.7.2 Site fixtures for details. The alignment should be curvilinear and fit to the natural form of the land. Straight lines and constant curve radii are to be avoided. Trails may require additional site-specific signage at the discretion of Parks.

4. Trail Width:

   a. 3m minimum width

   b. Special situations such as intersections, entrances and exits from highly used activity nodes, downhill curves or excessive downhill grades will require the width of the trail to expand up to 3.5m wide, or as directed by Parks.

10.5.2 Class 2 Trails

1. Description:

   Class 2 trails provide the opportunity for ancillary trail loops to augment and expand the experiences offered by the main trail. In all cases, Class 2 trails will receive a high level of use from a broad range of user groups. Trail surfaces must be asphalt, concrete, paving stones, or other approved equal.

2. Location:

   Priority is to provide secondary pedestrian routes and provide more contact between users and natural environments, such as water and vegetation. Class 2 trails are to be located in all secondary pedestrian routes, Municipal Reserves, Public Utility Lots, and areas that are not environmentally sensitive. Alignment can lead users to the boundaries of environmentally sensitive areas, such as Environmental Reserves.

3. Aesthetics and Alignment:

   Class 2 trails are to be less linear and more looped in character than that of Class 1 and should follow the surrounding terrain. Bench nodes will be required every 500m; see Section 10.7.2 Site Furniture for more details.

4. Trail Width:

   a. 2.5m minimum width

   b. Special situations such as intersections, entrances and exits from highly used activity nodes, downhill curves or excessive downhill grades will require the width of the trail to expand up to 3.5m wide, or as directed by Parks.

10.5.3 Class 3 Trails

1. Description:

   Class 3 trails provide experiences which focus on contact with nature and natural systems. Class 3 trails will primarily receive high use from select user groups. Areas adjacent to Class 3 trails should be left in a natural state. Trail surface should be gravel unless approved by Parks.

2. Location:

   Class 3 trails shall be located in environmentally sensitive areas such as Environmental Reserves.

3. Aesthetics and Alignment:

   Should encourage visual and physical contact with the natural environment. Alignments should cause minimal disturbance to the surrounding environment and follow the natural terrain of the area wherever possible.

4. Trail Width:
    a. 2.5m minimum width
    b. Special situations such as intersections, entrances and exits from highly used activity nodes, downhill curves or excessive downhill grades will require the width of the trail to expand up to 3.5m wide, or as directed by Parks.

10.5.4 Tread Surfaces

1. Asphalt – Class 1 and 2 Trails
    a. Hot mix, 12.5mm maximum aggregate size
    b. 75mm asphalt compacted to 97% Standard Proctor Density on.
    c. 150mm of 19mm crushed gravel base course compacted to 98% Standard Proctor Density on.
    d. 150mm scarified and/or re-compacted sub grade to 95% Standard Proctor Density.
    e. Hot poured, thermoplastic, inlaid centerline, 100mm wide. Class 2 trails only require centerline on sections greater than 2.5m wide and on stretches with a longitudinal grade greater that 4%.
    f. Asphalt testing to be conducted in accordance with the Regional Municipality Standard Construction Specifications.
2. Paving Stone – Class 1 and 2 Trails
    a. 60mm min width paving stones
    b. 25mm bedding sand
    c. 150mm of 19mm crushed gravel base course compacted to 98% Standard Proctor Density
    d. 150mm scarified and/or re-compacted sub grade to 95% Standard Proctor Density
3. Concrete – Class 1 and 2 Trails
    a. 120mm minimum depth 30Mpa concrete in accordance with Section 4 Transportation, Roads and Sidewalks and the Regional Municipality Standard Construction Specifications.
    b. 150mm of 19mm compacted crush gravel base course compacted to 98% Standard Proctor Density
    c. 150mm scarified and/or re-compacted sub grade to 95% Standard Proctor Density
    d. The finished surface shall be transverse brushed.
    e. Contraction joints shall be spaced at 1.5m.

4. Gravel – Class 3 Trails
    a. 150mm of 19mm crushed gravel compacted to 98% Standard Proctor Density.
    b. 150mm scarified and/or re-compacted sub grade to 95% Standard Proctor Density.

10.5.5 Compaction Test

1. Forward sub-grade and crushed gravel compaction tests to Parks for approval, prior to asphalt, concrete, or paving stone installation.
2. Compaction Tests are required every 150m on centre.
3. If the percent compaction average does not meet or exceed the minimums, specified above, two additional tests will be required.
4. If the accumulated percent compaction average does not pass, a geo-textile will be required to stabilize the trail base.

10.5.6 Trail Intersections

1. Class 1 trail start areas and intersections are to be lit, see lighting information in 10.7.2 Site Furniture.
2. Where Class 1 and 2 trails cross or intersect with roads, install pedestrian crossing in accordance with Section 4 Roadway Design, including stop signs for the trails. Contact Parks for signage details.

10.5.7 Trail Signage and Markers

1. Requirements for trail signage such as, but not limited to, maps, trail names, sharp corners, yield signs, steep slopes, trail narrowing, regulatory and wayfinding signage may be determined by the Parks Branch.

10.5.8 Vertical and Horizontal Right-of-Way Clearance

1. Vertical clearance shall be a minimum height of 2.4m above the trail surface. Superior sight lines must be incorporated at intersections, steep grades, sharp crests and curves.
2. Horizontal clearance shall be a minimum width of 1m from the edge of the trail surface.
3. Fixed objects such as signage, fencing, and light poles are to be installed at a minimum of 1m from the trail edge. Ensure no portion of the object extends into the horizontal clearance area or beyond the vertical clearance area.
4. Where bench nodes are installed, the closest edge of the seating surface should be a minimum of 1m from the trail edge.

10.5.9 Grades, Radius, and Super Elevation

1. Running grades should not exceed 1:20 (5%). In areas with steep topography, grades of up to a maximum of 1:12 (8%) are permitted, with 1.2 x 1.2m landings provided every 10m.
2. Radii of trails will vary based on anticipated trail use and the design speed of bicycles, skiers and other users. Recommended radii should vary between 30 and 60m.
3. The trail corner super elevation would function in the range of 2% to 5% relative to the application. Additional super elevation is required for trails used by cross-country skiing, especially if steeper grades co-exist.

10.5.10 Drainage

1. Trails are not to be used for overland drainage.
2. Trails require 1% crown or 2% cross slopes relative to the adjacent grades. Adjacent grades are to slope away from the trail.
3. Culverts are required where surface drainage routes cross the trail.
4. Trails are not to be directly routed through low areas or depressions that attract and hold runoff for long periods of time.
5. Bridges may be required to span high drainage areas, at the discretion of Parks. A flat approach may be required, at the discretion of Parks, for bridges adjacent a slope.

10.5.11 Root Barriers

1. Root barriers are required along trail sections located within 10 metres of plant species which are known to have aggressive rooting systems, such as populus and salix. Root barriers will be required to run the length of the drip of the tree(s) in the 10m encroachment area. Vertical root barriers will be required on the on the side(s) of trail where the tree(s) exists. Horizontal root barriers will be required the entire width of the trail.
2. Vertical root barriers shall be 40mm high density polyethylene and a minimum 500mm depth from bottom of trail surface.
3. All root barriers to be installed to manufacturer’s specifications.

10.6 SPORTS FIELDS AND RECREATIONAL FACILITIES

10.6.1 General

1. All underground utilities shall be located, prior to construction.
2. Refer to standard landscape details for sports fields and recreational facility size requirements.
3. Refer to Section 10.3 Topsoil and Turf for additional details.
4. All sports field equipment such as goal posts, bleachers, backstops, dugouts are to be specified on the developer's drawings.
5. Each sports field will be irrigated with an automatic irrigation system or strategically located standpipes, locations to be approved by Parks. Submit irrigation plans, to be approved by Parks, prior to construction. Contact the Parks Department for the current Sports Field Irrigation Standards and Specifications.

10.6.2 Sports Amenity Furnishings

1. General
    a. All underground utilities shall be located, prior to construction.
    b. All site furnishings are to be installed as per manufactures specifications.
2. Materials and Fixtures
    a. Hockey Nets
        i. Riley Manufacturing, Crush net professional hockey goal, 44" deep, primed and powder coated, solid frame, with netting and padding, or approved equal.
    b. Soccer Goal
        i. Kwik Goal, 8'x24' Evolution goal, catalogue #2B3306, powder coated white, with net and anchors, or approved equal.
    c. Football Posts
        i. Bison, Perfect goal, catalogue #FB55CG-SY, or approved equal.
    d. Rugby Posts
        i. Kwik Goal, 27' uprights, catalogue #2J101, or approved equal.
    e. Players Benches
        i. National Recreation Systems, 15' permanent player's bench, catalogue #BE-PB15, or approved equal.

f. Bleachers

   i. National Recreation Systems, 4 rows, 15’ non-elevated, with 40/unit seating capacity, catalogue #NB-0415AD2, or approved equal.

g. Ball Diamond Backstops

   i. All materials shall conform to the Canadian General Standards Board (CGSB) Specification Can 2-138.1.1 and .2.

   ii. All material to be installed as per manufacturer’s specifications and/or as per detail 10-904.

h. Outdoor Rink Dasher Boards:

   i. Frames shall be galvanized or anodized aluminium.

   ii. Boards shall be minimum 25mm thick high-density polyethylene.

   iii. A 1.2m high chain link fence shall be installed on top of the dasher boards. Chain link fence to be reinforced with pipe every 1.0 m behind goal areas.

   iv. All gates to have opening apparatus installed on inside.

   v. Board system to be reinforced and braced adjacent to vehicle gate.

   vi. All anchors and hardware shall be galvanized.

10.6.3 Backstop Construction

Install the chain link fence in accordance with the C.G.S.B. specification CAN 2-138.3 and the following clauses:

1. Post Installation

   a. Posts shall be plumbed and set to give correct alignment. Bending of the post will not be permitted.

   b. Post spacing: shall not exceed 3.0m. Line posts are spaced in line of fence, maximum 3.0m apart.

   c. Post footing: all line and terminal posts shall be set in concrete footings of the proper diameter and 2.4m depth to ensure adequate support.

2. Braces

   a. Braces shall be placed diagonally from the terminal post to the first adjacent line post and securely attached.

   b. Corner posts shall have braces on both sides.

3. Fabric Installation
    a. The bottom tension wire shall be stretched taut along the bottom of the fabric and securely attached to the bottom edge of the fabric at 450mm spacing and to all posts.
    b. The fabric shall be stretched taut to the tension as specified by the manufacturer.
    c. Fabric clips shall be used to fasten the fabric to the top rail at 450mm spacing and to the line posts at 380 mm spacing.
    d. Tension bars, bands and bolts shall be used to fasten fabric to the terminal posts.

10.7 SITE FIXTURES

10.7.1 Play Structures

10.7.1.1 General

1. All playground equipment shall be constructed and installed in compliance with current industry standards and practices and shall adhere to CAN/CSA – Z614-20.
2. Western Red Cedar will be permitted for use on playground structures, any other wood products will need to be approved by Parks.
3. Galvanized slide beds may be used at the discretion of Parks and is dependent upon site and slide alignment.
4. The development of play environments that foster natural experiences is strongly encouraged, in a manner that is safe and manageable, and may include:
    a. outdoor spaces designated for play and comprised of natural components such as hills, logs, water, sand, mud, boulders in an effort to encourage exploration.
    b. plants intended to represent the natural environment.
    c. more traditional playground components that may be supplemented with natural play experiences in an effort to support creative play and development of gross motor skills.

10.7.1.2 Accessibility

1. Providing accessible play opportunities for persons with disabilities is a basic criterion of all playground planning and design. Accessibility requirements shall adhere to CAN/CSA Z1614:20 Annex H standards.
2. Accessible play components are intended for those users using wheelchairs or other mobility devices.
3. 50% of all play components in a playground shall be accessible, i.e. users can enter and exit the component via an accessible route.

4. An accessible route may be at or above grade and shall have a minimum clear width of 1525mm and a maximum slope of 1:16.
5. More than one type of accessible play component shall be provided in each playground. Types of play components include (but are not limited to) rocking, swinging, climbing, spinning and sliding.

10.7.1.3 Warranty

1. Playground equipment and all parts thereof shall be warrantied for two years or as specified in the manufacturer's warranty agreement, whichever is greater.
2. Provide Parks with documentation to include maintenance manual, parts list, and Record Drawings for each play structure.

10.7.1.4 Excavation

1. General
    a. The site shall be staked prior to excavation. The Developer / Contractor is responsible for verifying all measurements as per the drawings.
2. Utility Locates
    a. All utility locates shall be completed prior to any construction or excavation.
3. Excavation of Site
    a. Excavate area to proper elevations as indicated in the approved landscape drawings.
4. Drainage
    a. Parks shall inspect the excavated area prior to the play structure installation.
    b. Ensure that the play area drainage slopes at a ratio of 1:24 (down 25mm, for every 600mm traveled in parallel with ground) to the French Drain and / or the adjacent exit swale. Weeping tile will be wrapped in a filter fabric and surrounded with minimally 25mm of pea gravel (or aggregate of similar affect). The play area slopes at 2% minimum to the weep holes and the adjacent exit swale. Filter fabric will be required to keep loose surfacing from pushing out the weep holes. Weeping tile will be required where grades do not allow for surface drainage.
    c. Wherever it is deemed feasible by Parks, drainage shall tie into nearby storm sewers. If park does not have a storm sewer, weeping tile will direct water towards roadway or nearest storm sewer.
    d. An alternate means of drainage will be required in the event a play area is surrounded by hard surfaces such as asphalt, concrete, or paving stones.

10.7.1.5 Disposal of Material

1. All excess material shall be removed and disposed of offsite in an environmentally friendly manner acceptable to the Parks.

10.7.1.6 Borders

1. The safety zone described as the distance between the play equipment and the border shall meet or exceed the Canadian Standards Guidelines CAN/CSA - Z614-20.
2. All borders shall be level with the adjacent finished grade, unless approved by Parks.
3. Playground edging to be cast-in-place concrete header, minimum dimensions must be 250mm x 250mm with inside top edge being rounded to a radius of 50mm and outside top edge being rounded to a radius of 25mm to meet the adjacent surface. Concrete mix shall be in accordance with the following:

Minimum 28 Day Strength	25 MPa
Designated Aggregate Size	Maximum 25mm (1 inch)
Slump	25 – 75mm (1 – 3 inches
Air Entrainment	5 – 7 %
Cement	Type 10 Normal Portland Cement
Calcium Chloride	ASTM D98, 2% maximum, with Parks Department approval

4. See standard landscape details for more information.
5. Expansion joints are required every 3.0 m.
6. Wood, plastic, and metal playground edgers are not permitted.

10.7.1.7 Playground Surfacing

1. Playground surfacing to be engineered wood fibre and must meet the requirements of ASTM F 1292.
2. Engineered wood fibre shall be installed as per manufacturer specification to a minimum compacted depth of 350mm.
3. Engineered wood fibre surfacing is to include a drainage system which is to be verified by the Parks Branch prior to construction. .
4. Poured in place rubber surfacing applications shall be reviewed and approved by Parks prior to construction.
5. Pea gravel, synthetic tiles, sand and rubber crumb surfacing is not permitted.

6. Under all swings (to-fro, saucer, all multi-user varieties) wear mats of proper designation, must be laid underneath the swing. . The matting must reach 1.8m in length and1.2m in width under any 'to-fro' style swing. The center of this measurement will sit directly under the bottom of a motion less swing seat.
7. Before a CCC / Total Completion is completed Parks can call upon the developer / contractor to add more surfacing material to the playground, should the surfacing not meet the specified requirements.

10.7.1.8 Play Structure Installation

1. Supply and install playground equipment as per drawings. The equipment shall be installed according to manufacturer's specifications. A certified playground installer must install the playground equipment.
2. Completed work shall be inspected by the manufacturer and Parks, and a written approval or certificate will be required prior to CCC being issued. Parks will not accept until all deficiencies have been rectified by the installer, or the Parks Department (Parks reserves the right to determine which party does the required work).
3. Parks must be notified whenever a new playground (or one that is being modified) is to be constructed by a Developer and / or Contractor. Parks must be supplied with play space drawings before construction begins, for their considerations. Parks must also be onsite to approve start-ups, drainage plans (layout), drainage installation, drainage type (swale, French drain, storm sewer, etc.), concrete pilings, and general site conditions before any protective surfacing is installed. Parks will come back again after everything is complete to assist the Landscape Consultant in issuing a CCC.

10.7.2 Site Furniture

10.7.2.1 General

1. All underground utilities shall be located, prior to construction.
2. All site furnishings are to be installed as per manufactures specifications.

10.7.2.2 Materials and Fixtures

1. Bollards
    a. Are required where trails connect or intersect with roadways or parking areas, see standard landscape details.
2. Garbage Containers
    a. Haul All Hid-A-Bag I standard container, 265 liters, single compartment, painted standard green, with latch or approved equal. To be provided at all park entrances/exits and bench nodes, unless otherwise approved.
    b. Haul All Hid-A-Bag II standard container, 490 liters, double compartment, painted standard green, with latch or approved equal. To be provided at all intensive use areas, unless otherwise approved.
    c. Alfa Maxi – AL-01867, stone finish or approved equal. To be placed within 10m of a roadway or parking area.
    d. Recycle bins to be painted “Recycle Blue” and to have standard lid with restrictor plate inside.
    e. Appropriate decals to be supplied/applied prior to acceptance.

10.7.2.3 Illumination

1. Lighting is required at critical areas, such as, street crossings, Class 1 trail intersections, bridges, underpasses, and activity nodes. As well as outdoor facilities such as ice rinks and football fields.
2. Lighting style to reflect light down toward foot surfaces or features, not to refract light outward, or approved equal.
3. Design height for lighting to be a minimum of 5000mm above finished grade. Parks reserves the right to accept or reject wood poles.
4. Outdoor panels to be mounted above snow level.
5. Electrical plans to be stamped by an Electrical Engineer and approved by Parks and/or any other municipal department deemed necessary by Parks.

10.7.2.4 Benches

1. Metal Benches –DuMor Bench Series 119, surface mount (S-2) Black or approved equal. For use in formal/urban park settings.
2. Wood Benches – Dumor Douglas Fir bench, model number 88-60 (with optional armrests) or approved equal. For use in informal/natural park settings.

10.7.2.5 Picnic Tables

1. Metal Picnic Tables – DuMor Table 448, surface mount (S-2) Black with options to add wheelchair accessibility or approved equal for use in formal/urban park settings.

10.7.2.6 Bicycle Racks and Bicycle Parking Spaces

2. Metal Bicycle Rack – polyester powder coated black rack. Blue IMP catalogue number BR126 or approved equal.
3. Bicycle racks to be placed to accommodate bicycle parking spaces and aisles as follows:
    a. Each bicycle parking space shall be a minimum of 600mm wide x 1800mm deep.
    b. Each bicycle parking space shall have a minimum vertical clearance of 2000mm.
    c. Each bicycle parking space shall be directly accessible by an aisle 1500mm wide minimum.
4. Bicycle parking spaces and access aisles to be concrete, asphalt, paving stone or similar hard surfacing.
5. See the Standard Detail drawings for Bicycle Rack Details.

10.7.2.7 Installation

Install all site furnishings in accordance with the manufacturers' specifications, unless otherwise noted in this section.

1. Bollards
    a. See Standard Landscape Details for installation requirements.
2. Garbage Containers
    a. Excavate area for concrete pad and provide 100mm of compacted crushed gravel for pad to sit on. Container to be mounted, as per manufacturer's specifications, on a 120mm poured pad or pre-cast pad. Top of concrete to be level with the adjacent finished grade.
    b. Containers to have minimum 600mm clearance on at least one side of container and 600mm clearance behind container for access and bag removal. Clearance area to be level.
    c. Containers are to be located a minimum of 5.0m away from seating areas or benches, and minimum 1.0 meter from sidewalks, pathways and roads.

3. Benches and Picnic Tables
    a. Pedestals must be set in 2 – 250mm diameter concrete piles to a minimum depth of 1,200mm.
    b. Top of concrete pile to be 100mm below finished grade and sloped to drain.
    c. Seat surface to 425mm above finished grade.
    d. All benches and picnic tables to be installed on gravel, asphalt, concrete, or paving stone pads. Pad to be a minimum of 600mm wider than the fixture unless otherwise noted. See gravel, asphalt, concrete, or paving stone details for additional information.

10.7.3 Uniform Fencing

10.7.3.1 General

1. Uniform fencing shall be constructed in accordance with the approved drawings.
2. Uniform fencing shall be constructed adjacent to public open space and adjacent to the following locations:
    a. Arterial Roadways
    b. Parks and Playfields
    c. Public Walkways and Utility Lots
    d. School Sites
    e. Municipal owned lands – e.g. Fire hall sites
    f. Multiple Family Sites
    g. Neighborhood Commercial Sites
    h. Other areas as required by Parks.
3. Post and Rail fencing is required in parks adjacent to roadways or lanes. See Post and Rail Fence Detail 10-300 for additional information. Fence to be offset 150mm onto the park property.
4. Wood Screen Fencing is required between private property and public open space lands (including parks and school sites, PUL's, and other sites as specified). See Wood Screen Fence Detail 10-301 and 10-302 for additional information. Fence to be offset 150mm onto the private property.
5. Chain link fencing can be used as an alternate for wood screen fencing in some applications but must be approved by Parks.
6. Sound Abatement fencing will be reviewed and approved by the Engineering Department, see section 4.9 Sound Abatement for details.
7. Pedestrian gates and locations shall be approved by Parks. They must be a maximum of 1m wide and open toward the private property side.

10.7.3.2 Chain Link Fencing

1. Materials
    a. All materials shall conform to the Canadian General Standards Board (C.G.S.B.) Specification Can 2-138.1.1 and .2.
2. Terminal Posts
    a. Corner posts shall be a standard continuous weld, end, corner posts 88.99mm O.D. galvanized pipe, furnished complete with all necessary bracing and fittings. Commercial Grade 0.125" wall thickness required for terminal posts.
3. Line Posts
    a. Line posts shall be standard continuous weld 60.3mm O.D. galvanized pipe complete with post tops without barbed wire overhang arm. Commercial Grade 0.100" wall thickness required for line posts.
4. Top Rail
    a. 42.2mm O.D. galvanized pipe coupled with slip on rail sleeves for every standard length. Commercial Grade 0.100" wall thickness required for top rail.
5. Fabric
    a. Chain link 50mm mesh x 3.5mm gauges to desired height manufactured from the highest quality galvanized wire, or vinyl coated in accordance with ASTM - A392-81-CLASS1.
6. Bottom Tension Wire
    a. 3.5mm (9) gauge galvanized steel.
7. Braces
    a. Braces shall be 42.2mm O.D. hot dipped galvanized steel pipe.
8. Fittings
    a. All fittings are made of first grade malleable iron, pressed steel or aluminum.
    b. Tie wire to be 3.5mm (9) gauge galvanized steel or aluminum.
    c. Tension bands and bolts shall be spaced at 380mm on the terminal posts.
    d. Fabric clips shall be number 3.5mm (9) gauge aluminum alloy wire.
    e. All material shall be colour codes 10.
9. Construction Methods
    a. Install the chain link fence in accordance with the C.G.S.B. specification CAN 2-138.3 and the following clause.

10. Post Installation
    a. Posts shall be plumbed and set to give correct alignment. Bending of the post will not be permitted.
    b. Post spacing: shall not exceed 3m. Line posts are spaced in line of fence, maximum 3m apart.
    c. Post footing: all line and terminal posts shall be set in concrete footings of the proper diameter and depth to ensure adequate support.
11. Fabric Installation
    a. The fabric shall be stretched taut to the tension as specified by the manufacturer.
    b. Fabric clips shall be used to fasten the fabric to the top rail at 450mm spacing and to the line posts at 380mm spacing.
    c. Tension bars, bands and bolts shall be used to fasten fabric to the terminal posts.
    d. The bottom tension wire shall be stretched taut along the bottom of the fabric and securely attached to the bottom edge of the fabric at 450mm spacing and to all posts.
12. Braces
    a. Braces shall be placed diagonally from the terminal post to the first adjacent line post and securely attached.
    b. Corner posts shall have braces on both sides.

10.7.3.3 Post and Rail Fencing

a. See Standard Landscape Details for materials and installation details.

10.7.3.4 Wood Screen Fencing

a. See Standard Landscape Details for materials and installation details.

10.7.3.5 Site Clean Up

a. Take every precaution not to damage, injure or mark existing surfaces, structures or landscaping on adjacent properties.
b. In the event of damage to previously existing site elements, the Developer / Contractor is responsible for repairing it to its original condition or better.

10.7.3.6 Locks and Security

1. Contact Parks for specific requirements for the keying of all locks.

10.8 MEDIANS AND BOULEVARDS

Median and boulevard treatment shall be a function of the adjacent land uses.

10.8.1 Medians

1. Where the median is part of a high traffic volume thoroughfare, or there is a steep road gradient where winter operations require a higher use of salt and sand, the median should be hard surfaced the full width from back-of-curb to back-of-curb. Removable planter boxes are to be provided, at the direction of the Municipality, in alignment with the Municipality's Community Place-making Initiative documents and guidelines.
2. Along Residential areas, and in the vicinity of neighbourhood commercial areas, the median should be hard surfaced the full width from back-of-curb to back-of-curb, with trees (and tree grates) along the center of the median.
3. Along industrial areas and business parks, the median treatment should be hardscaped, per the boulevard treatment options presented below, with planting of salt-hardy shrubs.

10.8.2 Boulevards

1. Boulevard treatment within 1.5 m from the back-of-curb on Major Collector and Arterial roads are to be hardened to reduce the impact of the "kill zone" from winter salt and sand operations, in particular in areas where plantings cannot survive due to inhospitable conditions. Options are presented below:
    a. Concrete (including patterned or coloured concrete). This option may be appropriate for street-facing commercial areas and should consider creating a continuous concrete boulevard incorporating the sidewalk.
    b. Permeable Pavers
    c. Artificial Turf
    d. Riprap
    e. Mulch Bed
    f. Exposed aggregate concrete with Tree Grates.
2. Contact the Municipal Parks department for the determination of the appropriate design specification for the particular application.

10.8.3 Entrance Features

The Municipality encourages development of Entrance Features at the entry point into the Subdivision or Development Area. Without limiting creativity, the boulevard treatment options presented above for hardscaping the landscape features in the vicinity of the Entrance Feature should be considered.

10.9 MAINTENANCE AND WARRANTY

10.9.1 General

1. Once the CCC has been issued, bi-monthly maintenance reports are to be submitted to Parks.
2. Maintenance Reports are to include Developer/Contractor name, neighbourhood, phase, lot number, date, company, crew foreman, weather, and maintenance description (turf cutting, watering, weeding, fertilizer applications, pesticide applications, pruning, tightening tree stakes, trash removal, snow removal, and / or other park repairs). All maintenance reports will be required prior to issuance of FAC.
3. The Developer/Contractor is responsible for all park maintenance such as, but not limited to, picking litter, emptying trash receptacles weekly or as required, general landscape maintenance and snow removal on Class 1 trails until the FAC has been issued.

10.9.2 Turf Maintenance

10.9.2.1 General

1. If the Developer / Contractor installs sod in lieu of topsoil and seed across all turfed areas within the proposed development area, the Municipality will take over maintenance of these landscaped areas within the development area during the warranty period. The establishment period of the sod (minimum of 1 month during the growing season or 3 cuttings, whichever is greater) will be the responsibility of the Developer / Contractor, however acceptance of the sod can be done once there have been three cuts on all sodded areas. The Developer / Contractor shall still be responsible for warranty items, but the Municipality will be responsible for maintenance.
2. Parks Branch to provide confirmation in writing to the Developer / Contractor to transfer the maintenance responsibilities.
3. Such maintenance shall include all measures necessary to establish the turf in a vigorous growing condition, including but not limited to the activities noted in this section.

10.9.2.2 Spring Clean Up

1. Removal and disposal of all sand or gravel or any other material deposited on the turf, as a result of snow removal.
2. Rake turf to remove dead vegetation, leaves and debris.

10.9.2.3 Mowing

1. At regular intervals as required to maintain turf at a minimum height of 75mm and maximum of 125mm. Grassed areas shall be neatly mowed, and all edges shall be neatly trimmed. No more than 1/3 of the grass blade height shall be removed at any single mowing. Pattern or direction of mowing shall be changed by 45° for each time the area is mowed.
2. All excess grass clippings shall be removed from trail surfaces and playground areas, immediately after each mowing.

10.9.2.4 Irrigate

1. Irrigate when required and with sufficient volumes to ensure germination, prevent turf and underlying soil from drying out and with sufficient time between watering to promote deep root growth.

10.9.2.5 Fertilizing

1. Apply high nitrogen fertilizer (25-5-10 or as determined by a soil test) twice per season to establish a vigorous stand of turf.
2. Fertilizer to be granular, water soluble type, applied in accordance with the Manufacturer’s written instructions.

10.9.2.6 Weed Control

1. Shall be carried out when required to keep landscaped areas free of weeds. When herbicides are used, they shall be applied by a provincially certified applicator in accordance with the manufacturer's recommendations, and the Province of Alberta Weed Control Act and Agricultural Chemical Act. Any damage resulting from the Developer's / Contractor’s use of herbicides shall be remedied at the Developer’s / Contractor/s expense.
2. Seeded areas shall have less than five percent (5%) weed cover. Weeds prohibited by the Alberta Weed Control Act shall not be permitted.

10.9.2.7 Erosion

1. Repair areas that have eroded using erosion control as directed by Parks.

10.9.2.8 Turf Patching

1. Turf patching shall be carried out over all areas, which are sparse, show deterioration or are bare and are larger than 900mm sq.
2. Remove existing and dead sod, weeds and debris. Scarify as required to prepare a smooth, loose surface for sodding.
3. Roll sodded areas where necessary, to remove depression and irregularities, and water as required.

10.9.2.9 Re-grading

1. Re-grade areas where differential settlement has occurred and areas which do not drain properly.
2. Remove excess material from site or supply and spread fill or additional topsoil to bring grade to required elevations.
3. After re-grading the sub-grade, supply and spread topsoil to an appropriate depth for sod or seed as per section 10.3.1.

10.9.2.10 Aerating

1. Core aerate areas where soil has become compacted or thatch exceeds 12mm.
2. Remove plugs and top dress with compost or as directed by a soil test.

10.9.2.11 Protection of Site

1. All landscaped areas shall be adequately protected by necessary fences at the expense of the Developer/Contractor until such time as turf is established and can accommodate foot traffic.

10.9.3 Tree and Shrub Maintenance

10.9.3.1 General

1. Tree and shrub maintenance shall include all measures necessary to establish and maintain all plant material in an acceptable, vigorous and healthy growing condition including but not limited to the activities noted in this section.

10.9.3.2 Weed and Disease Control

1. All shrub and tree beds shall be maintained weed free, with a well-defined edge.
2. When herbicides or pesticides are utilized, they shall be applied in accordance with manufacturers' recommendation and shall be applied by a licensed pesticide applicator. Herbicides and pesticides shall be used in accordance with the Agricultural Chemicals Act and its regulations. Damage resulting from the Developer's / Contractor's use of herbicides or pesticides will be repaired at the Developer's/Contractor's expense, as per Parks' recommendation.

10.9.3.3 Watering

1. All plant material shall be watered individually. The Developer / Contractor shall be responsible for supplying and distributing any water for installation or maintenance purposes.
2. Trees shall be watered at a rate of 1.2 liters per mm of caliper per week. Trees shall be watered to the point of saturation, do not over water trees. Trees may require more than one watering per week.

Tree Caliper (mm)	Litres per week
50	60.0
75	90.0
100	120.0
125	150.0
150	180.0
175	210.0

10.9.3.4 Water Maintenance

1. The schedule shall be submitted prior to issuance of FAC.

10.9.3.5 Pruning

1. After planting, limit pruning to the removal of dead, broken, and/or diseased branches only.
2. Pruning shall be done in such a manner as to preserve the natural character and shape of the plant material.

3. Only clean, sharp tools shall be used. All cuts shall be clean, smooth and cut to the branch collar or carefully made just above a healthy bud, leaving no stubs. Sterilize pruners after each cut to limit the spread of disease. Cuts, bruises or scars on the bark shall be tracked back to living tissue and removed. The affected areas shall be shaped so as not to retain water.
4. Pruning shall be done in accordance with ANSI A300 and Best Management Practices (BMPs) established by the International Society of Arboriculture (ISA).

10.9.3.6 Shrub and Tree Bed Maintenance

1. Maintain edge of all beds with a 90-degree vertical edge cut, 100mm deep around the perimeter of the bed.
2. Maintain a minimum of 75mm depth of mulch. Ensure that crowns of shrubs and bottom branches are not covered with mulch.

10.9.3.7 Tree Stakes

1. All accessories such as tree ties and stakes shall be maintained in good condition and repaired or replaced when required.
2. Remove the tree stakes and ties after 1 year to prevent tree girdling.

10.9.4 Trail Maintenance

10.9.4.1 General

1. Maintenance shall include all measures necessary to maintain the working condition of the surface, including, but not limited to the items noted in this section.
2. Snow Removal on Class 1 trails only.

10.9.4.2 Asphalt Repairs

1. Cracks wider than 2mm and depressions deeper than 3mm shall be repaired, prior to the FAC inspection.

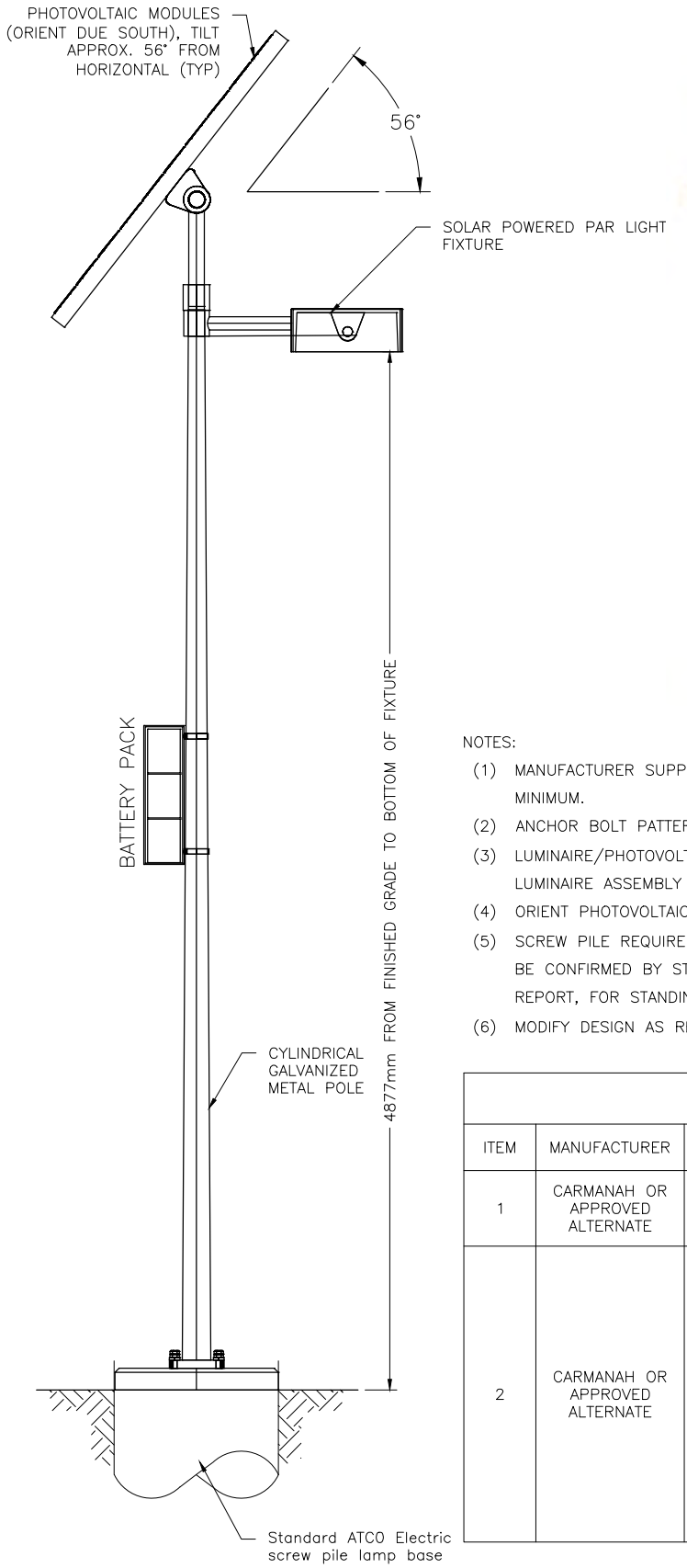
10.10 STANDARD DRAWINGS – LANDSCAPE AND PARKS DEVELOPMENT STANDARDS

Dwg. No.	Title
10-001	Solar Powered Light Fixture and Pole
10-002	Solar Powered Light Fixture Pole and Base Details
10-100	Paving Stone Detail Heavy Duty
10-101	Paving Stone Detail Medium Duty
10-102	Paving Stone Detail Light Duty
10-200	P.U.L. Layouts
10-201	P.U.L. Access Points
10-202	Knock Down Bollard
10-203	Swing Bollard Access Gate
10-204	Wood Bollard
10-210	Buffalo Gates – Full Assembly
10-211	Buffalo Gates – Left Gate and Upper Post Assembly
10-212	Buffalo Gates – Right Gate and Upper Post Assembly
10-213	Buffalo Gates – Assembly B and C Logo and Bushing
10-214	Buffalo Gates – Assembly C Lower Post
10-215	Buffalo Gates – Assembly H Latch
10-216	Buffalo Gates – Assembly F Anchor Bolt
10-217	Buffalo Gates – Assembly G Reinforcing Cage and Foundation
10-300	Post and Rail Fence Detail
10-301	Wood Screen Fence Details
10-302	Wood Screen Fence Step Down Detail
10-303	Chain Link Fence
10-304	Chain Link Fence Gate Details
10-400	Playground Concrete Border Details

Dwg. No.	Title
10-401	Play Area Concrete Border Drainage Details
10-402	Playground Subdrain
10-403	Playground Subdrain Installation
10-404	Playground Wear Mat
10-500	Tree Planting Detail
10-501	Shrub Bed Planting Detail
10-502	Tree Planting on Slope
10-503	Tree and Shrub Naturalization Detail
10-504	Tree Protection Detail
10-505	Bioswale Cross-section Detail
10-600	Sod Details
10-700	Topsoil/Subgrade Preparation Detail
10-701	Urban Park Culvert Detail
10-702	Trail Culvert Detail
10-703	Bench Node Details
10-704	Bench Installation
10-705	Garbage Receptacle Installation
10-706	Picnic Table Installation
10-800	Class III Gravel Trail Detail
10-801	Asphalt Trail Details
10-802	Concrete for Multi-Purpose Pad
10-900	Football Field Layout
10-901	Combination Major/Minor Soccer Fields
10-902	Basketball Court Layout
10-903	Ball Diamond Detail
10-904	Backstop Layout Drawing

Dwg. No.	Title
10-905	Backstop Assembly
10-906	Tennis Court Layout
10-907	Pickleball Court Layout
10-908	Boulder Installation

STANDARD DETAIL:	10-001
DATE: JAN. 2021	REV: 2





NOTES:

(1) MANUFACTURER SUPPLIED ANCHOR BOLTS TO BE AISI/SAE 4140 HEAT TREATED AT A MINIMUM.

(2) ANCHOR BOLT PATTERN TO BE CONFIRMED WITH POLE VENDOR.

(3) LUMINAIRE/PHOTOVOLTAIC PANEL/BATTERY SHOWN AS REFERENCE ONLY. SUPPLIED LUMINAIRE ASSEMBLY WILL VARY SLIGHTLY BETWEEN MANUFACTURERS.

(4) ORIENT PHOTOVOLTAIC MODULE DUE SOUTH. TILT AS PER INDICATED ON DRAWING.

(5) SCREW PILE REQUIREMENTS BASED ON NATURAL UNDISTURBED SOIL CONDITIONS, MUST BE CONFIRMED BY STRUCTURAL DESIGN ENGINEER AND REVIEWED AGAINST GEO-TECH REPORT, FOR STANDING HEIGHT OF 4.88m (16ft) ONLY, SEE NOTE 6

(6) MODIFY DESIGN AS REQUIRED TO SUIT LOCATION.

BILL OF MATERIALS

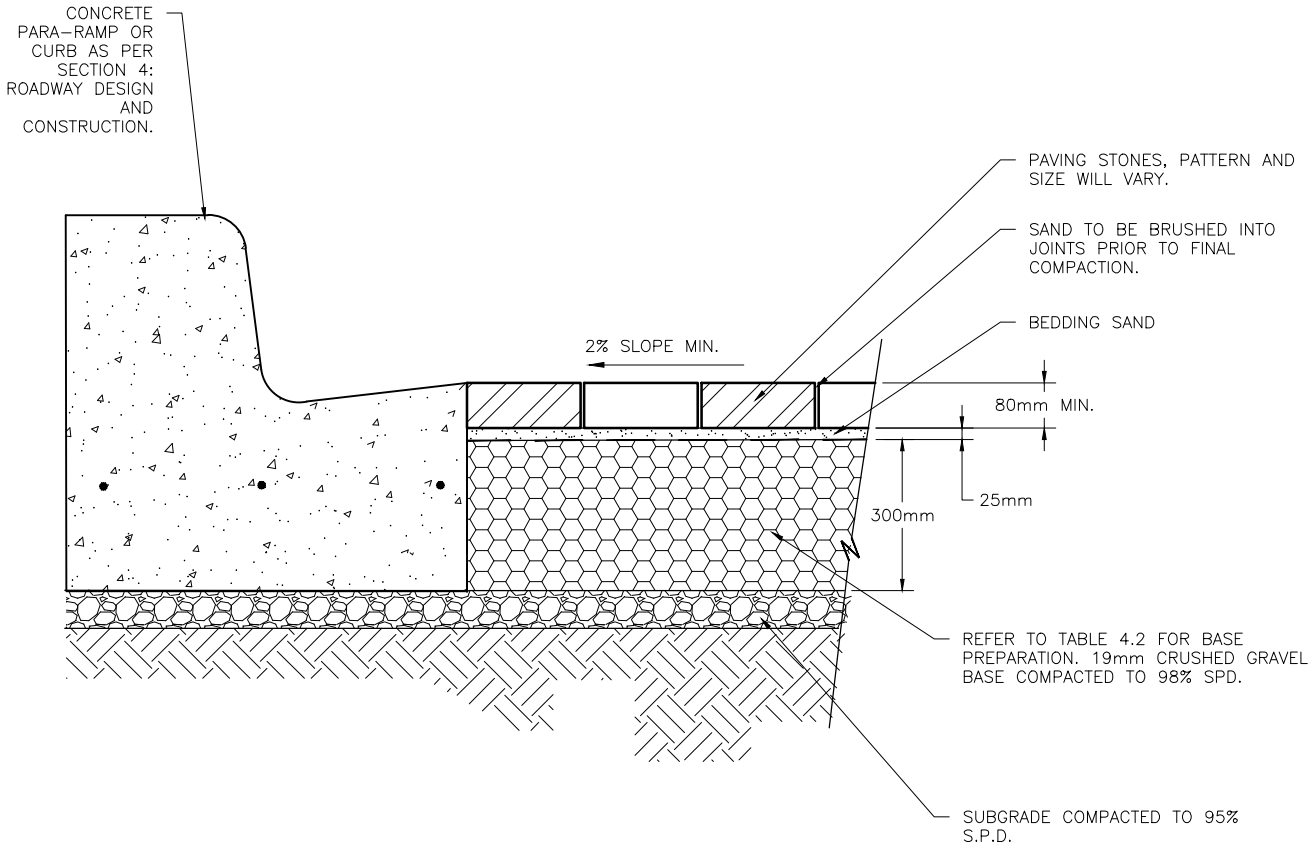
ITEM	MANUFACTURER	MODEL	PART #	OTHER
1	CARMANAH OR APPROVED ALTERNATE	1530 SERIES LUMINAIRE / BATTERY ASSEMBLY	1530-SV-SPM-MPM-LWS-STR-T2-HT-032-D2D	PART# INDICATES: SHOE BOX FIXTURE, LED LAMP.
2	CARMANAH OR APPROVED ALTERNATE	POLE		SPECIFY DURING ORDER: 16FT TALL STRAIGHT ROUND STEEL POLE C/W ANCHOR BOLTS, BASE AND COVER, POWDER COAT FINISH, AND COMPLETE WITH TOP TENON. (POLE WILL BE SUPPLIED BY NOVAPOLE INTERNATIONAL. SHOP DRAWING OF POLE WITH BASE INFORMATION WILL BE SUPPLIED UPON REQUEST.)

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SOLAR POWERED LIGHT FIXTURE POLE

Time: 10:38am
Date: Mar 18, 2021
Files: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-001.dwg by
Xrefs:

STANDARD DETAIL:	10-100
DATE: JAN. 2021	REV: 2

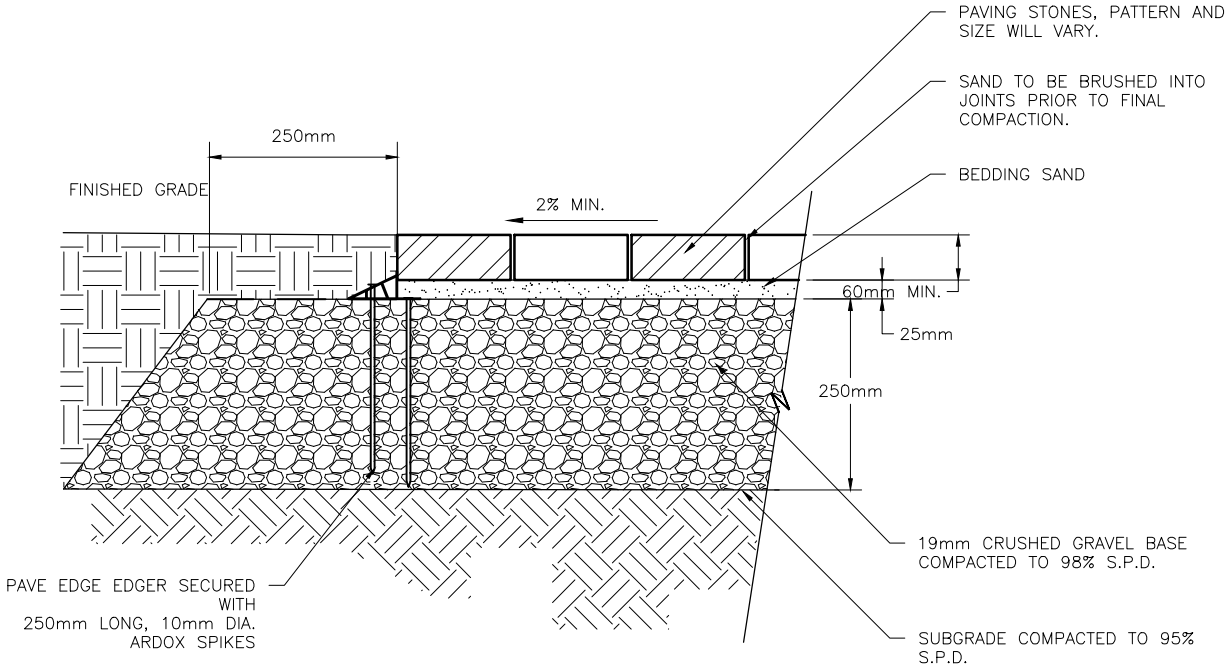


REGIONAL MUNICIPALITY OF WOOD BUFFALO

PAVING STONE DETAIL HEAVY DUTY

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Date: Feb 12, 2021
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Xrefs:

STANDARD DETAIL:	10-101
DATE: JAN. 2021	REV: 2

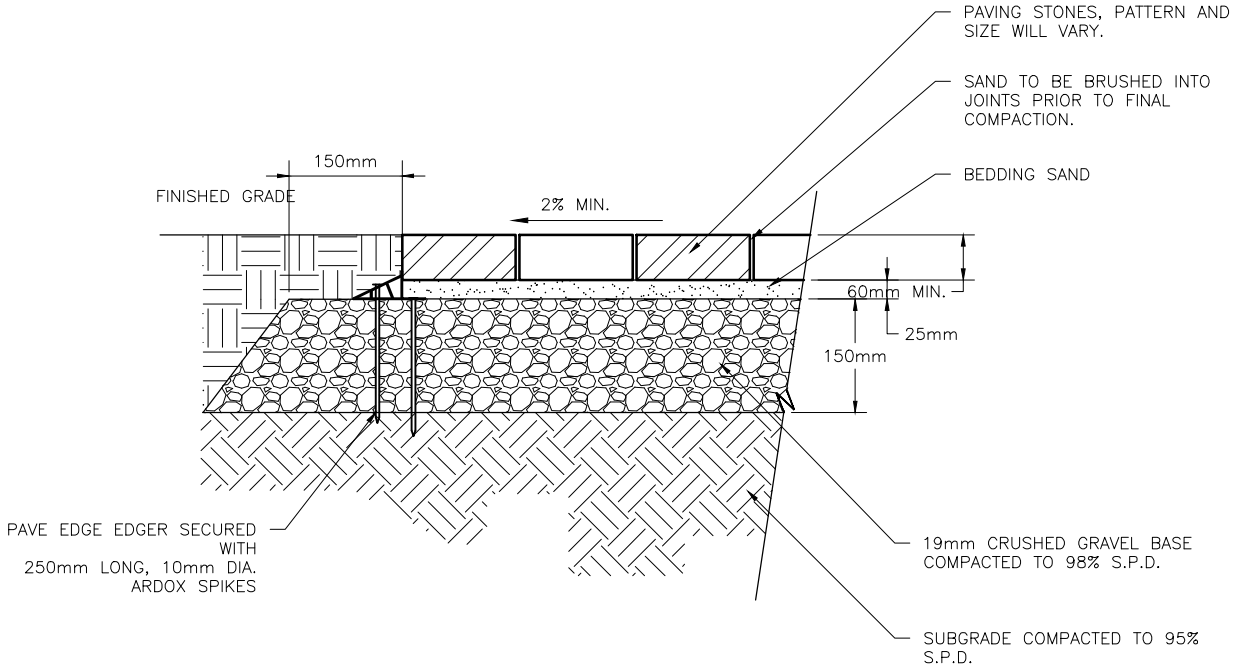


REGIONAL MUNICIPALITY OF WOOD BUFFALO

PAVING STONE DETAIL MEDIUM DUTY

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Date: Feb 12, 2021
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Xrefs:

STANDARD DETAIL:	10-102
DATE: JAN. 2021	REV: 2

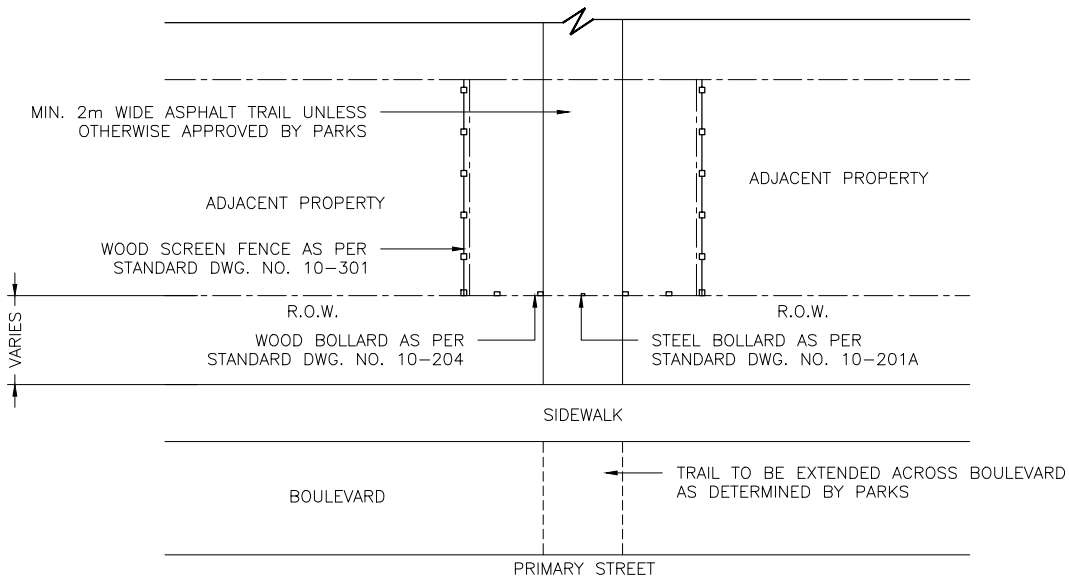


REGIONAL MUNICIPALITY OF WOOD BUFFALO

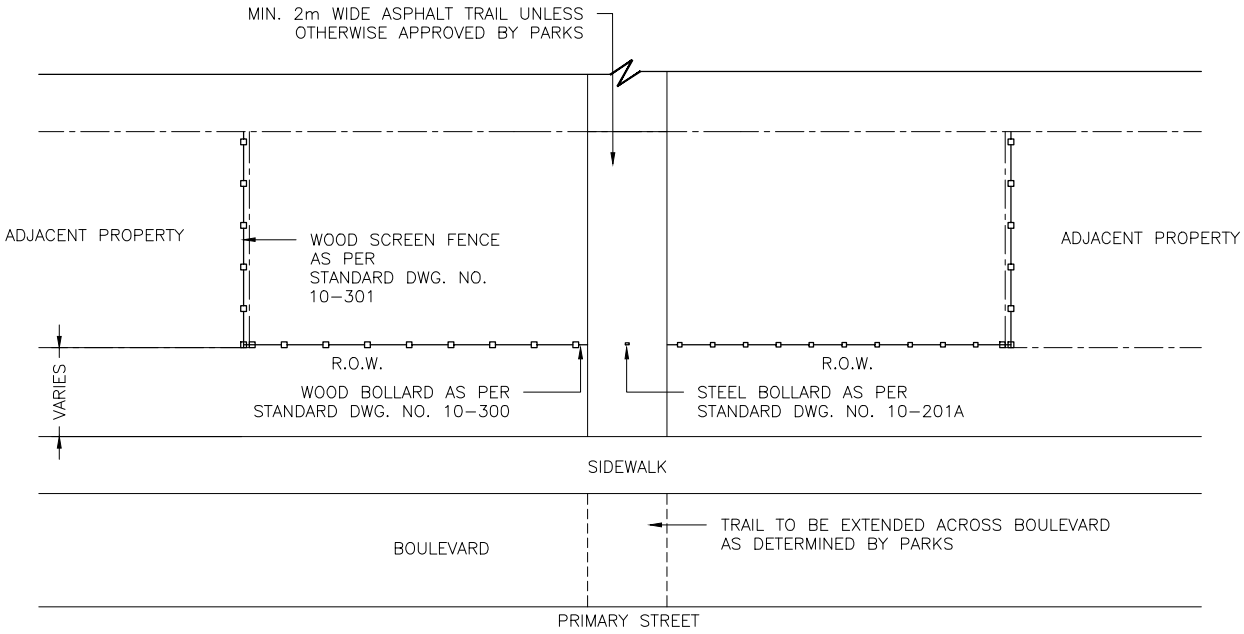
PAVING STONE DETAIL LIGHT DUTY

Time: 10:49am
Date: Feb 12, 2021
File: x:\161\active\161108920\drawing\sheet_files\figures\section 10\10-100-102.dwg by
Xrefs:

STANDARD DETAIL:	10-200
DATE: JAN. 2021	REV: 2



10-200A – P.U.L.s 9 METERS AND SMALLER IN WIDTH



10-200B – P.U.L.s LARGER THAN 9 METERS IN WIDTH

NOTES:

(1) WHEN P.U.L.s HAVE ONLY TWO ACCESS POINTS ONLY ONE ACCESS POINT REQUIRES ACCESS BARRIERS. ACCESS POINT REQUIRES KNOCK DOWN BOLLARD(S) (SEE NOTE #3) AS PER STANDARD DWG. NO. 10-202.

(2) WHEN P.U.L.s HAVE MORE THAN TWO ACCESS POINTS ALL ACCESS POINTS REQUIRE ACCESS BARRIERS. A MINIMUM OF ONE ACCESS POINT REQUIRES KNOCK DOWN BOLLARD(S) (SEE NOTE #3) AS PER STANDARD DWG. NO. 10-202 AND AS DETERMINED BY PARKS. ALL OTHER ACCESS POINTS SHALL HAVE STEEL BOLLARDS AS PER STANDARD DWG. NO. 10-201A.

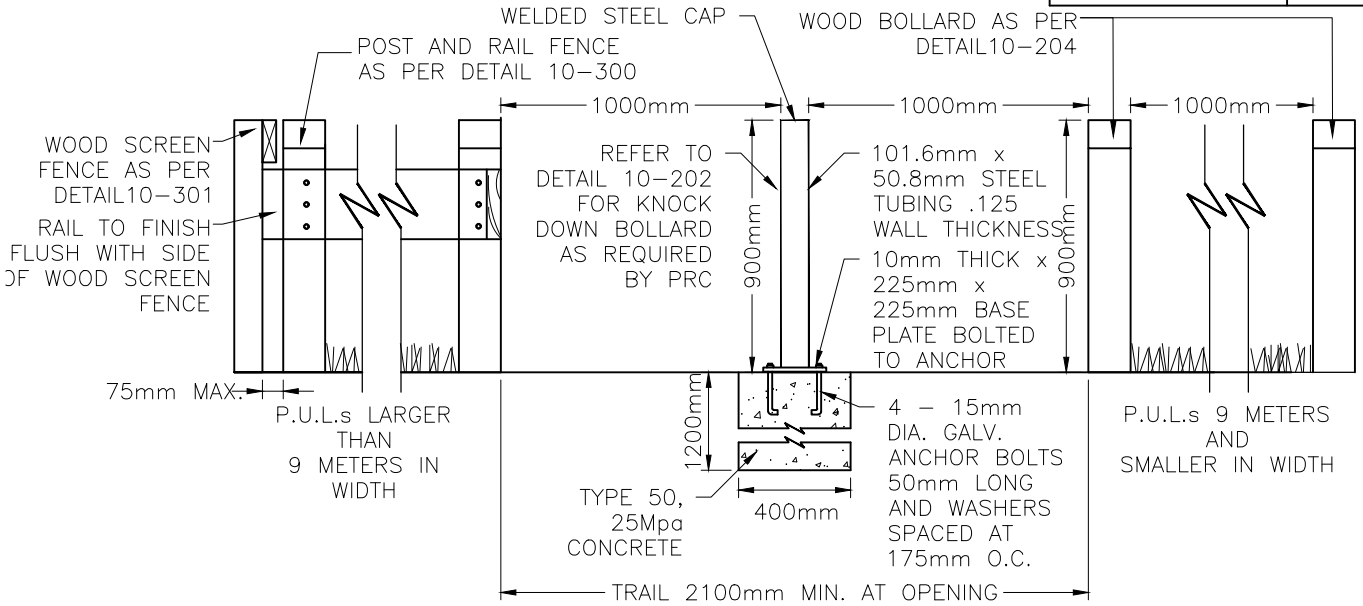
(3) P.U.L. ACCESS POINTS MAY REQUIRE MORE THAN ONE KNOCK DOWN BOLLARD AS DETERMINED BY PARKS. TRAILS SHALL BE WIDENED, AS APPROPRIATE, AT ACCESS POINTS AT THE DISCRETION OF PARKS. ALL TRAIL WIDENINGS ARE TO BE SMOOTH AND SEAMLESS. ACCESS BARRIERS TO BE ALIGNED WITH END OF FENCE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

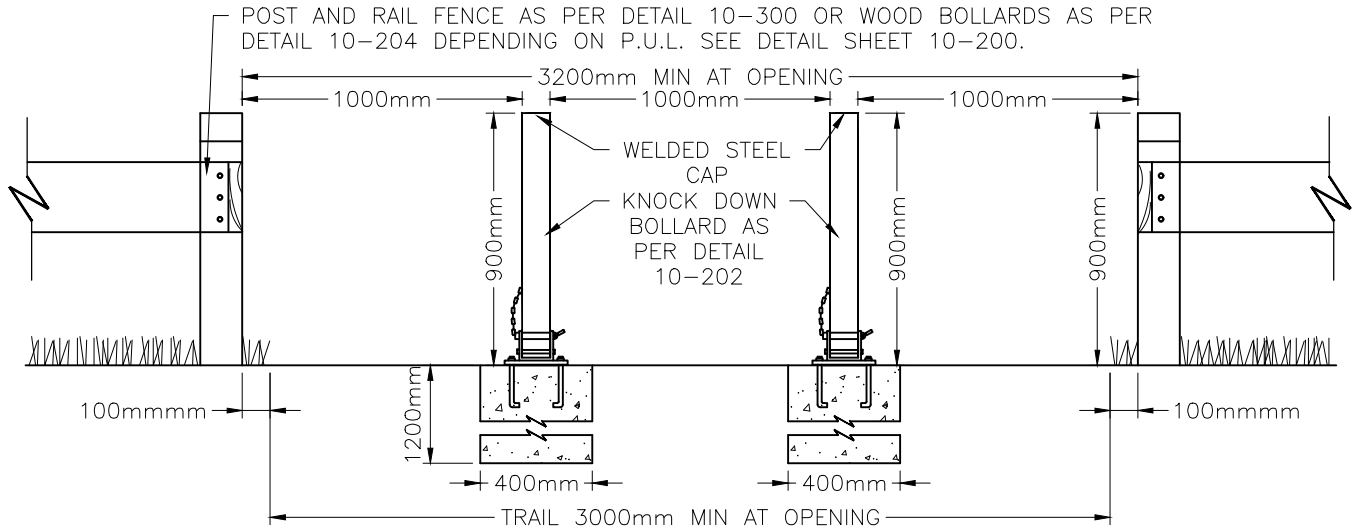
P.U.L. LAYOUTS

Time: 12:23pm
Date: Feb 12, 2021
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Xrefs:

STANDARD DETAIL:	10-201
DATE: JAN. 2021	REV: 1



10–201A – P.U.L. ACCESS POINT WITH SINGLE BOLLARD



10–201B – P.U.L. ACCESS POINT WITH DOUBLE KNOCK DOWN BOLLARDS

NOTES:

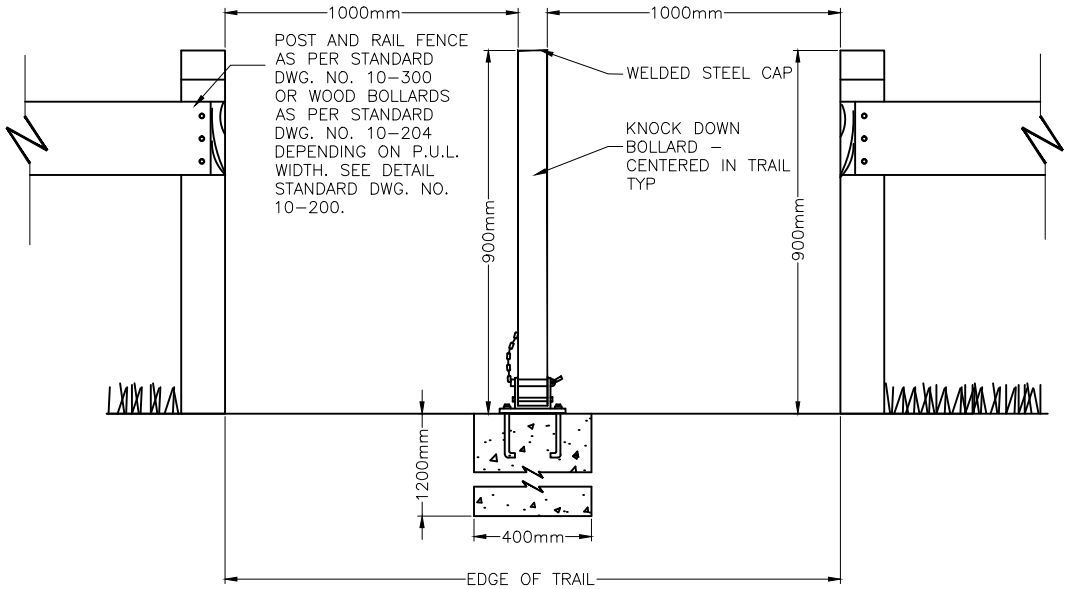
1. ALL METAL AND HARDWARE TO BE GALVANIZED.
2. ALL WELDS TO BE GROUND SMOOTH.
3. ALL STEEL BOLLARDS TO BE POWDER COATED PRIOR TO INSTALLATION. COLOR TO BE APPROVED BY PARKS AND RECREATION.
4. DEVELOPER TO PROVIDE SHOP DRAWINGS OF STEEL BOLLARDS PRIOR TO APPROVALS.
5. P.U.L. ACCESS POINTS MAY REQUIRE MORE THAN ONE STEEL BOLLARD AS DETERMINED BY PARKS AND RECREATION.
6. ALL BOLLARD SPACING TO BE 1000mm TYPICAL. SPACING BETWEEN WOOD BOLLARD AND SCREEN FENCE MAY BE LESSER DISTANCE IF REQUIRED.

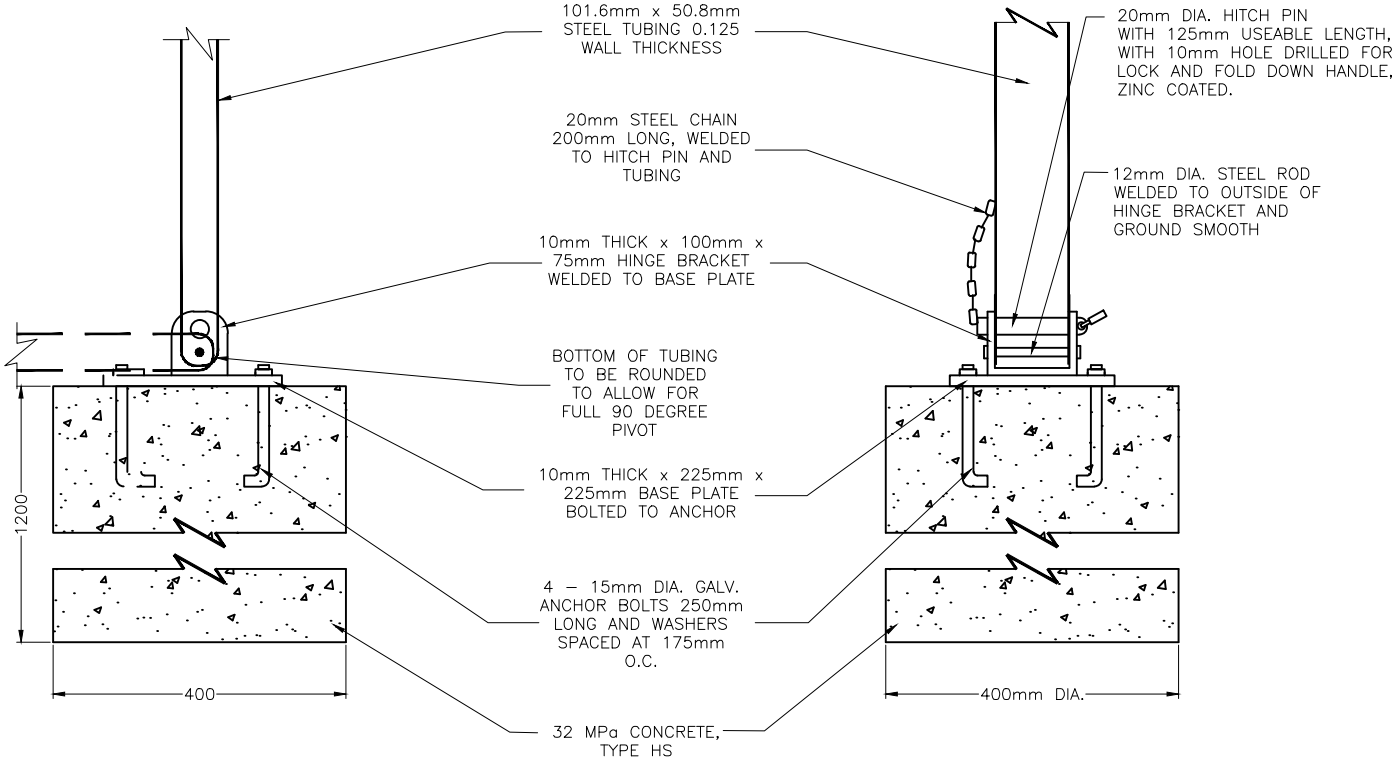
REGIONAL MUNICIPALITY OF WOOD BUFFALO

P.U.L. ACCESS POINTS

Time: 6:04pm
Date: Feb 11, 2021
File: x:\161\active\161108920\drawing\sheet_files\figures\section 10\10-201.dwg by
Xrefs:

STANDARD DETAIL:	10-202
DATE: OCT 2016	REV: 1





NOTES:

(1) ALL METAL AND HARDWARE TO BE GALVANIZED.

(2) ALL WELDS TO BE GROUND SMOOTH.

(3) DEVELOPER TO PROVIDE LOCKS UNTIL PRFAC HAS BEEN ISSUED.

(4) POWDER COAT PRIOR TO INSTALLATION, COLOR TO BE APPROVED BY PARKS AND RECREATION.

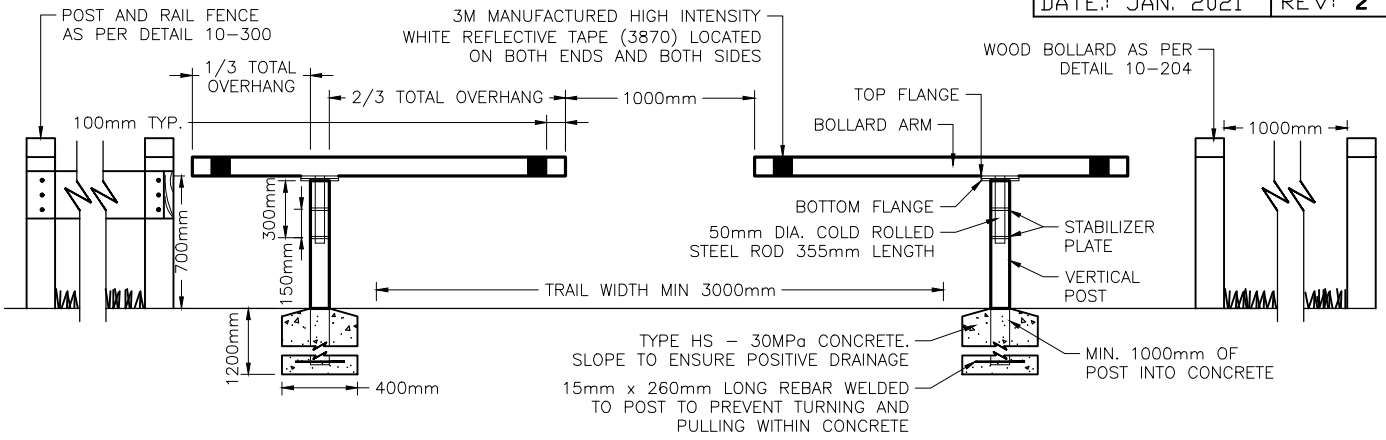
(5) DEVELOPER TO PROVIDE SHOP DRAWINGS OF BOLLARDS PRIOR TO APPROVALS.

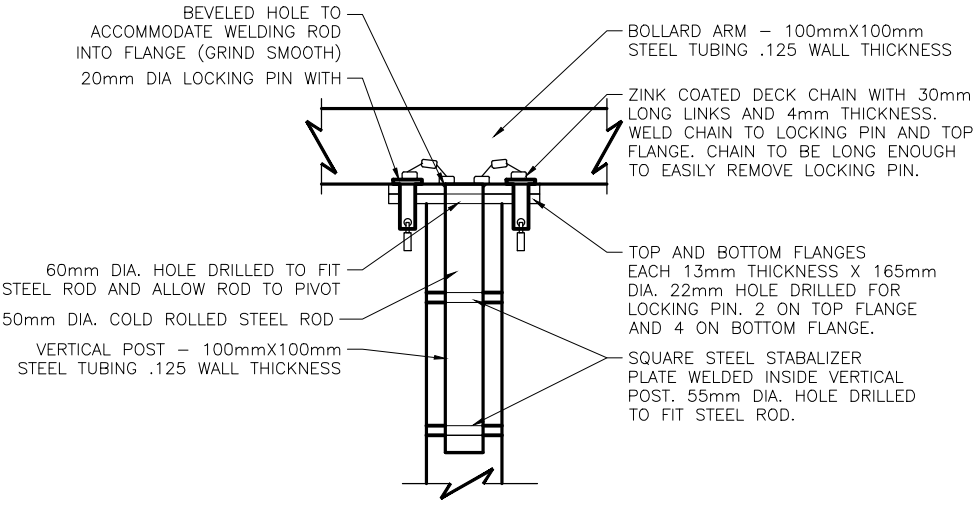
(6) P.U.L. ACCESS POINTS MAY REQUIRE MORE THAN ONE BOLLARD AS DETERMINED BY PARKS AND RECREATION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

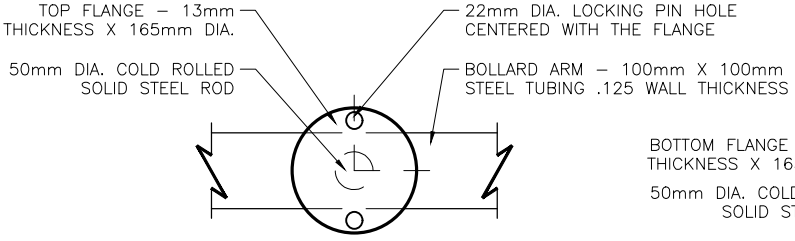
KNOCK DOWN BOLLARD

STANDARD DETAIL:	10-203
DATE: JAN. 2021	REV: 2

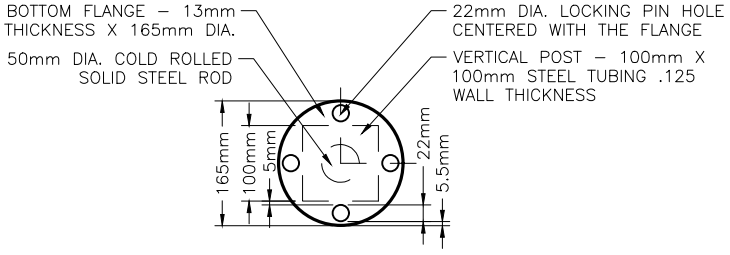




ASSEMBLY DETAIL



TOP FLANGE



BOTTOM FLANGE

NOTES:

(1) ALL METAL AND HARDWARE TO BE GALVANIZED.

(2) ALL WELDS TO BE GROUND SMOOTH.

(3) ALL STEEL BOLLARDS TO BE POWDER COATED PRIOR TO INSTALLATION. COLOR TO BE APPROVED BY PARKS.

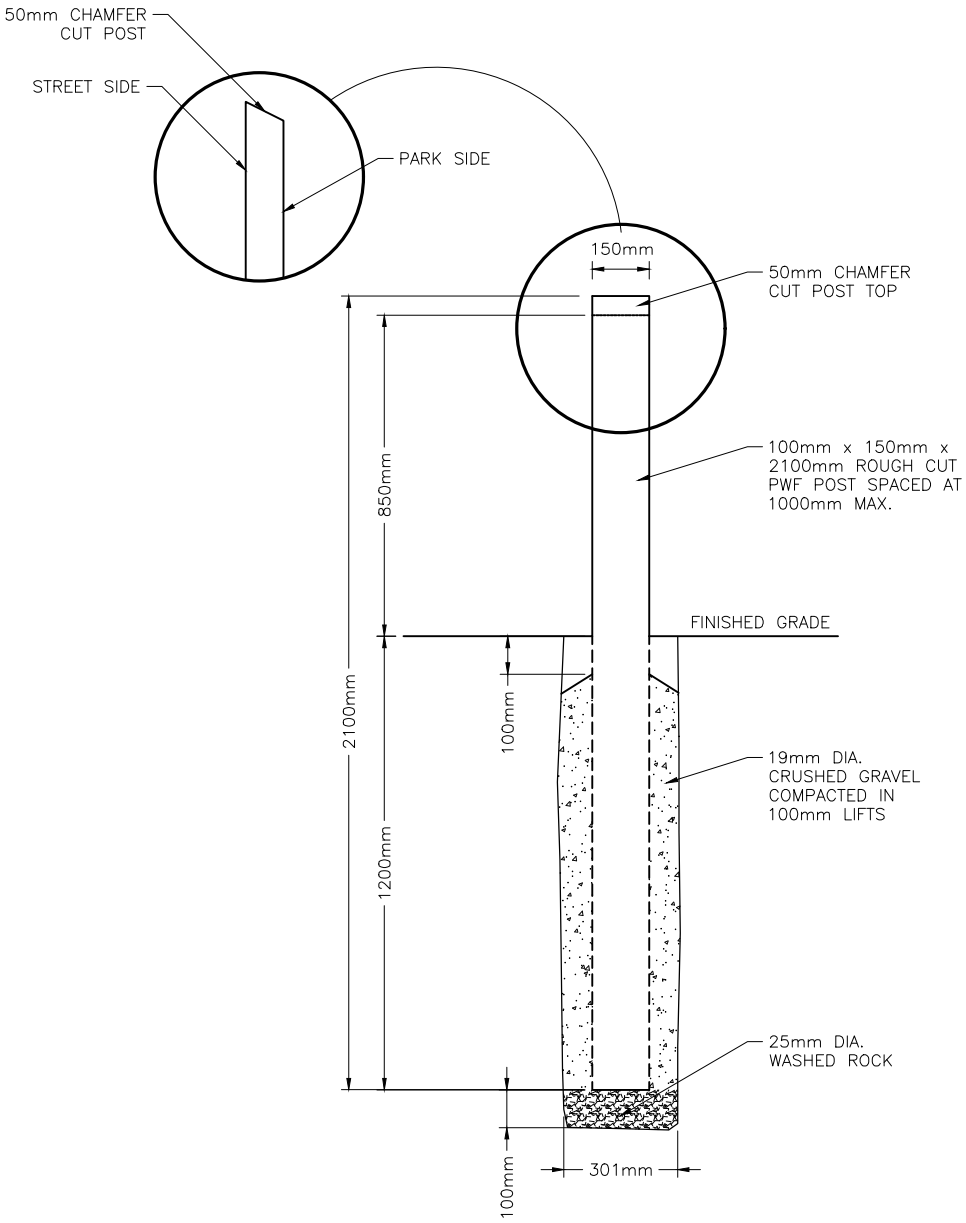
(4) DEVELOPER TO PROVIDE SHOP DRAWINGS OF STEEL BOLLARD PRIOR TO APPROVALS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

SWING BOLLARD ACCESS GATE

Time: 11:31am
Date: Feb 12, 2021
File: x:\161\active\161108920\drawing\sheet_files\figures\section 10\10-203.dwg by
Xrefs:

STANDARD DETAIL:	10-204
DATE: JAN. 2021	REV: 2



NOTES:

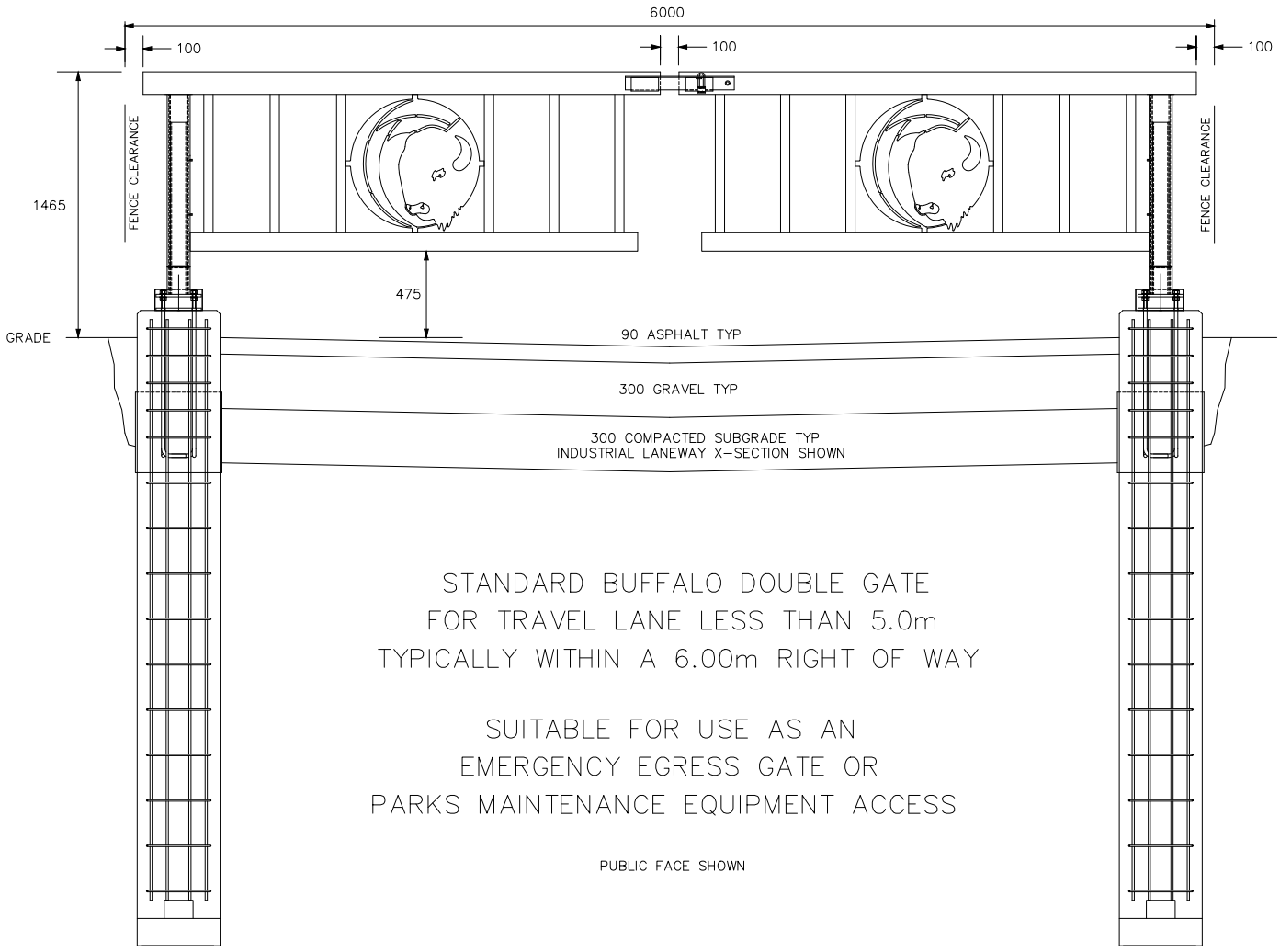
(1) ALL CUT ENDS TO BE TREATED WITH WOOD PRESERVATIVE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WOOD BOLLARD

Time: 11:32am
Date: Feb 12, 2021
Files: W:\161\active\161108920\drawing\street_files\figures\section 10\10-204.dwg by
Xrefs:

STANDARD DETAIL:	10-210
DATE: MAR. 2021	REV: 0



STANDARD BUFFALO DOUBLE GATE
FOR TRAVEL LANE LESS THAN 5.0m
TYPICALLY WITHIN A 6.00m RIGHT OF WAY

SUITABLE FOR USE AS AN
EMERGENCY EGRESS GATE OR
PARKS MAINTENANCE EQUIPMENT ACCESS

PUBLIC FACE SHOWN

GENERAL NOTES:

1. ALL DIMENSIONS IN mm
2. NO ALTERATIONS WITHOUT WRITTEN APPROVAL

FABRICATION

1. SANDBLAST/GRIND SMOOTH ALL EXPOSED SURFACES.
2. PAINT WITH PRIMER AFTER SANDBLASTING/GRINDING.
3. GRIND SMOOTH ALL WELDS & PAINT WITH PRIMER.

WELDING

1. WELD ALL JOINTS FULLY USING E7018-1 ELECTRODES OR E71T-1 FLUX CORE WIRE, STRINGER PASSES ONLY, UNLESS OTHERWISE NOTED.
2. ALL WELDING TO BE IN ACCORDANCE WITH CSA W59.
3. STRUCTURE TO BE INSPECTED/CERTIFIED BY A PROFESSIONAL ENGINEER.

FINISH

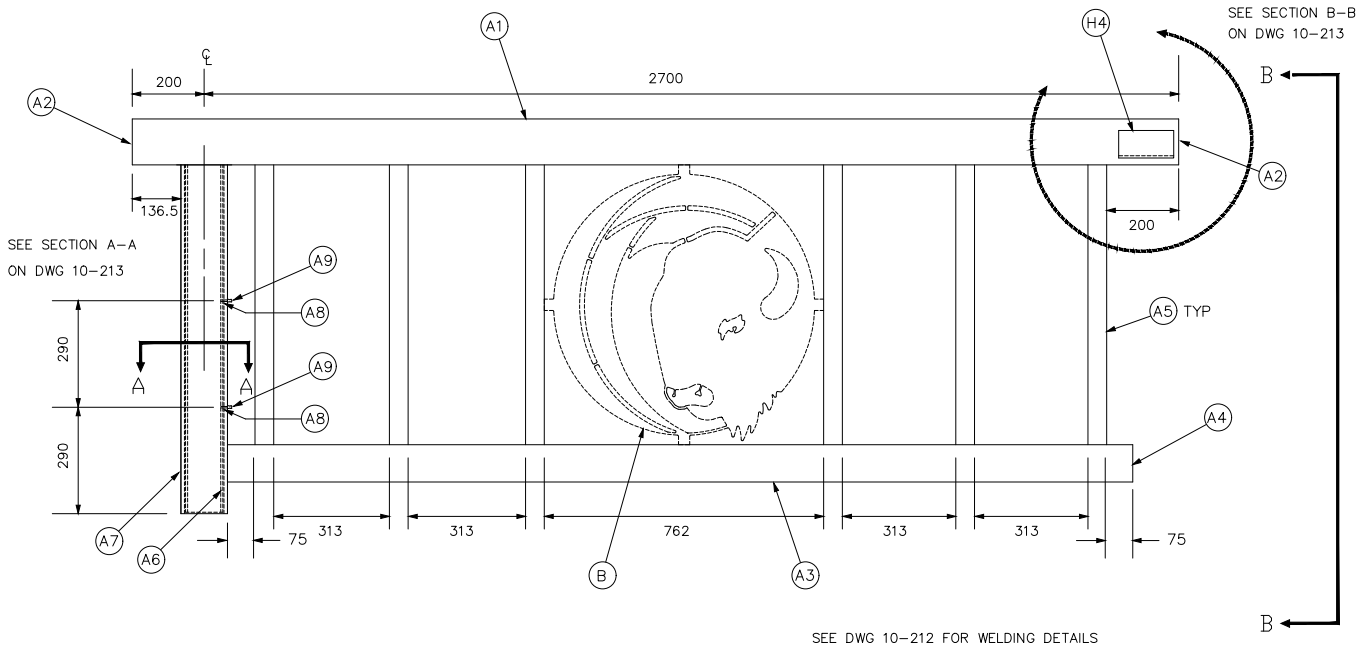
1. POWDER COAT ALL EXPOSED SURFACES BLACK.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUFFALO GATES
FULL ASSEMBLY

STANDARD DETAIL:	10-211
DATE: MAR. 2021	REV: 0

SEE LATCH DETAIL ON DWG 10-215



SEE DWG 10-212 FOR WELDING DETAILS

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT	
A		LEFT GATE & UPPER POST ASSEMBLY				
A1	1	TOP RAIL	HHS: 127mm x 127mm x 4.8mm – 2900mm LONG	CSA G40.21 350W		
A2	1	TOP RAIL END CAP	PLATE: 127mm x 127mm x 3mm	CSA G40.21 300W		
A3	1	BOTTOM RAIL	HHS: 102mm x 102mm x 4.8mm – 2466mm LONG	CSA G40.21 350W		
A4	1	BOTTOM RAIL END CAP	PLATE: 127mm x 127mm x 3mm	CSA G40.21 300W		
A5	6	BALUSTER	HHS: 51mm x 51mm x 3mm – 762mm LONG	CSA G40.21 350W		
A6	1	OUTER PIVOT SLEEVE	TUBING: 101.6mm OD x 5.7mm – 946mm LONG	AISI TYPE 304 L SS (SEAMLESS)		
A7	1	OUTER POST	HHS: 127mm x 127mm x 9.5mm – 950mm LONG	CSA G40.21 350W		
A8	2	GREASE TUBE	TUBING: 3.2mm ID x 19mm LONG			
A9	2	GREASE NIPPLE	1/8" –27 GREASE ZERK FITTING	N/A		
H		LEFT LATCH ASSEMBLY				
H4	1	LATCH RECEIVER	ANGLE: 75mm X 15mm – 150 LONG	CSA G40.21 300W		

GENERAL NOTES:

1. ALL DIMENSIONS IN mm
2. NO ALTERATIONS WITHOUT WRITTEN APPROVAL

FABRICATION

1. SANDBLAST/GRIND SMOOTH ALL EXPOSED SURFACES.
2. PAINT WITH PRIMER AFTER SANDBLASTING/GRINDING.
3. GRIND SMOOTH ALL WELDS & PAINT WITH PRIMER.

WELDING

1. WELD ALL JOINTS FULLY USING E7018-1 ELECTRODES OR E71T-1 FLUX CORE WIRE, STRINGER PASSES ONLY, UNLESS OTHERWISE NOTED.
2. ALL WELDING TO BE IN ACCORDANCE WITH CSA W59.
3. STRUCTURE TO BE INSPECTED/CERTIFIED BY A PROFESSIONAL ENGINEER.

FINISH

1. POWDER COAT ALL EXPOSED SURFACES BLACK.

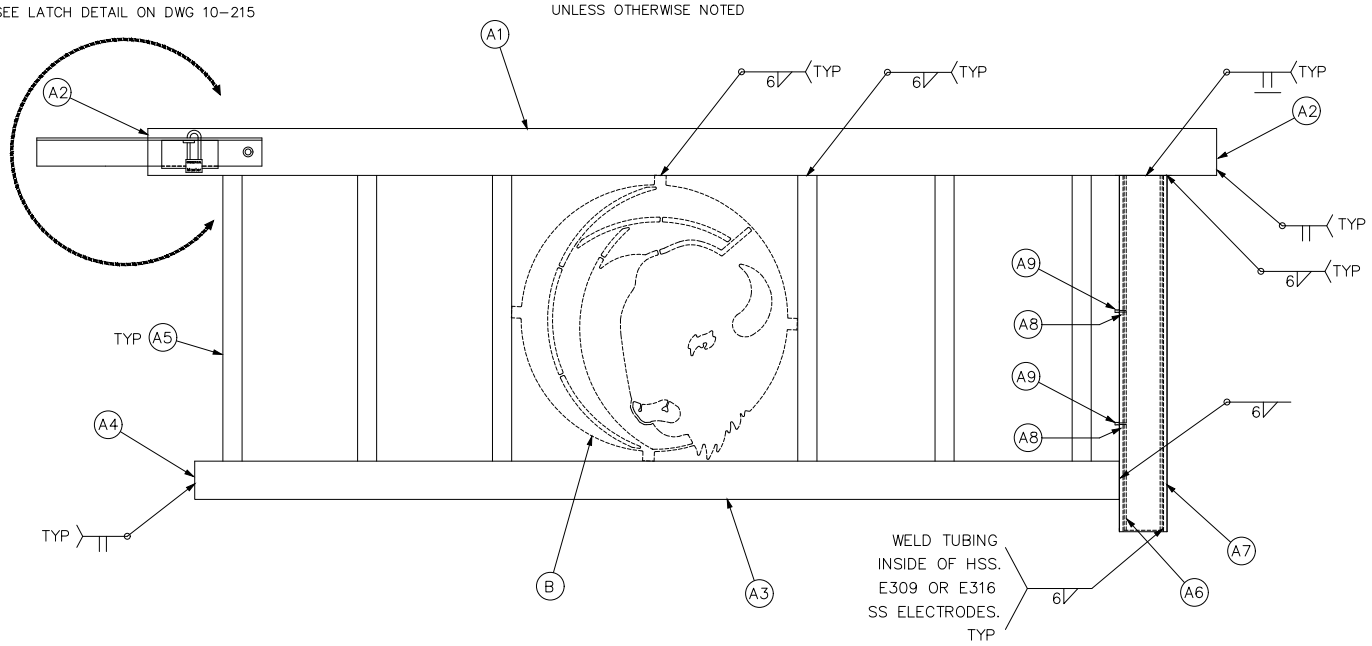
REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUFFALO GATES
LEFT GATE AND UPPER POST ASSEMBLY

STANDARD DETAIL:	10-212
DATE: MAR. 2021	REV: 0

SEE LATCH DETAIL ON DWG 10-215

SEE DWG 10-211 FOR DIMENSION DETAILS UNLESS OTHERWISE NOTED



SEE DWG 10-211 FOR DIMENSION DETAILS

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT	
A	1	RIGHT GATE & UPPER POST ASSEMBLY				
A1	1	TOP RAIL	HHS: 127mm x 127mm x 4.8mm – 2900mm LONG	CSA G40.21 350W		
A2	2	TOP RAIL END CAP	PLATE: 127mm x 127mm x 3mm	CSA G40.21 300W		
A3	1	BOTTOM RAIL	HHS: 102mm x 102mm x 4.8mm – 2466mm LONG	CSA G40.21 350W		
A4	1	BOTTOM RAIL END CAP	PLATE: 127mm x 127mm x 3mm	CSA G40.21 300W		
A5	6	BALUSTER	HHS: 51mm x 51mm x 3mm – 762mm LONG	CSA G40.21 350W		
A6	1	OUTER PIVOT SLEEVE	TUBING: 101.6mm OD x 5.7mm – 946mm LONG	AISI TYPE 304 L SS (SEAMLESS)		
A7	1	OUTER POST	HHS: 127mm x 127mm x 9.5mm – 950mm LONG	CSA G40.21 350W		
A8	2	GREASE TUBE	TUBING: 3.2mm ID x 19mm LONG			
A9	2	GREASE NIPPLE	1/8" –27 GREASE ZERK FITTING	N/A		
H	1	RIGHT LATCH ASSEMBLY				
H1	1	PIVOT BOLT	BAR: 19mm – 10 LONG + 25mm – 6 LONG	CSA G40.21 300W		
H2	1	LATCH ARM	ANGLE: 75mm x 75mm – 600mm LONG	CSA G40.21 300W		
H3	1	LATCH SUPPORT	ANGLE: 75mm X 10mm – 150 LONG	CSA G40.21 300W		
H5	1	PARKS LOCK	MASTER, COMMERCIAL, LONG SHACKLE	A473 KEY (2)		

GENERAL NOTES:

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FABRICATION

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2. PAINT WITH PRIMER AFTER SANDBLASTING/GRINDING.
3. GRIND SMOOTH ALL WELDS & PAINT WITH PRIMER.

WELDING

1. WELD ALL JOINTS FULLY USING E7018-1 ELECTRODES OR E71T-1 FLUX CORE WIRE, STRINGER PASSES ONLY, UNLESS OTHERWISE NOTED.
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3. STRUCTURE TO BE INSPECTED/CERTIFIED BY A PROFESSIONAL ENGINEER.

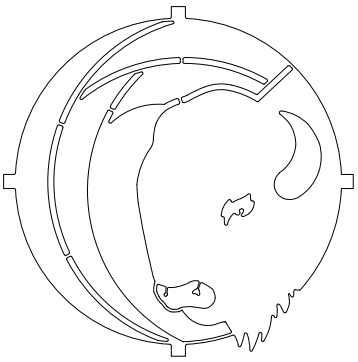
FINISH

1. POWDER COAT ALL EXPOSED SURFACES BLACK.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUFFALO GATES
RIGHT GATE AND UPPER POST ASSEMBLY

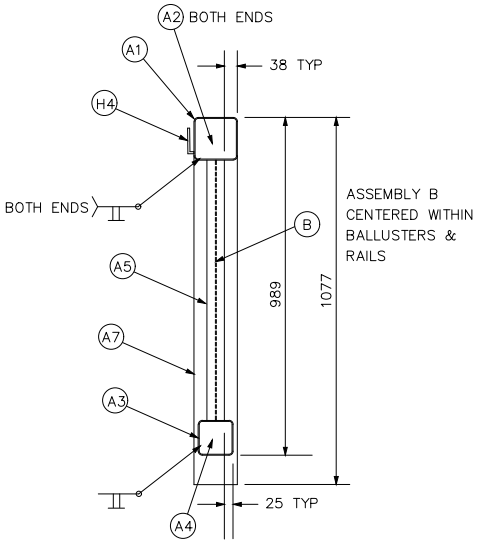
STANDARD DETAIL:	10-213
DATE: MAR. 2021	REV: 0



ASSEMBLY B – LOGO DETAILS

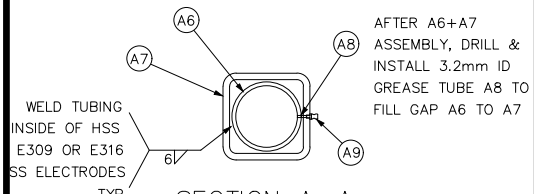
1. OVERALL 671mm (30") HIGH & WIDE.
2. EXTERIOR SUPPORT RING IS 711mm OD (28") & 686mm ID (27.") AT GAPS.
3. INTERIOR SUPPORTS TO 6mm WIDE. LOCATION OF INTERIOR SUPPORTS MAY VARY.
4. EXTERIOR SUPPORT TABS 35mm WIDE x 25mm LONG.
5. ALL INTERSECTIONS TO BE 3mm RADIUS

A HIGHER RESOLUTION FILE CAN BE PROVIDED ON REQUEST TO PARKS OPERATIONS.

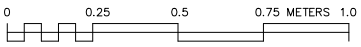


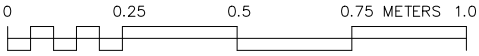
SECTION B–B





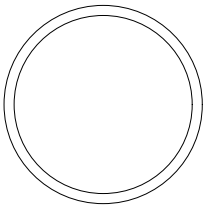
SECTION A–A



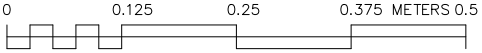


BILL OF MATERIALS						
ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT	
B	2	BUFFALO LOGO	PL: 6mm CUSTOM CUT	MILD STEEL	58.1Kg	

ASSEMBLY C – NYLON BUSHING



NOTE: ASSEMBLY C TO BE INSET INTO LOWER POST



BILL OF MATERIALS					
ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT
C	2	NYLON BUSHING	108mm OD/97mm ID x 13mm THICK	HIGH DENSITY NYLON	

GENERAL NOTES:

1. ALL DIMENSIONS IN mm
2. NO ALTERATIONS WITHOUT WRITTEN APPROVAL

FABRICATION

1. SANDBLAST/GRIND SMOOTH ALL EXPOSED SURFACES.
2. PAINT WITH PRIMER AFTER SANDBLASTING/GRINDING.
3. GRIND SMOOTH ALL WELDS & PAINT WITH PRIMER.

WELDING

1. WELD ALL JOINTS FULLY USING E7018–1 ELECTRODES OR E71T–1 FLUX CORE WIRE, STRINGER PASSES ONLY, UNLESS OTHERWISE NOTED.
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3. STRUCTURE TO BE INSPECTED/CERTIFIED BY A PROFESSIONAL ENGINEER.

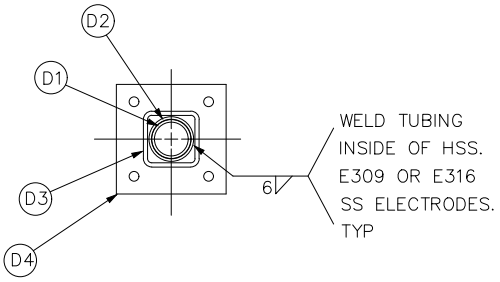
FINISH

1. POWDER COAT ALL EXPOSED SURFACES BLACK.

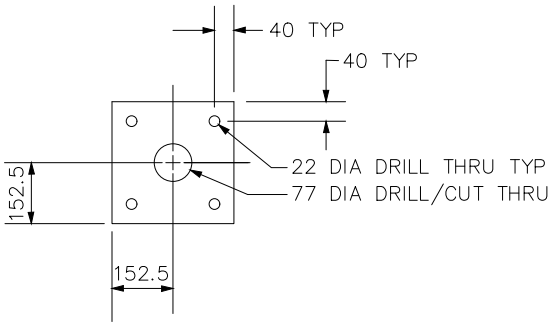
REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUFFALO GATES
ASSEMBLY B AND C LOGO AND BUSHING

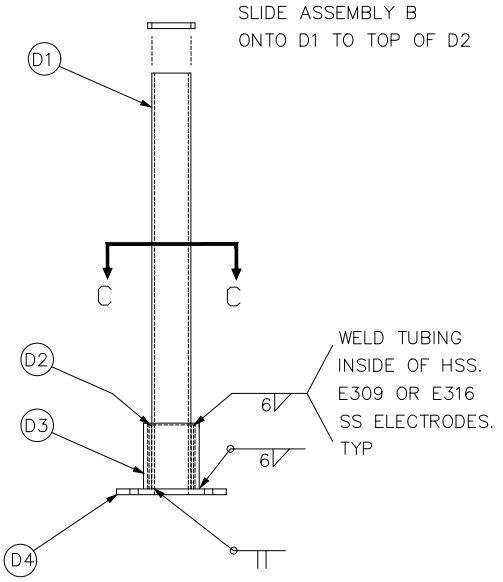
STANDARD DETAIL:	10-214
DATE: MAR. 2021	REV: 0



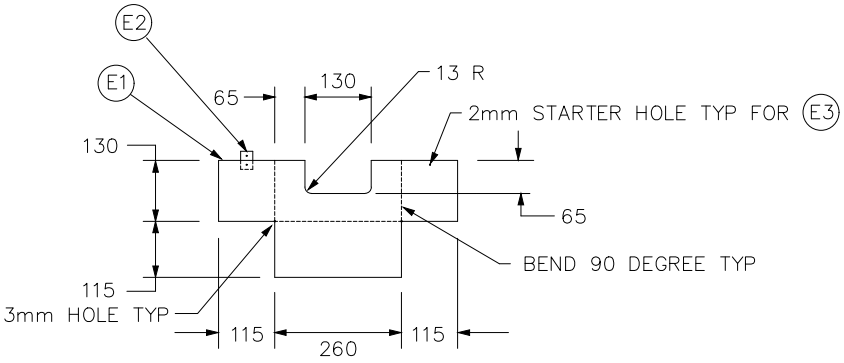
SECTION C–C



BASE PLATE D4 DETAIL



LOWER POST ASSEMBLY



ANCHOR POST COVER DETAIL

BILL OF MATERIALS						
ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT	
D	1	LOWER POST ASSEMBLY				
D1	1	INNER PIVOT SLEEVE	HSS: 89mm DIA x 6.4mm	CSA G40.21 350W	10.7 Kg	
D2	1	OUTER PIVOT SLEEVE	TUBING: 101.6mm OD x 5.7mm – 145mm LONG	AISI TYPE 304 L SS (SEAMLESS)	2.3 Kg	
D3	1	OUTER POST	HHS: 127mm x 127mm x 9.5mm – 150mm LONG	CSA G40.21 350W	1.8 Kg	
D4	1	FOUNDATION PLATE	PL: 19mm – 305mm x 305mm	CSA G40.21 300W	2.2 Kg	
E	1	ANCHOR POST COVER ASSEMBLY				
E1	2	ANCHOR POST COVER	SHEET: 490mm x 245mm	16Ga 304–#4 STAINLESS		
E2	2	BACKING PLATE	SHEET: 50mm x 75mm	16Ga 304–#4 STAINLESS		
E3	4	SHEET METAL SCREWS	AS APPROPRIATE	STAINLESS		

0 0.25 0.5 0.75 METERS 1.0

GENERAL NOTES:

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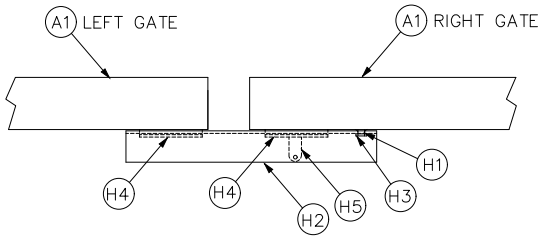
FINISH

1. POWDER COAT ALL EXPOSED SURFACES BLACK.

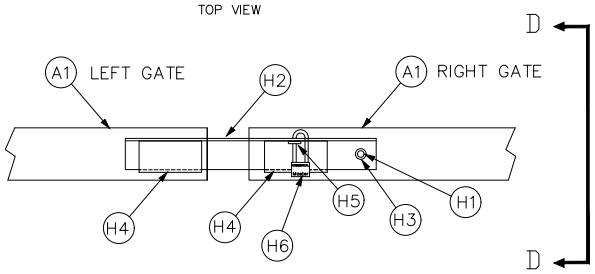
REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUFFALO GATES
ASSEMBLY C LOWER POST

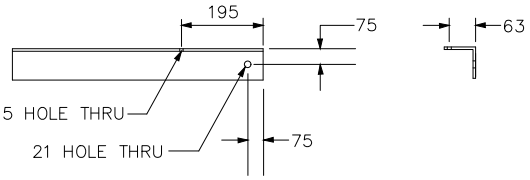
STANDARD DETAIL:	10-215
DATE: MAR. 2021	REV: 0



TOP VIEW

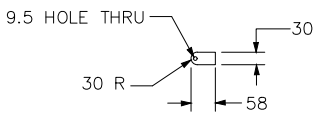


FRONT VIEW



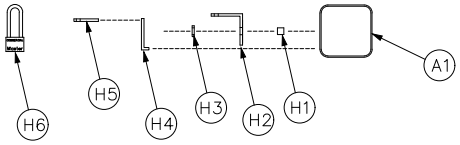
NOTE: FINISHED LOCK RECEIVER (9.5mm) HOLES TO BE ALIGNED

LATCH H2 DETAIL

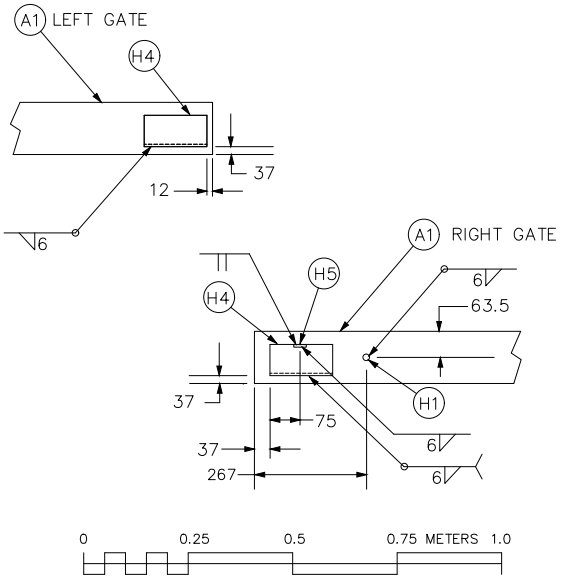


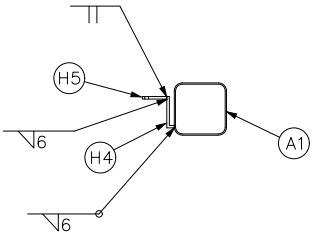
NOTE: FINISHED LOCK RECEIVER (9.5mm) HOLES TO BE ALIGNED

LOCK RECEIVER H5 DETAIL

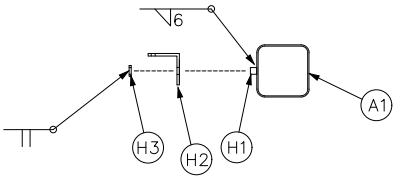


SECTION D -D EXPLODED VIEW





LATCH SUPPORT DETAIL



NOTE: LATCH ARM H2 TO ROTATE FREELY

LATCH PIVOT DETAIL

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT	
H	1	LATCH ASSEMBLY				
H1	1	PIVOT BOLT	BAR: 19mm DIA – 25mm LONG	CSA G40.21 50W		
H2	1	LATCH ARM	ANGLE: 75mm x 75mm – 600mm LONG	CSA G40.21 50W		
H3	1	LATCH RETAINER	WASHER: 19mm ID (x 1.5mm THICK)			
H4	2	LATCH SUPPORT	ANGLE: 75mm X 19mm – 150 LONG	CSA G40.21 50W		
H5	1	LOCK RECEIVER	PLATE: 58mm x 30mm x 6mm	MILD STEEL		
H6	1	PARKS LOCK (1/GATE)	MASTER, COMMERCIAL, LONG SHACKLE	A473 KEY (2)		

GENERAL NOTES:

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2. NO ALTERATIONS WITHOUT WRITTEN APPROVAL

FABRICATION

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2. PAINT WITH PRIMER AFTER SANDBLASTING/GRINDING.
3. GRIND SMOOTH ALL WELDS & PAINT WITH PRIMER.

WELDING

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3. STRUCTURE TO BE INSPECTED/CERTIFIED BY A PROFESSIONAL ENGINEER.

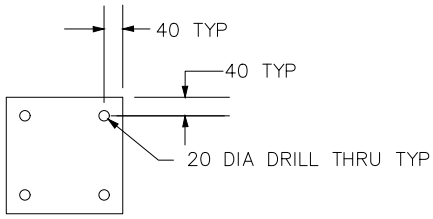
FINISH

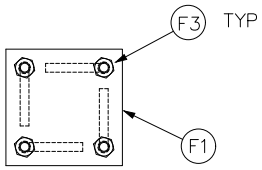
1. POWDER COAT ALL EXPOSED SURFACES BLACK.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

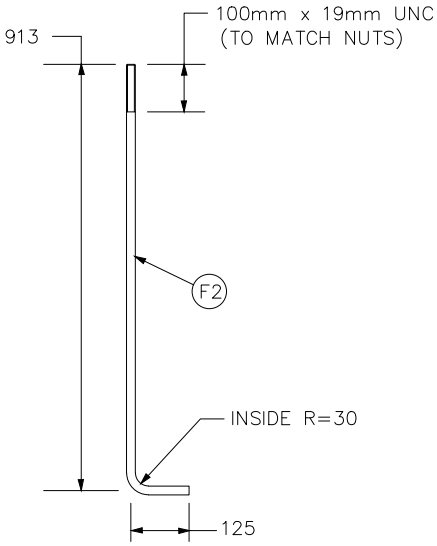
BUFFALO GATES
ASSEMBLY H LATCH

STANDARD DETAIL:	10-216
DATE: MAR. 2021	REV: 0

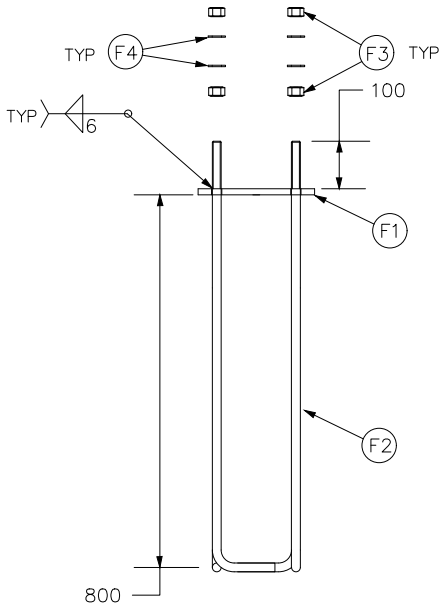




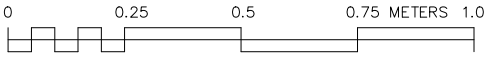
ANCHOR PLATE F1 DETAIL



ANCHOR BOLT F2 DETAIL



ANCHOR BOLT ASSEMBLY



BILL OF MATERIALS						
ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT	
F	1	ANCHOR ASSEMBLY				
F1	1	ANCHOR PLATE	PL: 19mm x 305mm x 305mm	CSA G40.21 300W		
F2	4	ANCHOR BOLTS	BAR: 19mm DIA x 1023mm LONG	ASTM F1554 Grade36		
F3	8	ANCHOR NUTS	A325 UNC –19mm DIA			
F4	8	FLAT WASHER	20mm ID			

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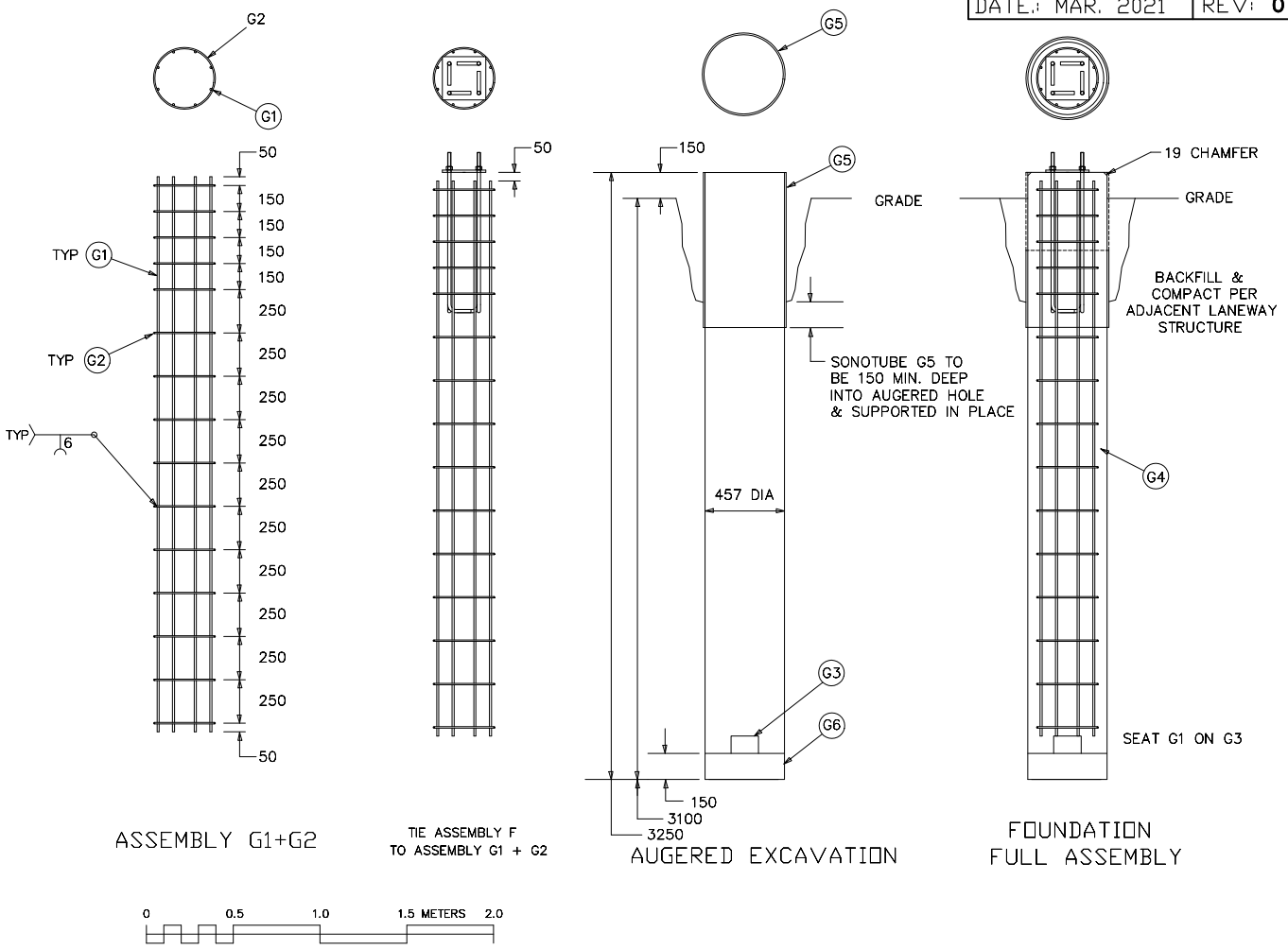
FINISH

1. POWDER COAT ALL EXPOSED SURFACES BLACK.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUFFALO GATES
ASSEMBLY F
ANCHOR BOLT

STANDARD DETAIL:	10-217
DATE: MAR. 2021	REV: 0



BILL OF MATERIALS						
ITEM	QTY	DESCRIPTION	MATERIAL	GRADE	WEIGHT	
G	1	CONCRETE FOUNDATION/REINFORCING CAGE				
G1	8	REBAR	15M DIA DEFORMED BAR – 2950 LONG			
G2	15	TIES	10M DEFORMED BAR – 1093mm LG/356mm OD			
G3	1	CONCRETE BLOCK	100mm HIGH			
G4	1	CONCRETE	32 MPa – 0.57 Cu.m.	GU, F-1/S-3, W/C=0.5		
G5	1	SONOTUBE	457mm DIA – 900 LONG			
G6	1	GRANULAR FILL	19mm MINUS – 0.2 Cu.m.			

GENERAL NOTES:

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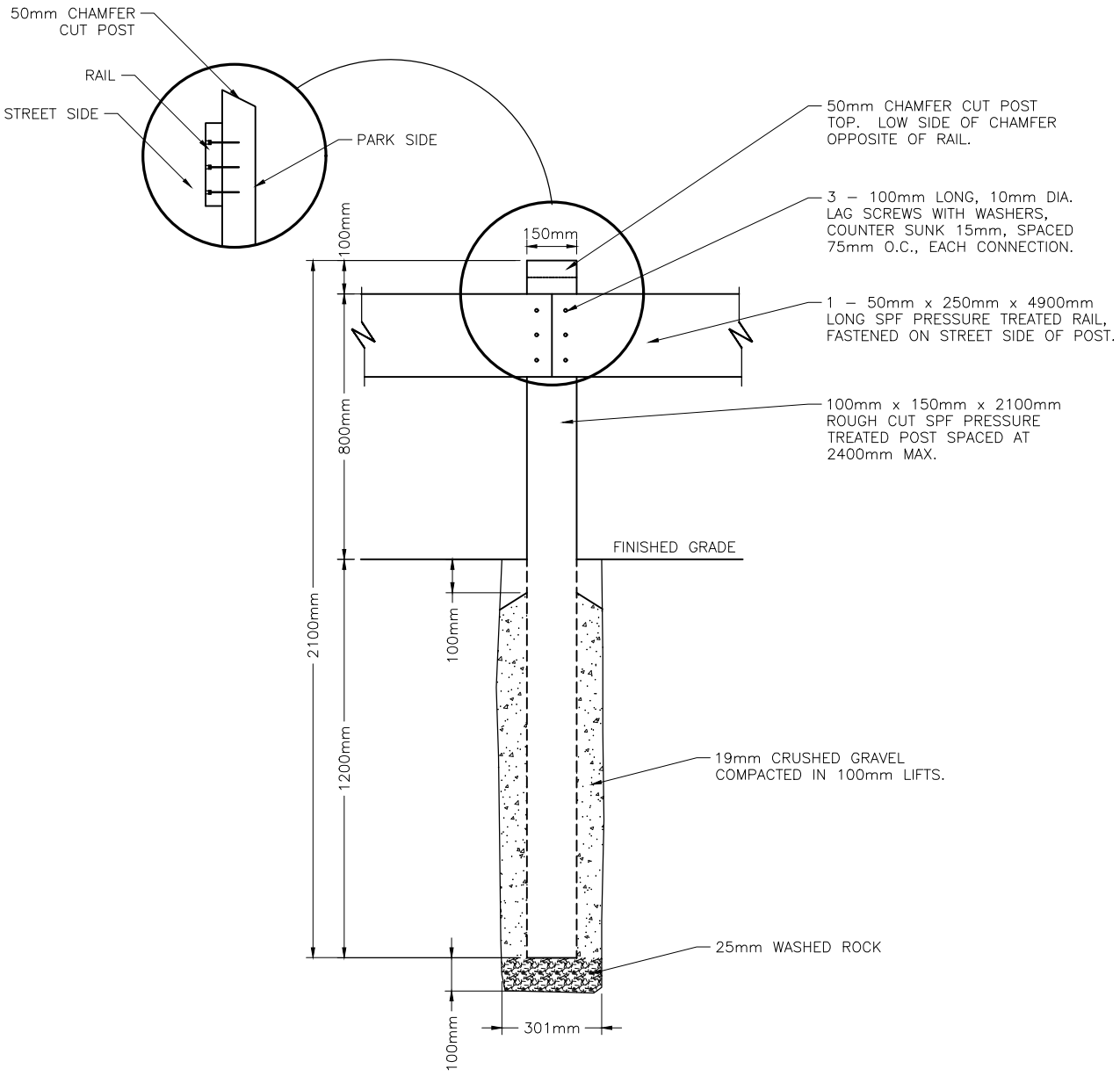
FINISH

1. POWDER COAT ALL EXPOSED SURFACES BLACK.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BUFFALO GATES
ASSEMBLY G
REINFORCING CAGE AND FOUNDATION

STANDARD DETAIL:	10-300
DATE: JAN. 2021	REV: 2



NOTES:

(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.

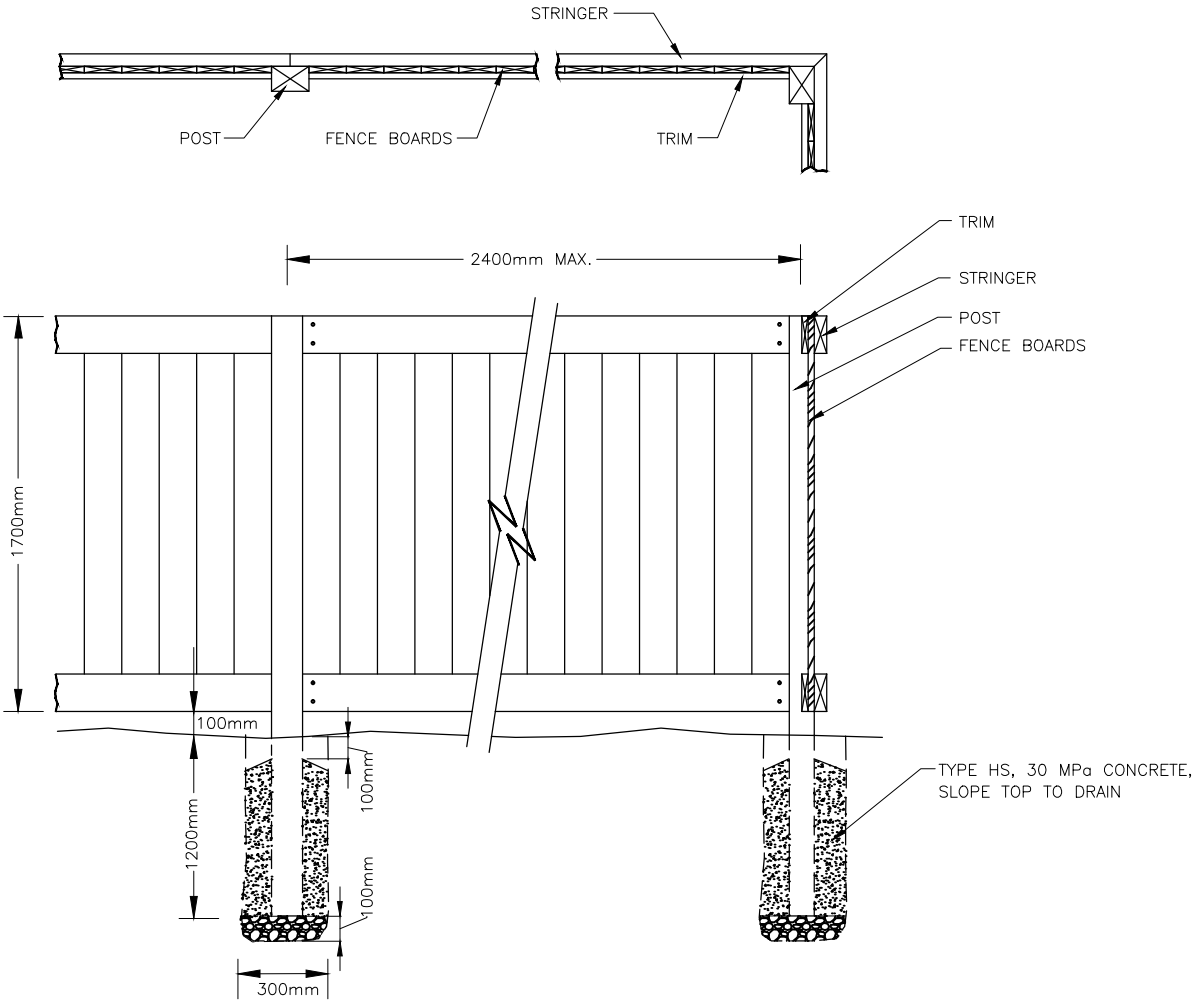
(4) ALL HARDWARE TO BE GALVANIZED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

POST AND RAIL FENCE DETAIL

Time: 11:33am
Date: Feb 12, 2021
Files: W:\161\active\161108920\drawing\sheet_files\figures\section 10\10-300.dwg by
Xrefs:

STANDARD DETAIL:	10-301
DATE: OCT 2016	REV: 1



NOTES:

(1) POSTS: 100mm x 150mm x 3000mm LONG, ROUGH CUT SPF PRESSURE TREATED TIMBER.

(2) STRINGERS: 2 – 50mm x 150mm x 2400mm LONG S4S SPF PRESSURE TREATED STRINGERS, FASTENED WITH 2 – 75mm #10 ZINC SCREWS PER CONNECTION. MOUNT STRINGERS FACING PUBLIC PROPERTY WHERE FENCE TERMINATES, ANGLE CUT STRINGER END AT 45 DEGREES.

(3) TRIM: 2 – 25mm x 150mm x 2250mm LONG, S4S SPF TRIM FASTENED WITH 2 – 63mm #8 ZINC SCREWS PER CONNECTION SPACED AT 600mm.

(4) FENCE BOARDS: 25mm x 150mm x 1700mm LONG S4S SPF FENCE BOARDS FASTENED WITH 2 – 50mm LONG GALVANIZED STAPLES PER CONNECTION.

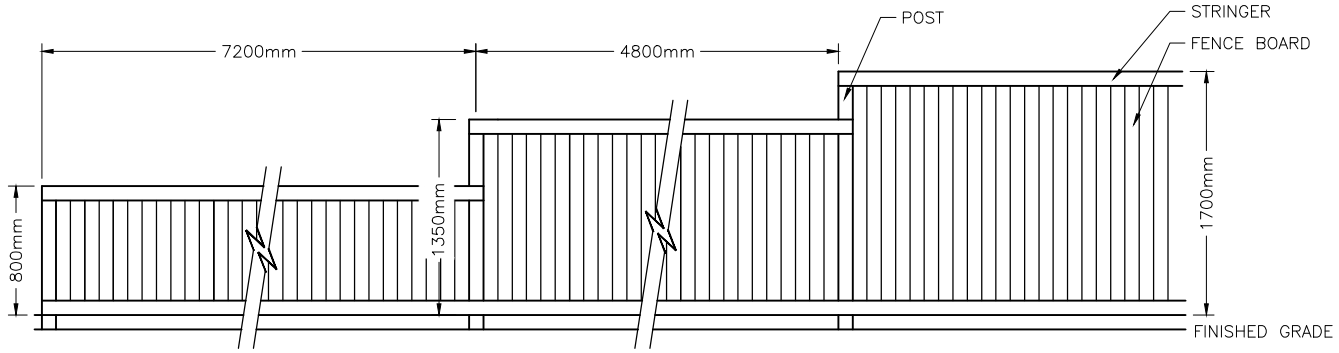
(5) FINISH: PAINT TO BE APPROVED BY THE MUNICIPALITY PRIOR TO CONSTRUCTION. ALL FENCING TO BE PAINTED PRIOR TO CONSTRUCTION.

(6) HARDWARE: ALL HARDWARE TO BE GALVANIZED, UNLESS OTHERWISE NOTED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

WOOD SCREEN FENCE DETAILS

STANDARD DETAIL:	10-302
DATE: JAN. 2021	REV: 2



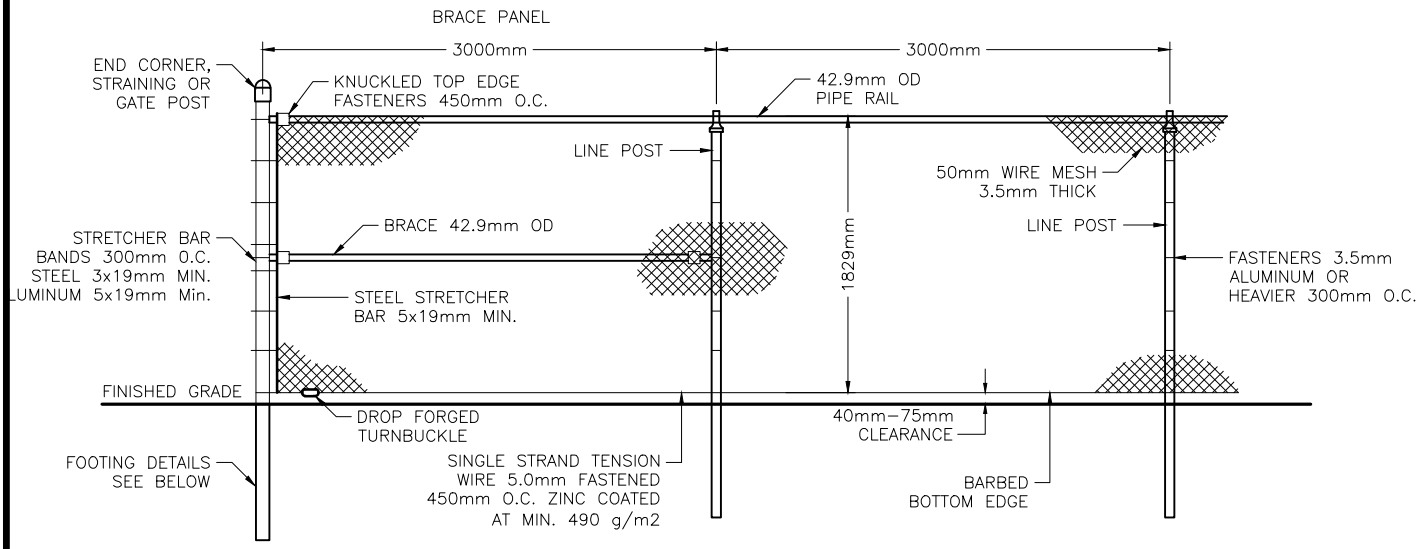
NOTE:
(1) SEE WOOD SCREEN FENCE DETAIL STANDARD DWG. NO. 10–301 FOR ADDITIONAL INFORMATION.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

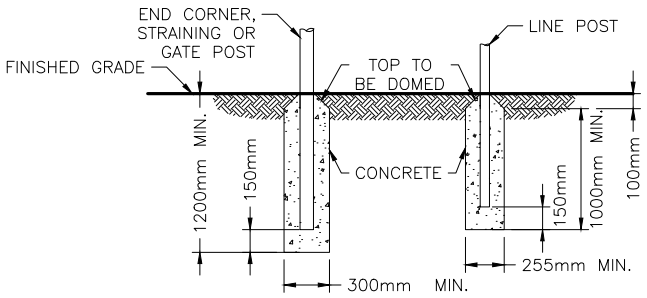
WOOD SCREEN FENCE STEP DOWN DETAIL

Time: 11:40am
Date: Feb 12, 2021
Files: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-302.dwg by
Xrefs:

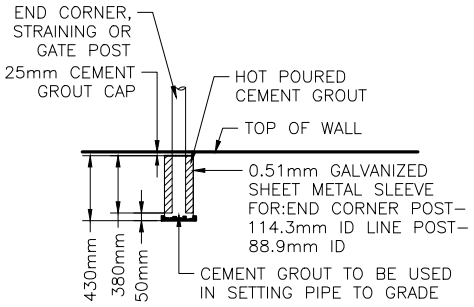
STANDARD DETAIL:	10-303
DATE: JAN. 2021	REV: 1



FENCE DETAIL



IN GROUND



ON RETAINING WALL

POST DETAILS			
DESCRIPTION	OD (mm)	LENGTH	
		STANDARD (m)	RETAINING WALLS (m)
LINE	60.3	2.8	2.0
END, CORNER, STRAINING AND GATES WITH OPENINGS 5.5m MAXIMUM	88.9	3.1	2.3
GATES WITH OPENINGS 10.0m MAXIMUM	114.3	3.1	N/A

SPECIFICATIONS

(1) POSTS, BRACES AND RAILS – HOT DIPPED GALVANIZED WELDED STEEL PIPE, STANDARD WEIGHT (COMMERCIAL GRADE 3.2mm (0.125 inches) THICK), ZINC COATED AT MINIMUM 366 g/m2.

(2) LINE POSTS AND TOP RAILS – HOT DIPPED GALVANIZED WELDED STEEL PIPE 2.54mm (0.10 inches) THICK.

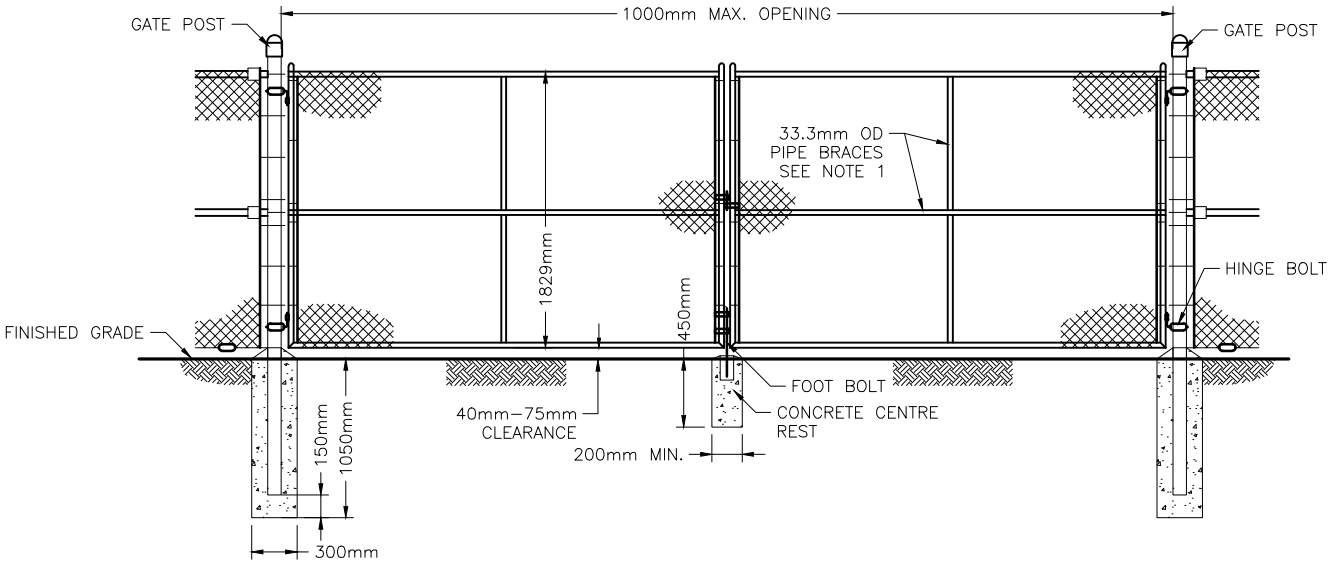
(3) CHAIN LINK, 50mm MESH, 3.5mm THICK WIRE, CLASS A ZINC COATED, GRADE 1 AT MINIMUM 490 g/m2.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

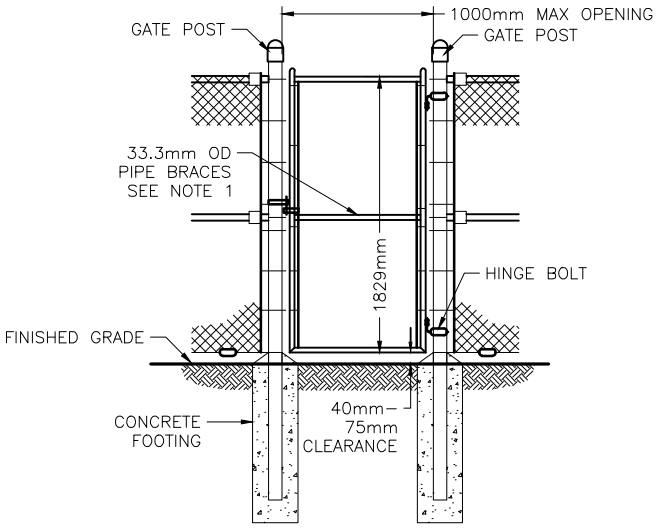
CHAIN LINK FENCE

Time: 11:46am
Date: Feb 12, 2021
Files: W:\161\active\161108920\drawing\sheet_files\figures\section 10\10-303.dwg by
Xrefs:

STANDARD DETAIL:	10-304
DATE: JAN. 2021	REV: 2



DOUBLE GATE (PARK MAINTENANCE)



SINGLE GATE

NOTES:

(1) PIPE BRACES:

GATE LEAVES UP TO 1.8m WIDE – HORIZONTAL BRACE ONLY.

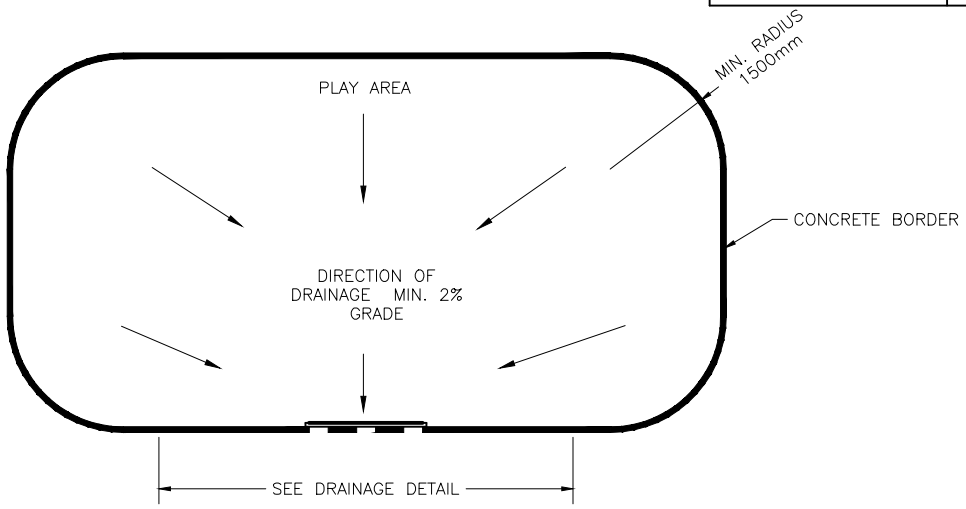
GATE LEAVES OVER 1.8m WIDE – BOTH HORIZONTAL AND VERTICAL BRACES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

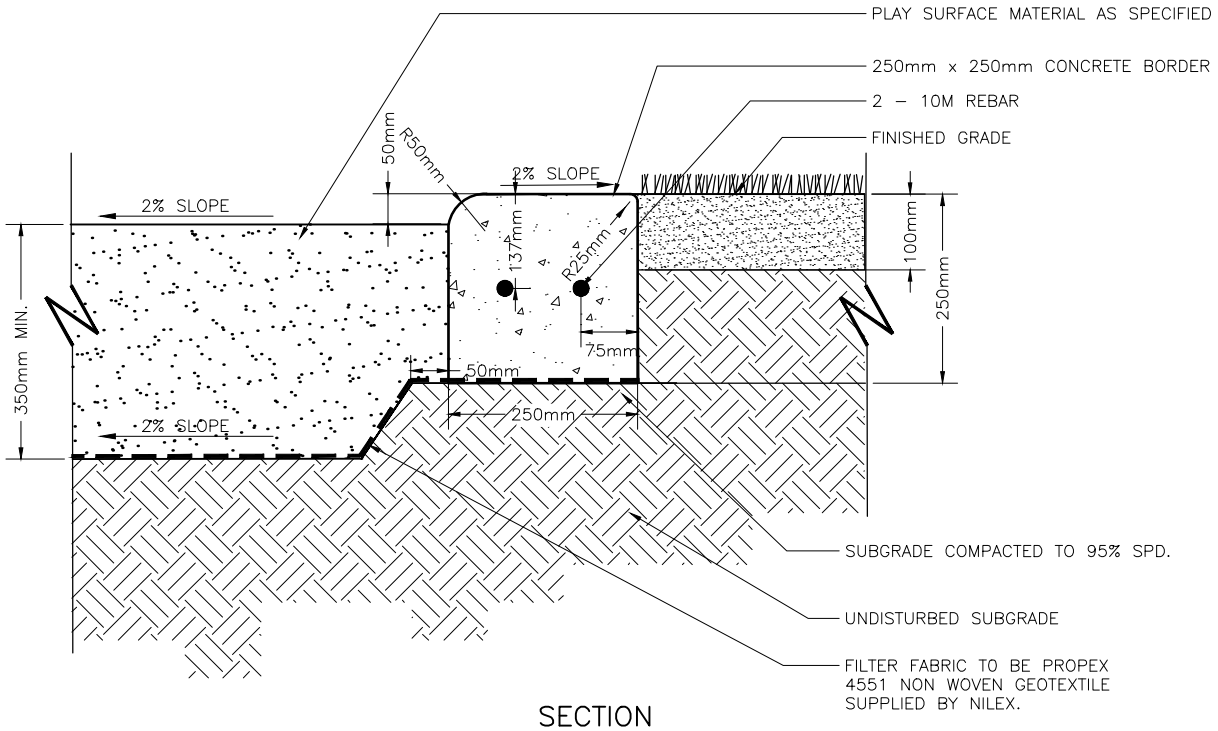
CHAIN LINK FENCE GATE DETAILS

Time: 11:48am
Date: Feb 12, 2021
Files: W:\161\active\161108920\drawing\sheet_files\figures\section 10\10-304.dwg by
Xrefs:

STANDARD DETAIL:	10-400
DATE: JAN. 2021	REV: 2



PLAN VIEW



SECTION

NOTES:

(1) CONTRACTION JOINTS SHALL BE CUT AT EVERY 3.0m. JOINTS SHALL NOT BE LESS THAN 30mm IN DEPTH AND 6mm IN WIDTH. THE EDGES OF THE JOINT SHALL BE ROUNDED OFF WITH AN EDGER HAVING A RADIUS OF 6mm.

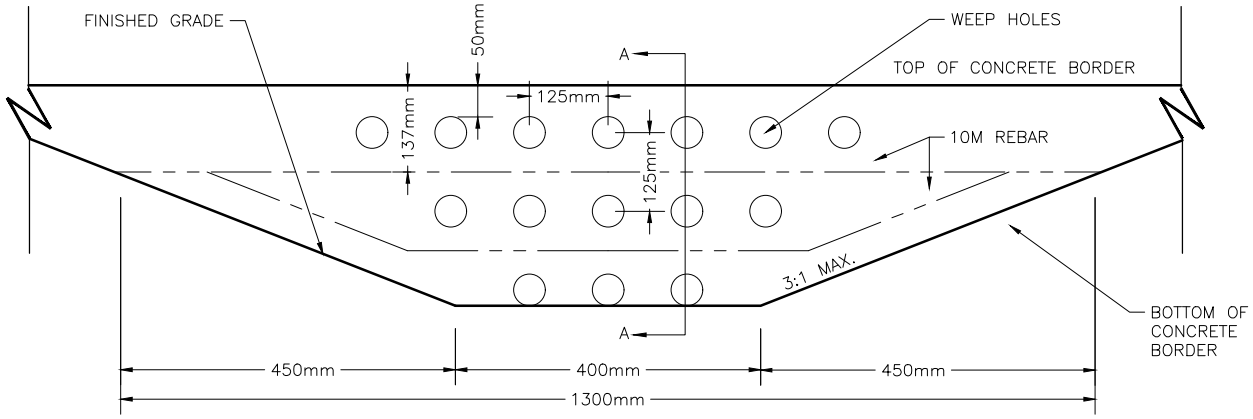
(2) DEVELOPER TO ENSURE BORDER LOCATION MEETS OR EXCESS APPROPRIATE EQUIPMENT OFFSETS AND SAFETY ZONES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

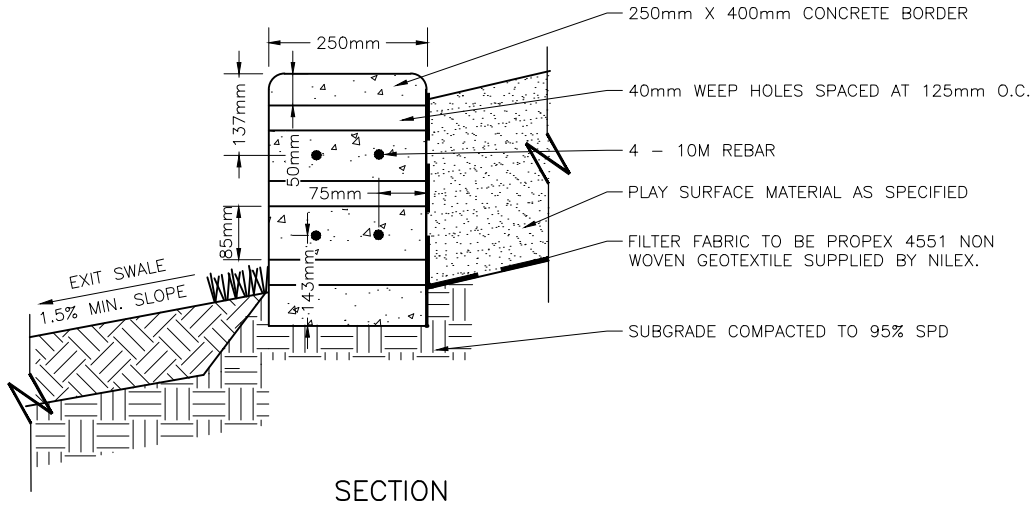
PLAYGROUND CONCRETE BORDER DETAILS

Time: 8:48am
Date: Mar 17, 2021
Files: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-400.dwg by
Xrefs:

STANDARD DETAIL:	10-401
DATE: JAN. 2021	REV: 2



ELEVATION



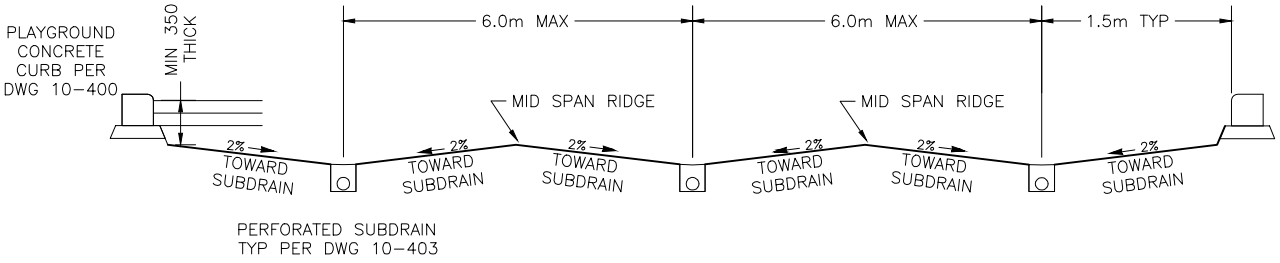
SECTION

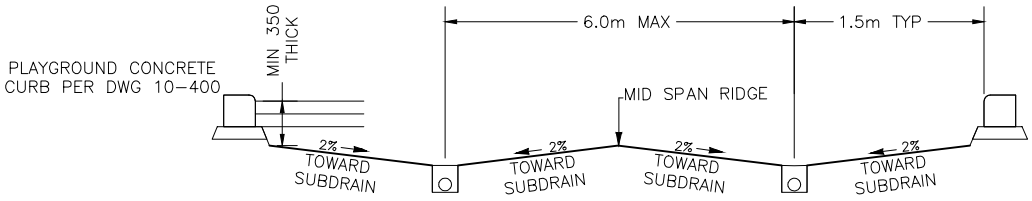
REGIONAL MUNICIPALITY OF WOOD BUFFALO

PLAY AREA CONCRETE BORDER DRAINAGE DETAILS

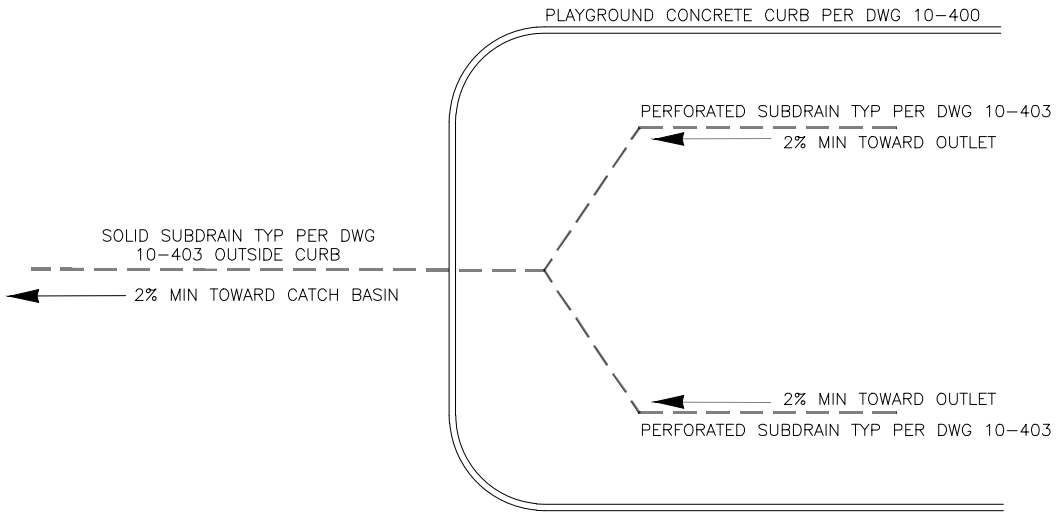
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Date: Mar 19, 2021
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Xrefs:

STANDARD DETAIL:	10-402
DATE: MARCH, 2021	REV: 0





SECTION A-A



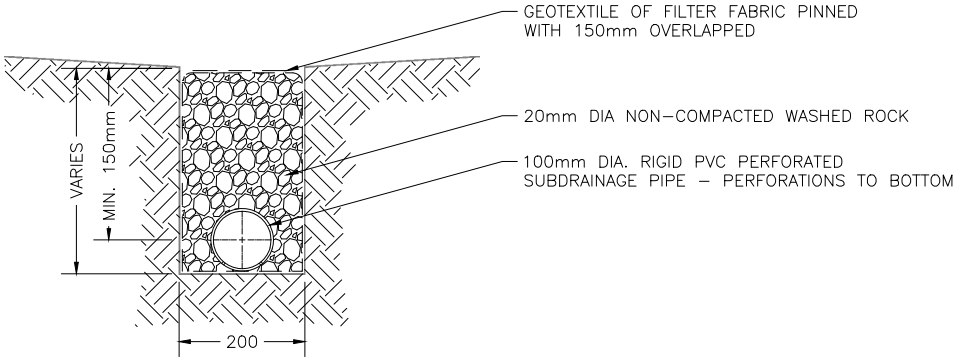
PLAN

REGIONAL MUNICIPALITY OF WOOD BUFFALO

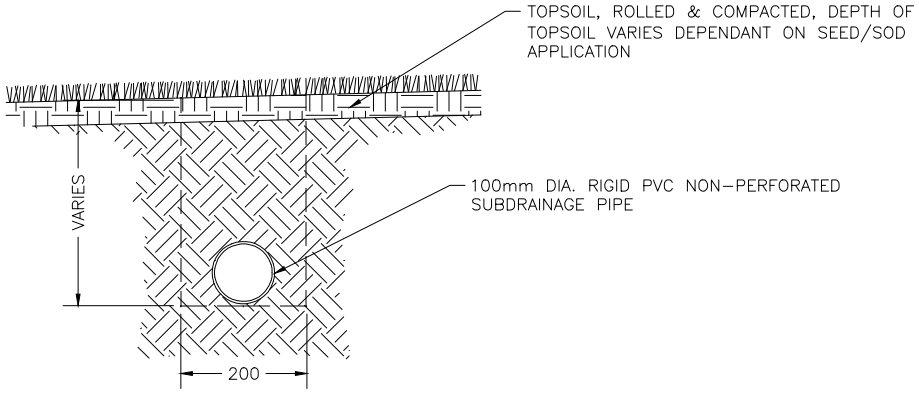
PLAYGROUND SUBDRAIN

Time: 8:04am
Date: Mar 19, 2021
File: x:\161\active\161108920\drawing\sheet_files\figures\section 10\10-402.dwg by
Xrefs:

STANDARD DETAIL:	10-403
DATE: MARCH, 2021	REV: 2

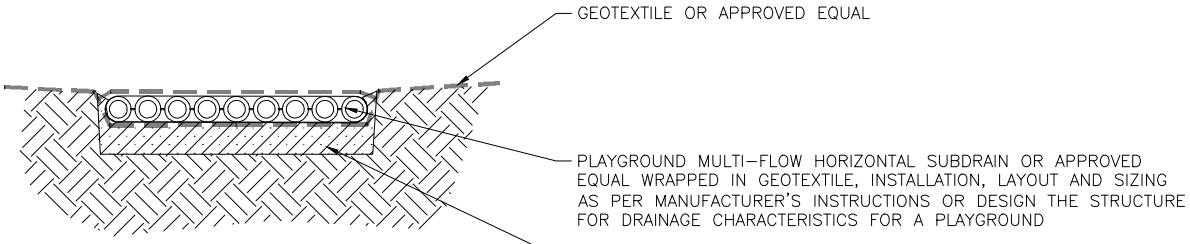


PERFORATED SUBDRAIN



NON-PERFORATED DRAIN

TO BE IMPLEMENTED OUTSIDE OF THE PLAYGROUND BORDER



MULTIFLOW DRAINAGE

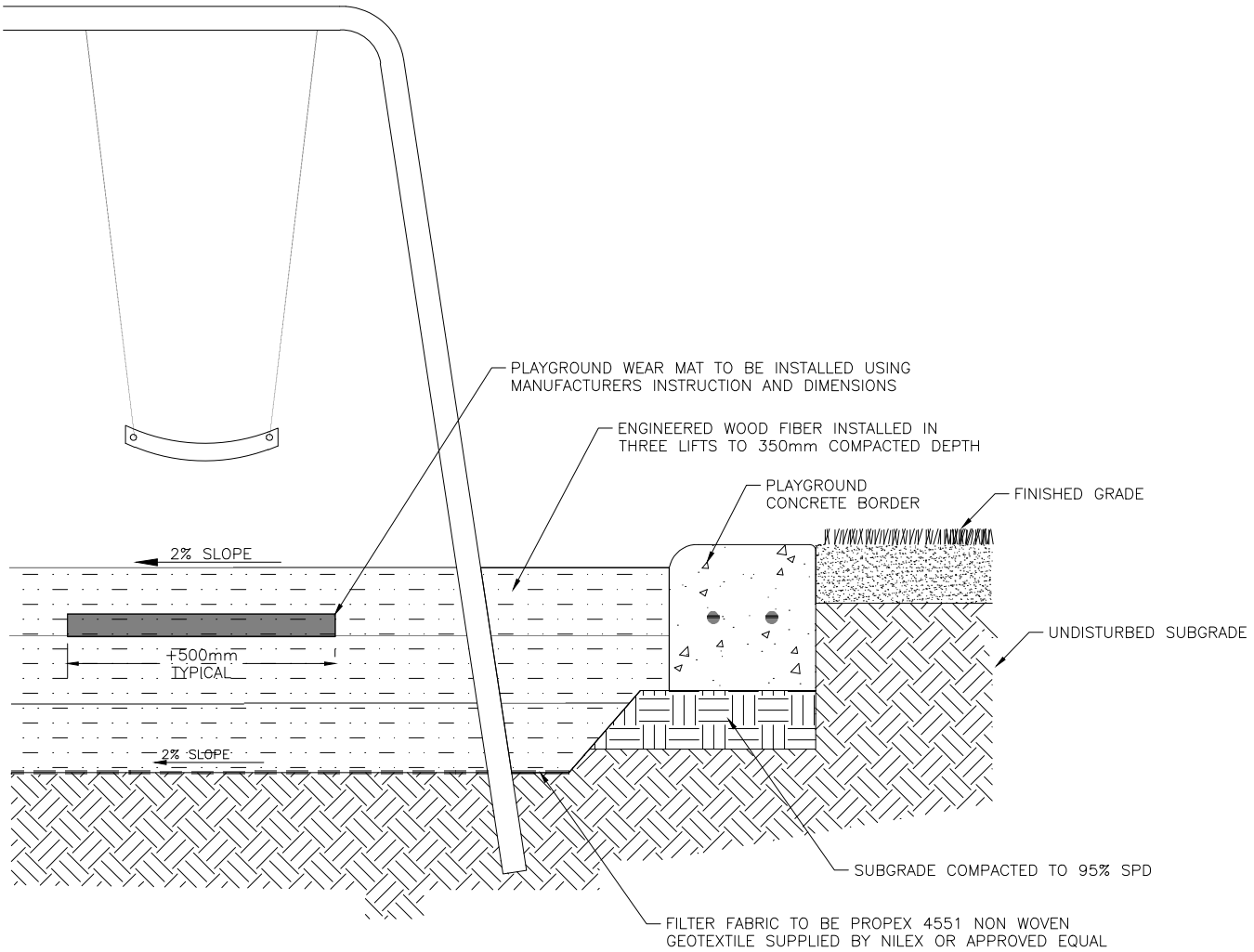
(1) A DRAINAGE SUMP IS NOT PERMITTED UNLESS THERE IS NO ACCEPTABLE DRAINAGE ALTERNATIVE, WHICH SHALL BE SUBJECT TO APPROVAL.
(2) MINIMUM 2.0% SLOPE ON ALL DRAINS.
(3) ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE.
(4) GEOTEXTILE TO BE NILEX 4551 OR EQUIVALENT.
(5) CLAY SUBGRADE GRUBBED, FREE OF STUMPS, ROOS, LARGE ROCKS AND DEBRIS. COMPACT TO 98% S.P.D. (FOR PLAYGROUNDS)

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PLAYGROUND SUBDRAIN INSTALLATION

Time: 8:05am
Date: Mar 19, 2021
Files: X:\116\active\116108920\drawing\sheet_files\figures\section 10\10-403.dwg by
Xrefs:

STANDARD DETAIL:	10-404
DATE: MARCH, 2021	REV: 2



(1) WEAR MATS TO BE INSTALLED IN THE MIDDLE LIFT OF THE ENGINEERED WOOD FIBER.
(2) ENGINEERED WOOD FIBER TO BE INSTALLED TO A COMPACTED DEPTH OF 350mm AND INSTALLED IN 115mm LIFTS, COMPACTING WITH A MECHANICAL COMPACTOR OR TRACK LOADER FOR LARGE AREAS AND HAND TAPPING AROUND COMPONENT POSTS.
(3) ALLL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

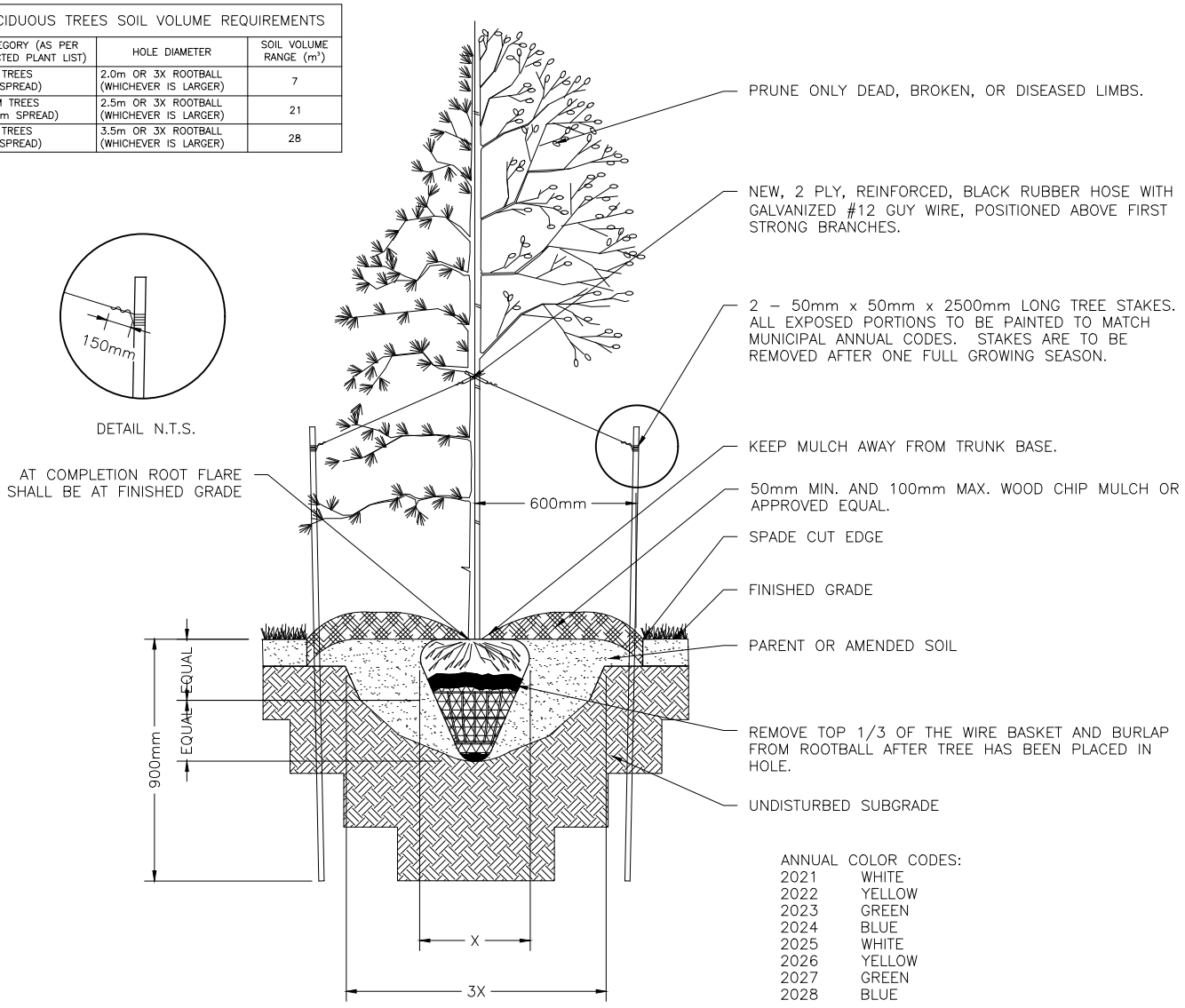
PLAYGROUND WEAR MAT

Time: 8:06am
Date: Mar 19, 2021
File: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-404.dwg by
Xrefs:

STANDARD DETAIL:	10-500
DATE: FEB. 2021	REV: 2

CONIFEROUS TREES SOIL VOLUME REQUIREMENTS		
CATEGORY (AS PER SELECTED PLANT LIST)	HOLE DIAMETER	SOIL VOLUME RANGE (m^3)
SMALL TREES (<5m SPREAD)	1.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	7
MEDIUM TREES (5m–15m SPREAD)	2.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	21
LARGE TREES (>15m SPREAD)	3.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	28

DECIDUOUS TREES SOIL VOLUME REQUIREMENTS		
CATEGORY (AS PER SELECTED PLANT LIST)	HOLE DIAMETER	SOIL VOLUME RANGE (m^3)
SMALL TREES (<4m SPREAD)	2.0m OR 3X ROOTBALL (WHICHEVER IS LARGER)	7
MEDIUM TREES (4m–9m SPREAD)	2.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	21
LARGE TREES (>9m SPREAD)	3.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	28



ANNUAL COLOR CODES:

2021	WHITE
2022	YELLOW
2023	GREEN
2024	BLUE
2025	WHITE
2026	YELLOW
2027	GREEN
2028	BLUE

NOTES:

(1) IF MIN. UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.

(2) ALL TREES TO MAINTAIN A MIN CLEARANCE AS SET OUT IN THESE STANDARDS FROM ALL UTILITIES.

(3) DIG ALL ROOT HOLES BY HAND WHEN TREE PIT IS CLOSER THAN ONE METRE FROM EDGE OF PIT TO THE STAKED UTILITY LINE.

(4) ALL SPECIMEN SHALL MEET THE CANADIAN NURSERY LANDSCAPE ASSOCIATION STANDARDS.

(5) TREES LARGER THAN 100mm CAL. OR 3.0 HEIGHT REQUIRE 3 TREE STAKES.

(6) ALL PLANT MATERIAL SHALL MEET THE HORTICULTURAL STANDARDS AND PRACTICES OF THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.

(7) SITES WITH HEAVY CLAY SHALL HAVE A LARGER THAN NORMAL HOLE AND EQUAL MIX OF SOIL FROM HOLE, ORGANIC MATTER AND SAND.

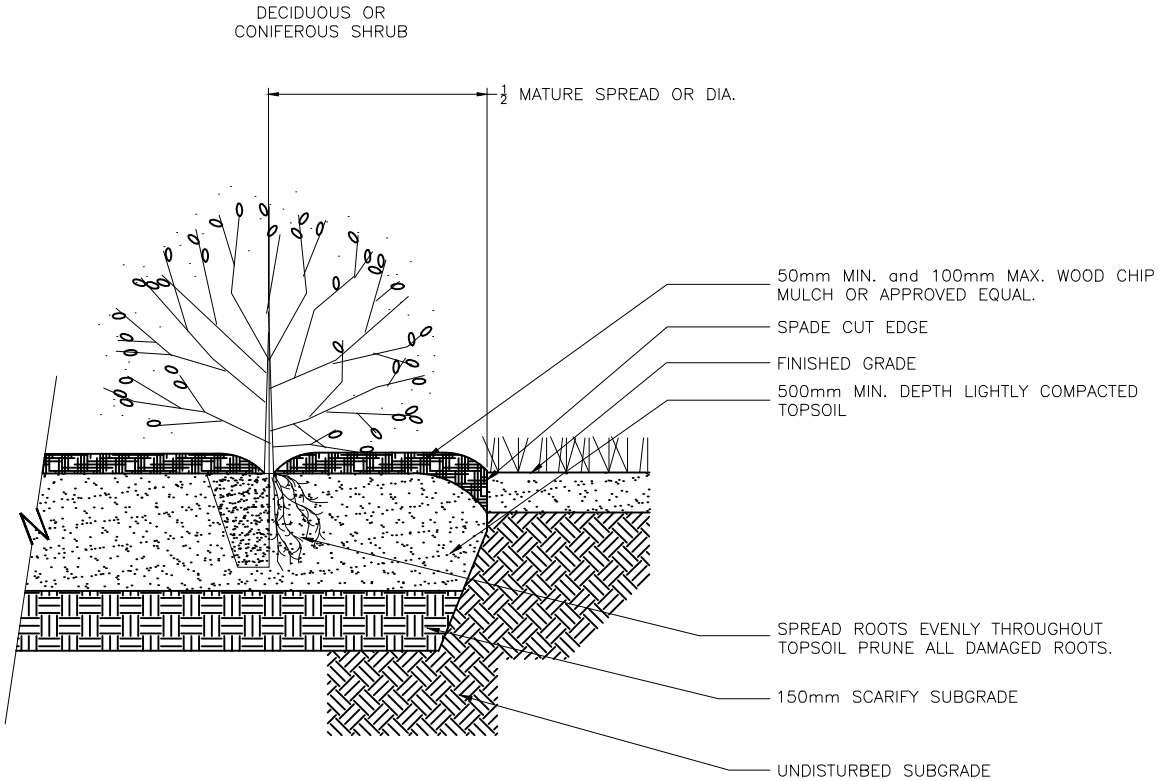
(8) AVOID GLAZING THE SIDES OF THE HOLE. SIDES OF HOLE SHALL BE SCARIFIED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TREE PLANTING DETAIL

Time: 3:35pm
Date: Mar 16, 2021
File: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-500.dwg by
Xrefs:

STANDARD DETAIL:	10-501
DATE: OCT 2016	REV: 0



NOTES:

(1) DO NOT PLACE MULCH WITHIN 50mm FROM SHRUB BASE.
(2) PRUNE ALL DEAD OR DAMAGED ROOTS AND BRANCHES.
(3) MINIMUM SHRUB SIZE AT PLANTING TO BE 600mm HEIGHT AND SPREAD.
(4) ALL PLANT MATERIAL SHALL MEET THE HORTICULTURAL STANDARDS AND PRACTICES OF THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.

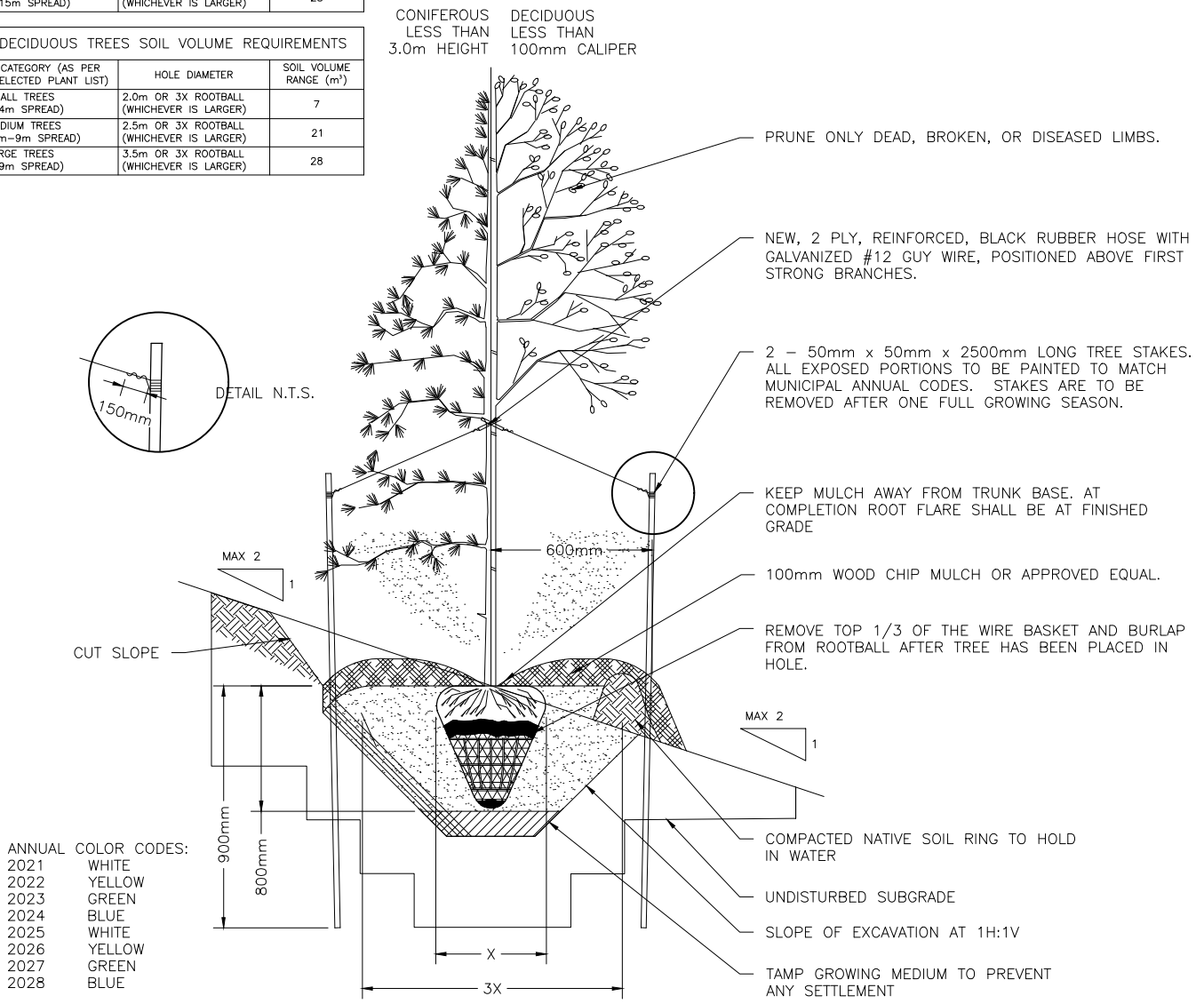
REGIONAL MUNICIPALITY OF WOOD BUFFALO

SHRUB BED PLANTING DETAIL

STANDARD DETAIL:	10-502
DATE: FEB. 2021	REV: 1

CONIFEROUS TREES SOIL VOLUME REQUIREMENTS		
CATEGORY (AS PER SELECTED PLANT LIST)	HOLE DIAMETER	SOIL VOLUME RANGE (m^3)
SMALL TREES (<5m SPREAD)	1.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	7
MEDIUM TREES (5m–15m SPREAD)	2.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	21
LARGE TREES (>15m SPREAD)	3.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	28

DECIDUOUS TREES SOIL VOLUME REQUIREMENTS		
CATEGORY (AS PER SELECTED PLANT LIST)	HOLE DIAMETER	SOIL VOLUME RANGE (m^3)
SMALL TREES (<4m SPREAD)	2.0m OR 3X ROOTBALL (WHICHEVER IS LARGER)	7
MEDIUM TREES (4m–9m SPREAD)	2.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	21
LARGE TREES (>9m SPREAD)	3.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	28



ANNUAL COLOR CODES:

2021	WHITE
2022	YELLOW
2023	GREEN
2024	BLUE
2025	WHITE
2026	YELLOW
2027	GREEN
2028	BLUE

NOTES:

(1) IF MIN. UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS.

(2) ALL TREES TO MAINTAIN A MIN CLEARANCE AS SET OUT IN THESE STANDARDS FROM ALL UTILITIES.

(3) DIG ALL ROOT HOLES BY HAND WHEN TREE PIT IS CLOSER THAN ONE METRE FROM EDGE OF PIT TO THE STAKED UTILITY LINE.

(4) ALL SPECIMEN SHALL MEET THE CANADIAN NURSERY LANDSCAPE ASSOCIATION STANDARDS.

(5) TREES LARGER THAN 100mm CAL. OR 3.0 HEIGHT REQUIRE 3 TREE STAKES.

(6) ALL PLANT MATERIAL SHALL MEET THE HORTICULTURAL STANDARDS AND PRACTICES OF THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.

(7) SITES WITH HEAVY CLAY SHALL HAVE A LARGER THAN NORMAL HOLE AND EQUAL MIX OF SOIL FROM HOLE, ORGANIC MATTER AND SAND.

(8) AVOID GLAZING THE SIDES OF THE HOLE. SIDES OF HOLE SHALL BE SCARIFIED.

(9) IF POOR DRAINAGE CONDITIONS EXIST, PROVIDE POSITIVE DRAINAGE SUB–SURFACE DRAINAGE AWAY FROM PLANTING EXCAVATION.

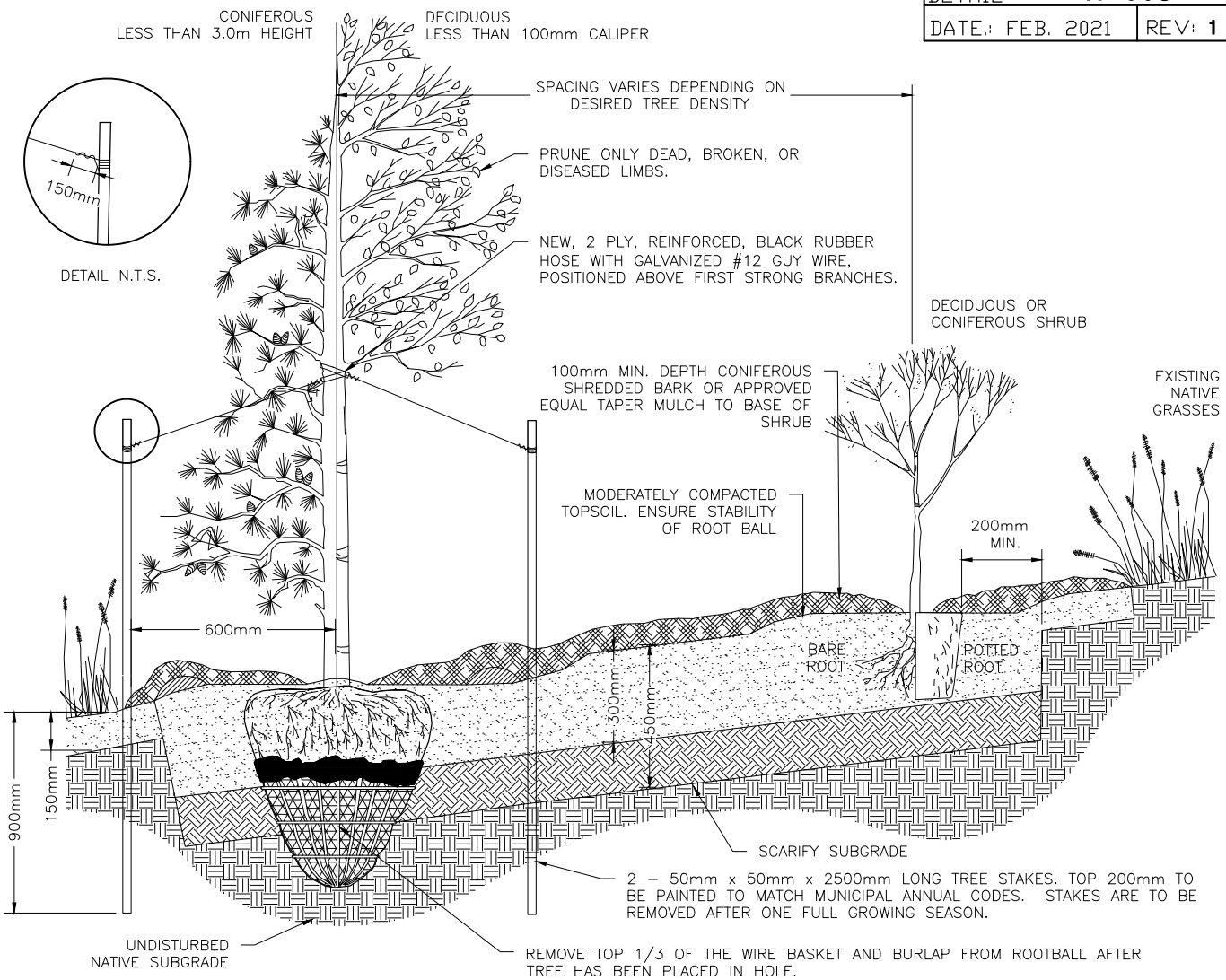
(10) 12.5mm PLASTIC EMITTER LINE TO BE PEGGED A MINIMUM OF EVERY 1.5m USING 200mm WIRE STAKES OR EQUIVALENT.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TREE PLANTING ON SLOPE

Time: 3:36pm
Date: Mar 16, 2021
File: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-502.dwg by
Xrefs:

STANDARD DETAIL:	10-503
DATE: FEB. 2021	REV: 1



NOTES:

(1) ALL COMPONENTS AND WORKMANSHIP TO CONFORM TO SPECIFICATION SECTION 02931 NATURALIZATION AS WELL AS THE RELATED SECTIONS.

(2) PRUNE ONLY DEAD, BROKEN OR DISEASED BRANCHES TO MAINTAIN PROPER SHRUB FORM (DECIDUOUS ONLY).

(3) ALL TREE STAKES TO MAINTAIN MINIMUM 1.0m CLEARANCE FROM ALL U/G POWER, TELEPHONE AND GAS ALIGNMENTS.

(4) IF MINIMUM UTILITY SETBACKS PERMIT POSITION TREE STAKES INTO DIRECTION OF PREVAILING WINDS OR IF IN BOULEVARD STAKES SHOULD BE IN LINE WITH THE DIRECTION OF TRAFFIC.

(5) DIG ALL ROOT HOLES BY HAND WHEN CLOSER THAN 1.0m TO U/G POWER, TELEPHONE AND GAS ALIGNMENTS (REFER TO SECTION 7.6.2 AND 7.6.3 WHEN CLEARANCE CANNOT BE MAINTAINED FOR ANY EXCAVATIONS).

(6) DO NOT PLACE MULCH WITHIN 50mm FROM SHRUB BASE.

(7) PRUNE ALL DEAD OR DAMAGED ROOTS AND BRANCHES.

(8) MINIMUM SHRUB SIZE AT PLANTING TO BE 600MM HEIGHT AND SPREAD.

(9) ALL PLANT MATERIAL SHALL MEET THE HORTICULTURAL STANDARDS AND PRACTICES OF THE CANADIAN NURSERY LANDSCAPE ASSOCIATION.

(10) SPACINGS VARY DEPENDING ON SHRUB SIZES.

ANNUAL COLOR CODES:

2021	WHITE	2025	WHITE
2022	YELLOW	2026	YELLOW
2023	GREEN	2027	GREEN
2024	BLUE	2028	BLUE

CONIFEROUS TREES SOIL VOLUME REQUIREMENTS		
CATEGORY (AS PER SELECTED PLANT LIST)	HOLE DIAMETER	SOIL VOLUME RANGE (m^3)
SMALL TREES (<5m SPREAD)	1.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	7
MEDIUM TREES (5m–15m SPREAD)	2.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	21
LARGE TREES (>15m SPREAD)	3.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	28

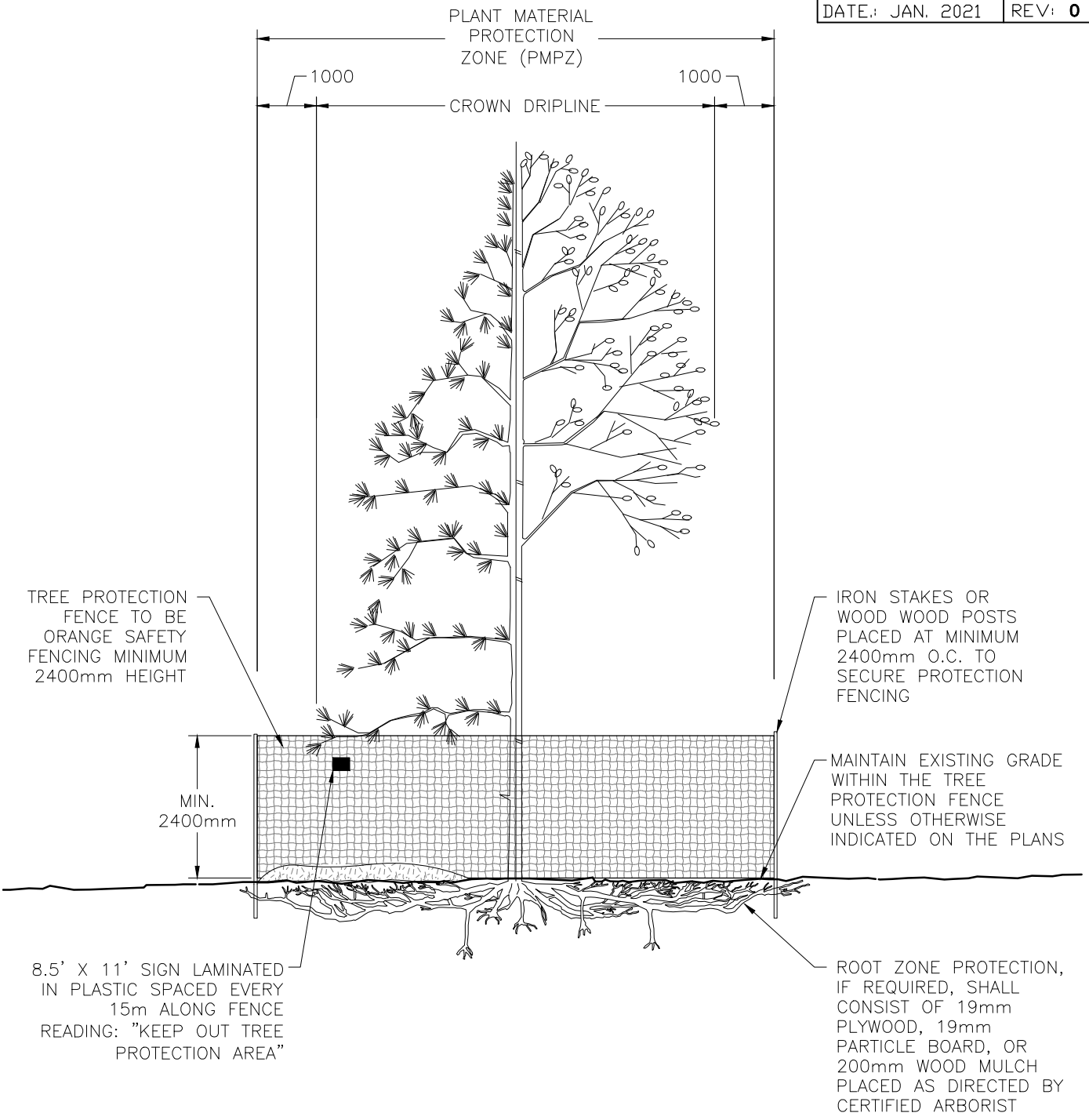
DECIDUOUS TREES SOIL VOLUME REQUIREMENTS		
CATEGORY (AS PER SELECTED PLANT LIST)	HOLE DIAMETER	SOIL VOLUME RANGE (m^3)
SMALL TREES (<4m SPREAD)	2.0m OR 3X ROOTBALL (WHICHEVER IS LARGER)	7
MEDIUM TREES (4m–9m SPREAD)	2.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	21
LARGE TREES (>9m SPREAD)	3.5m OR 3X ROOTBALL (WHICHEVER IS LARGER)	28

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TREE AND SHRUB NATURALIZATION DETAIL

Time: 3:37pm
Date: Mar 16, 2021
File: X:\116\active\116108920\drawing\sheet_files\figures\section 10\10-503.dwg by
Xrefs:

STANDARD DETAIL:	10-504
DATE: JAN. 2021	REV: 0



TREE PROTECTION NOTES:

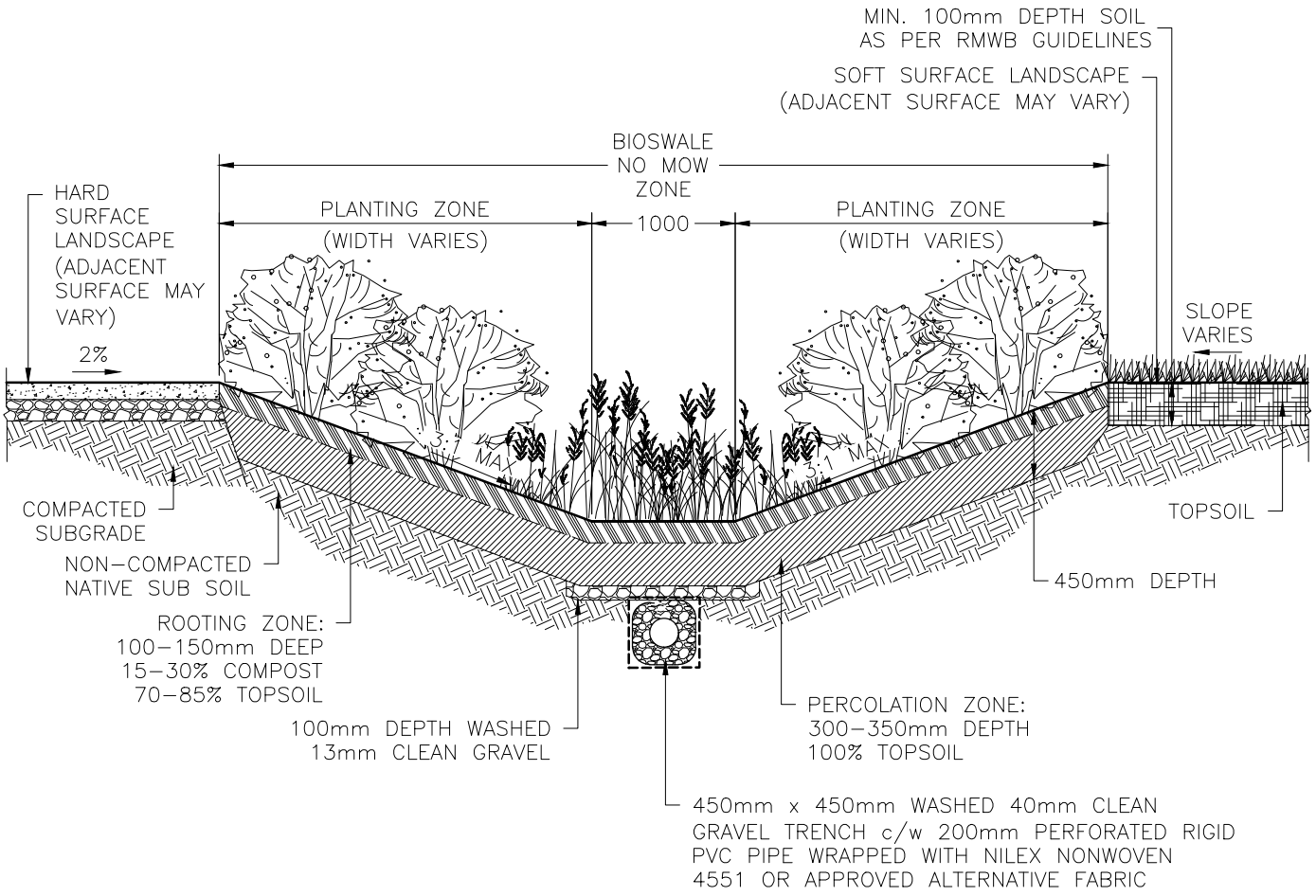
1. ALL PLANT MATERIAL TO BE PRESERVED SHALL BE CLEARLY INDICATED ON A CLEARING AND PROTECTION PLAN.
2. ABSOLUTELY NO VEHICLE OR FOOT TRAFFIC AROUND OR UNDER DRIP LINE OF EXISTING TREES OR WITHIN TREE PROTECTION AREA.
3. IF ACCESS AROUND OR UNDER DRIP LINE IS UNAVOIDABLE, ALL EFFORTS SHOULD BE TAKEN TO PROTECT TREE AND ROOT ZONE. ROOT PROTECTION IS REQUIRED AROUND BASE OF TREES THAT ARE WITHIN 3m OF CONSTRUCTION AREA.
4. CONTRACTOR WILL BE ASSESSED FOR ANY DAMAGES TO TREES DURING CONSTRUCTION, IF APPLICABLE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TREE PROTECTION DETAIL

Time: 10:04am
Date: Jan 28, 2021
Files: \\cd1044-fs06\work_group\11611\active\161108920\drawing\transmitted\section 10\10-504.dwg by
Xrefs:

STANDARD DETAIL:	10-505
DATE: JAN. 2021	REV: 0

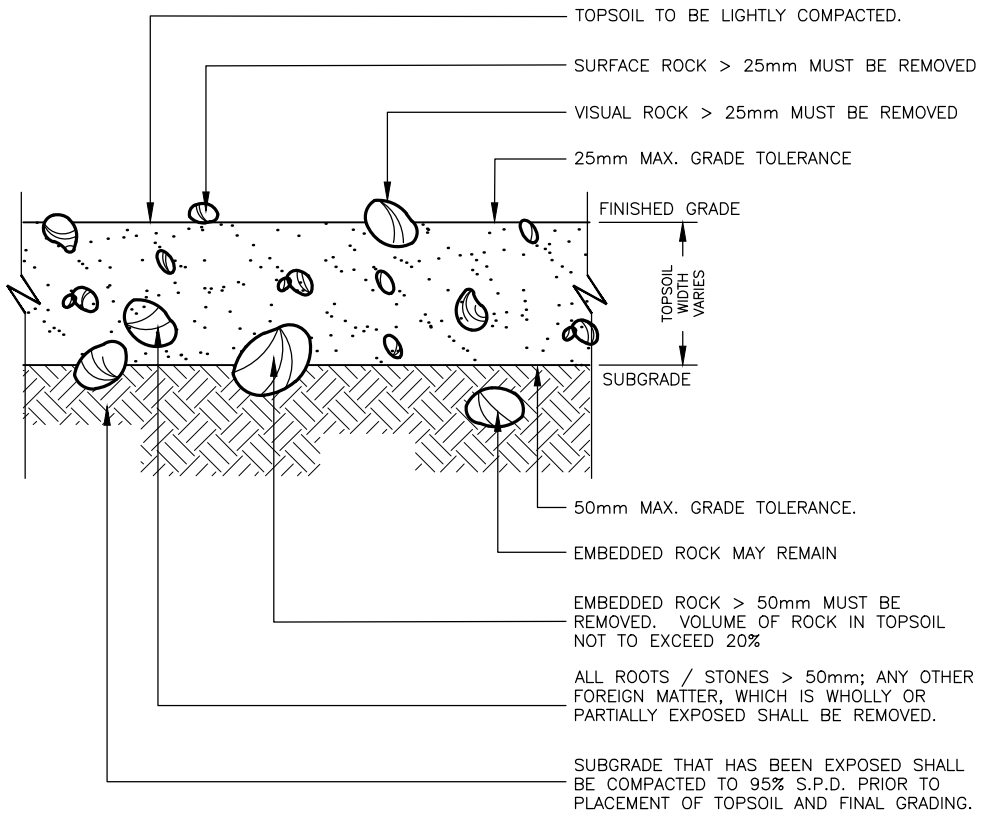


REGIONAL MUNICIPALITY OF WOOD BUFFALO

BIOSWALE CROSS-SECTION DETAIL

Time: 8:50am
Date: Mar 17, 2021
File: x:\161\active\161108920\drawing\sheet_files\figures\section 10\10-505.dwg by
Xrefs:

STANDARD DETAIL:	10-700
DATE: MARCH, 2021	REV: 2



NOTES:

(1) 150mm MIN. DEPTH TOPSOIL FOR SEEDED AREAS.

(2) 100mm MIN. DEPTH TOPSOIL FOR SODDED AREAS.

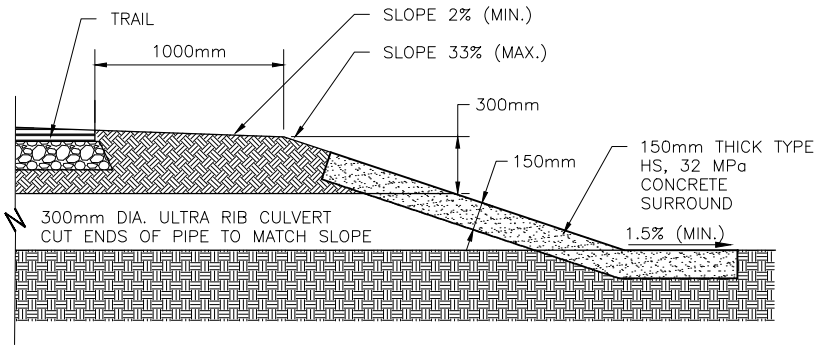
(3) 500mm MIN. DEPTH TOPSOIL FOR SHRUB AND TREE BEDS.

(4) DEVELOPER TO PROVIDE ORIGINAL SOIL ANALYSIS AND AMENDED SOIL ANALYSIS TO PARKS AND RECREATION FOR APPROVAL PRIOR TO INSTALLATION. SEE SECTION 10.3 TOPSOIL AND TURF FOR DETAILS.

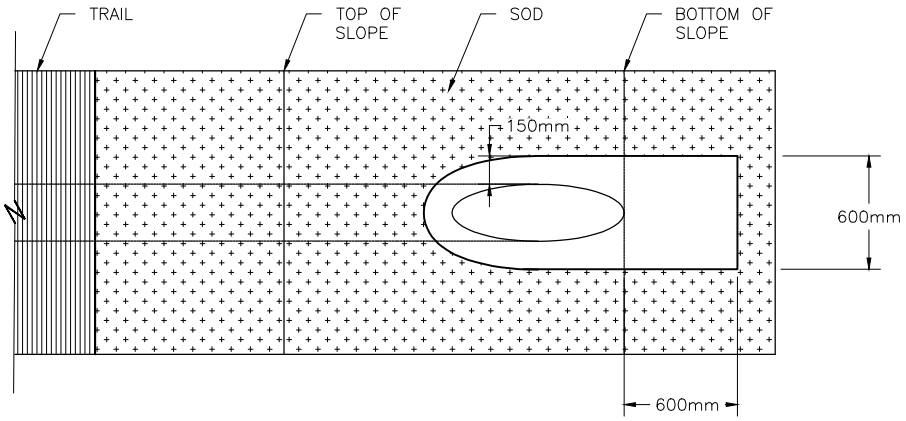
REGIONAL MUNICIPALITY OF WOOD BUFFALO

TOPSOIL / SUBGRADE PREPARATION DETAIL

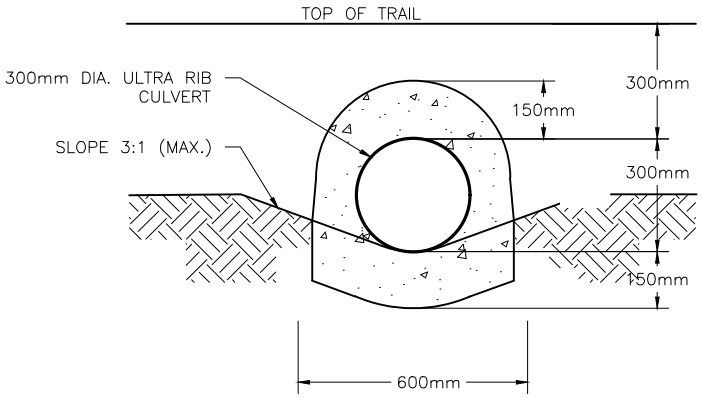
STANDARD DETAIL:	10-701
DATE: JAN. 2021	REV: 2



SECTION



PLAN



END ELEVATION

NOTES:

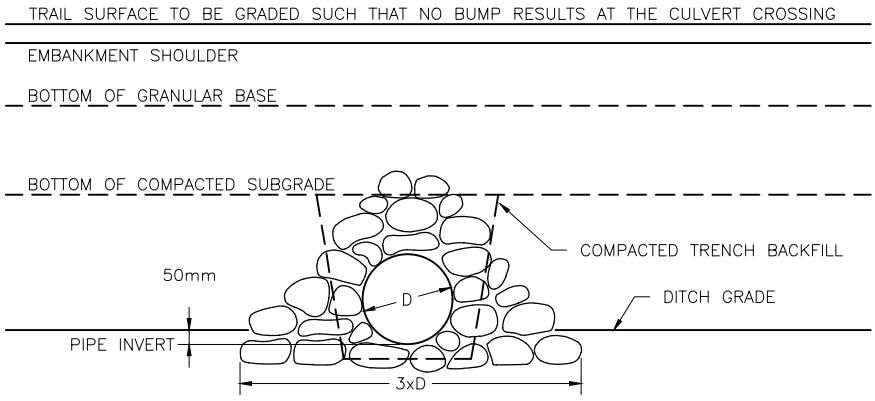
(1) SHAPE OR FORM THE SURROUNDING SURFACE TO MATCH THE CULVERT END AND SWALE CROSS SECTION AS PER DETAIL 6–556.

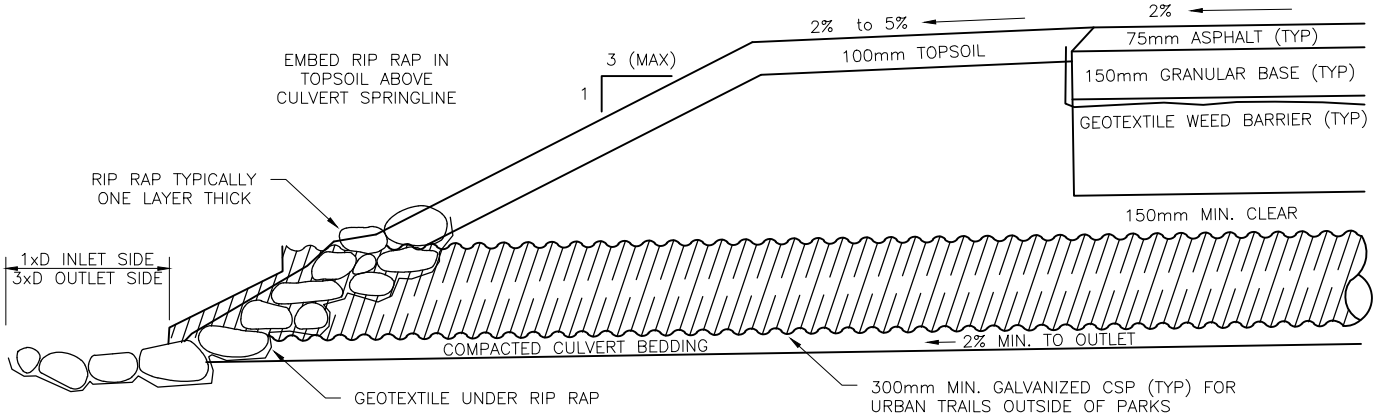
REGIONAL MUNICIPALITY OF WOOD BUFFALO

URBAN PARK CULVERT DETAIL

Time: 10:52am
Date: Mar 18, 2021
Files: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-701.dwg by
Xrefs:

STANDARD DETAIL:	10-702
DATE: MARCH 2021	REV: 0





RIP RAP TO CONFORM TO DITCH X-SECTION WHEN INTERCEPTED AT 90 DEGREES (+/-)

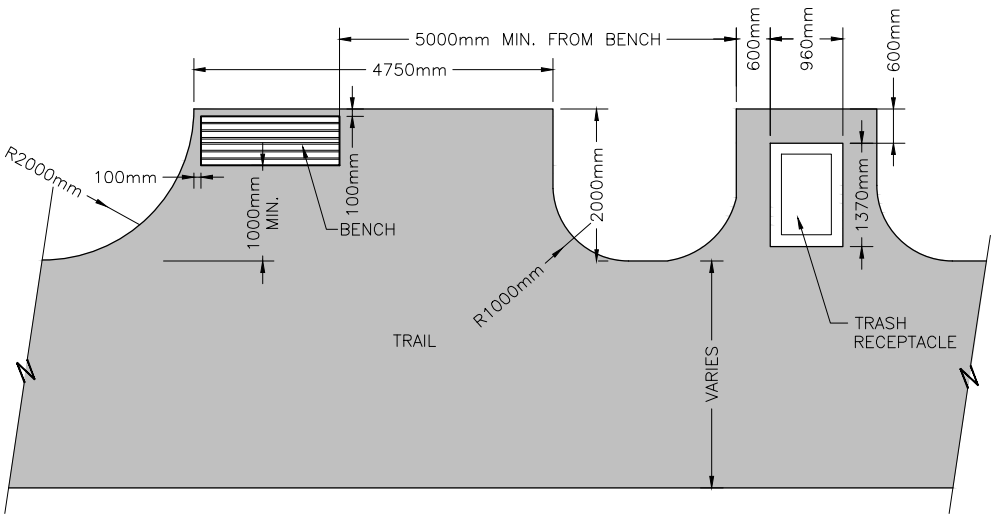
REFER TO STANDARD DRAWINGS:
- 6-501 TYPICAL RURAL ROCK RIP RAP FOR CULVERTS
- 10-701 PATHWAY CULVERT DETAILS
- 10-800 CLASS III GRAVEL TRAIL
- 10-801 ASPHALT/CONCRETE TRAIL DETAILS

REGIONAL MUNICIPALITY OF WOOD BUFFALO

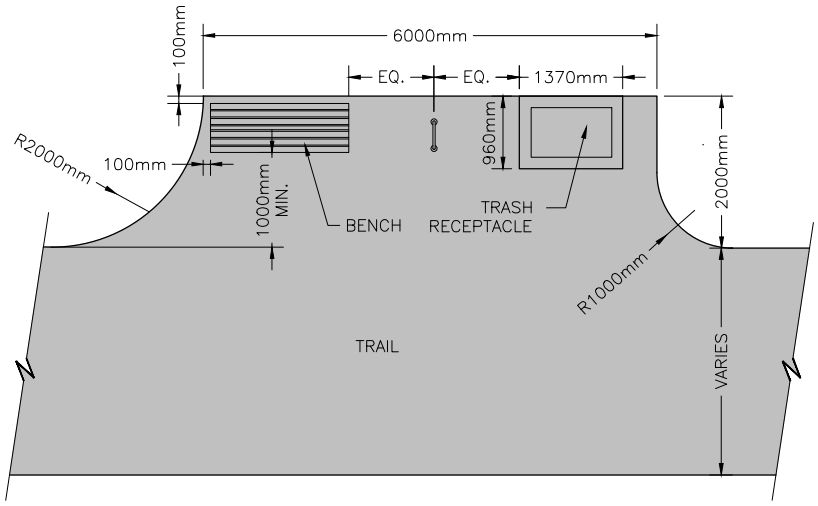
TRAIL CULVERT DETAIL

Time: 11:19am
Date: Mar 17, 2021
Files: X:\161\active\161108920\drawing\street_files\figures\section 10\10-702-new.dwg by
Xrefs:

STANDARD DETAIL:	10-703
DATE: JAN. 2021	REV: 2



BENCH NODE FOR NATURAL AREAS



BENCH NODE FOR MAINTAINED PARKS

NOTES:

(1) BENCH NODES ARE REQUIRED EVERY 500m ON CLASS 1 AND 2 TRAILS.

(2) TRASH RECEPTACLE TO BE, HID-A-BAG I, STANDARD PARKS GREEN, WITH LATCH, MOUNTED ON PRECAST CONCRETE PAD. TOP OF CONCRETE PAD TO BE FLUSH WITH FINISHED GRADE.

(3) BENCH TO BE DUMOR BENCH SERIES 119, SURFACE MOUNT S-2, BLACK OR DUMOR DOUGLAS FIR BENCH, MODEL NUMBER 88-60, OR APPROVED EQUAL.

(4) TRASH RECEPTACLES ARE ONLY TO BE PLACED AT NODES ALONG TOP OF BANK TRAILS WHERE THEY CAN BE EASILY ACCESSED AND EMPTIED.

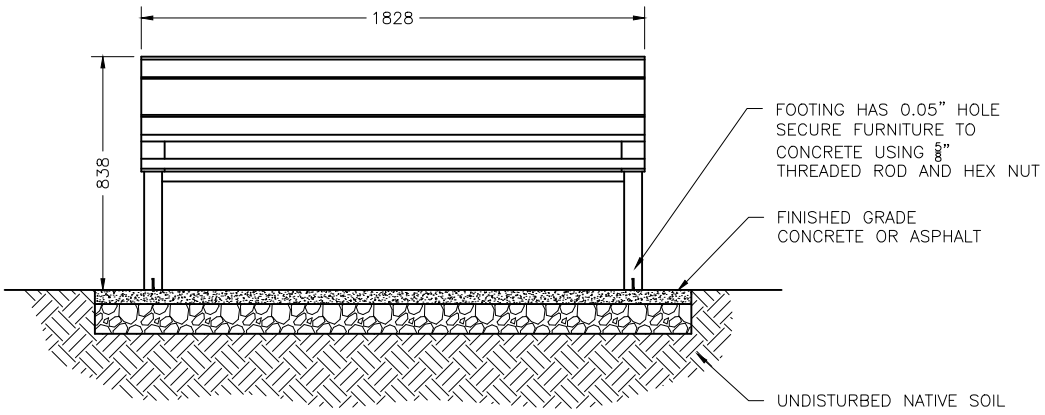
(5) BIKE RACK TO BE DU MOR LOOP MODEL 83 SERIES OR BLUE IMP BR1 26.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BENCH NODE DETAILS

Time: 11:20am
Date: Mar 18, 2021
Files: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-703.dwg by
Xrefs:

STANDARD DETAIL:	10-704
DATE: MARCH 2021	REV: 0



NOTES:

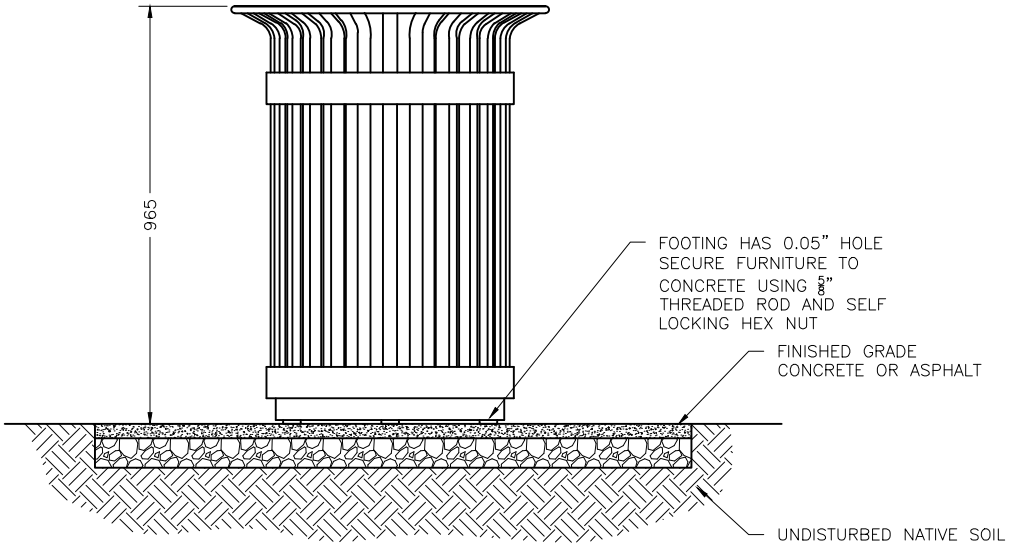
(1) IF PILES USED AS FOUNDATION, PILES TO BE RECESSED 50mm BELOW FINAL GRADE.
(2) SURROUNDING AREA TO BE FINISHED PER DESIGN OR TO MATCH EXISTING.
(3) AREA BEING FINISHED SHALL NOT EXCEED 75mm IN ELEVATION VARIATION FROM DESIGN.
(4) DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BENCH INSTALLATION

Time: 10:45am
Date: Mar 18, 2021
File: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-704.dwg by
Xrefs:

STANDARD DETAIL:	10-705
DATE: MARCH 2021	REV: 0



NOTES:

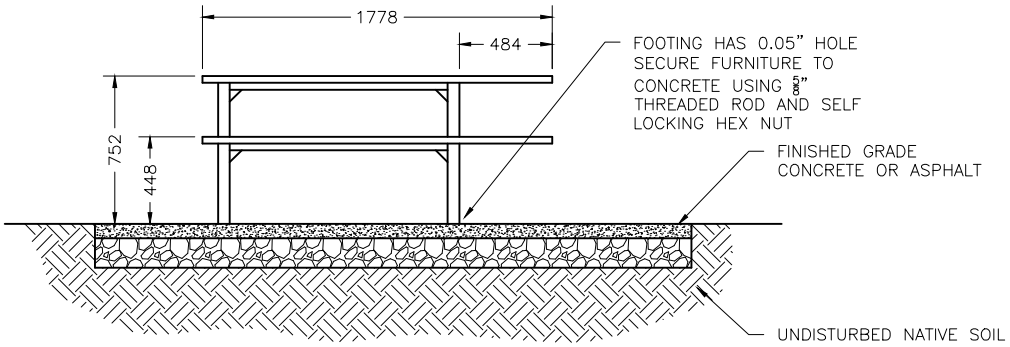
(1) IF PILES USED AS FOUNDATION, PILES TO BE RECESSED 50mm BELOW FINAL GRADE.
(2) SURROUNDING AREA TO BE FINISHED PER DESIGN OR TO MATCH EXISTING.
(3) AREA BEING FINISHED SHALL NOT EXCEED 75mm IN ELEVATION VARIATION FROM DESIGN.
(4) DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

GARBAGE RECEPTACLE INSTALLATION

Time: 11:16am
Date: Mar 18, 2021
Files: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-705.dwg by
Xrefs:

STANDARD DETAIL:	10-706
DATE: MARCH 2021	REV: 0



NOTES:

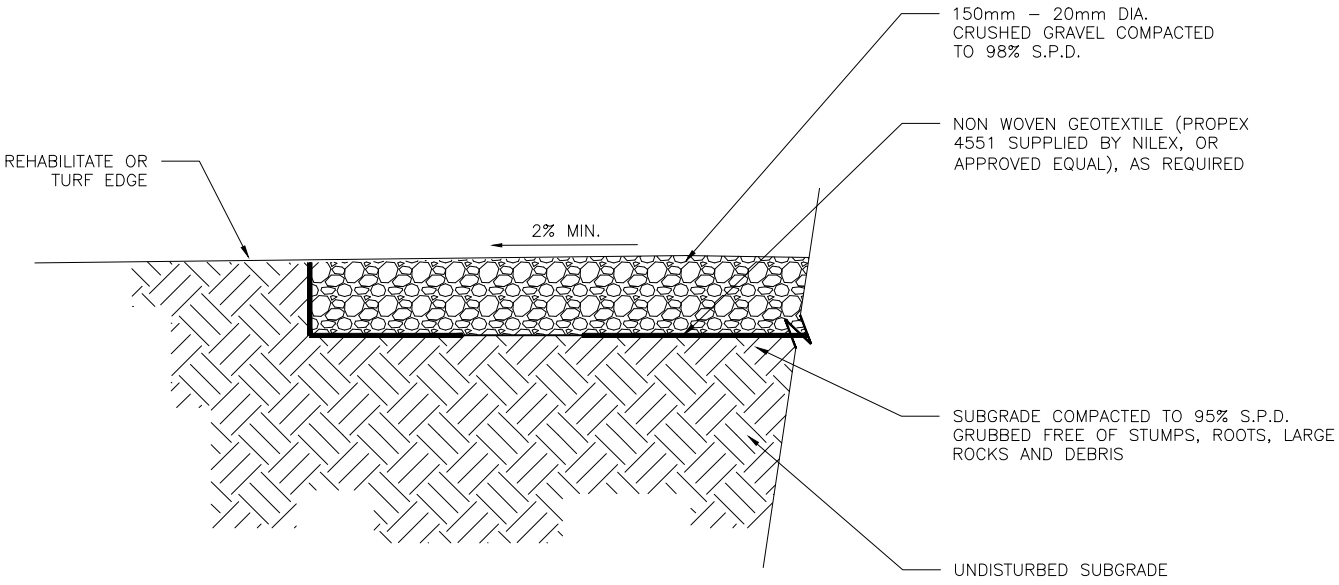
(1) IF PILES USED AS FOUNDATION, PILES TO BE RECESSED 50mm BELOW FINAL GRADE.
(2) SURROUNDING AREA TO BE FINISHED PER DESIGN OR TO MATCH EXISTING.
(3) AREA BEING FINISHED SHALL NOT EXCEED 75mm IN ELEVATION VARIATION FROM DESIGN.
(4) DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PICNIC TABLE INSTALLATION

Time: 10:47am
Date: Mar 18, 2021
Files: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-706.dwg by
Xrefs:

STANDARD DETAIL:	10-800
DATE: JAN. 2021	REV: 1



NOTES:

(1) WIDTH MAY VARY WITH LOCATION.

(2) HORIZONTAL CLEARANCE MIN. WIDTH OF 500mm FROM EDGE OF TRAIL.

(3) VERTICAL CLEARANCE MIN HEIGHT OF 2500mm ABOVE TRAIL SURFACE.

(4) CLASS II TRAIL WIDTH 2500mm MIN.

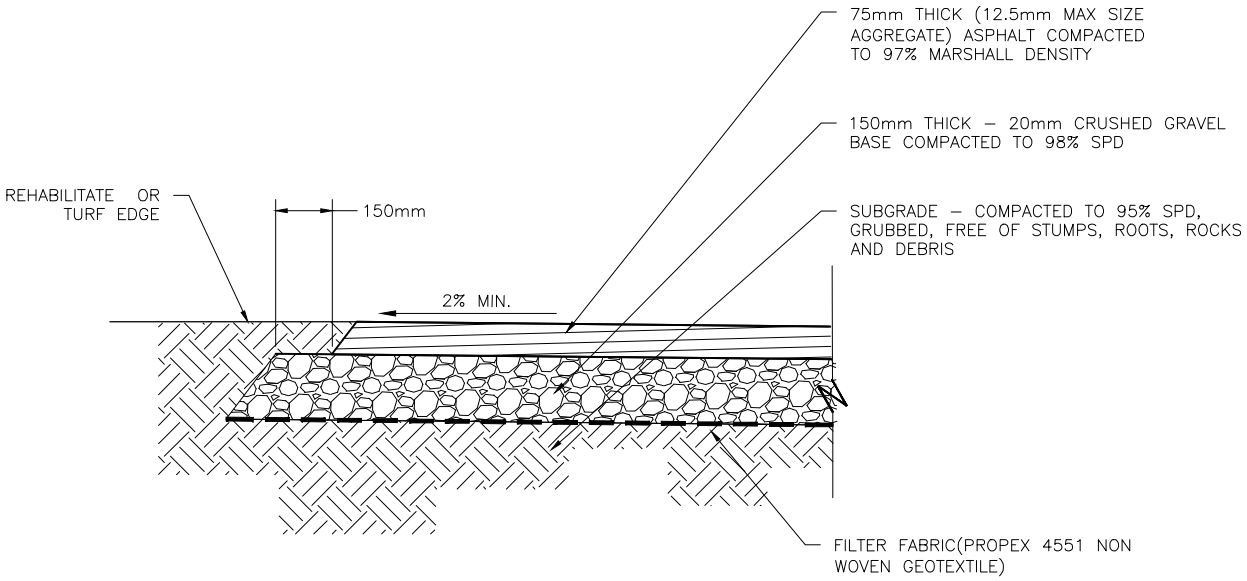
(5) PROPEX 4551 NON WOVEN GEOTEXTILE REQUIRED IF MIN. PERCENT COMPACTION (SPD) CANNOT BE ACHIEVED.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CLASS III GRAVEL TRAIL DETAIL

Time: 10:25am
Date: Feb 12, 2021
Files: W:\161\active\161108920\drawing\sheet_files\figures\section 10\10-800.dwg by
Xrefs:

STANDARD DETAIL:	10-801
DATE: JAN. 2021	REV: 3



NOTES:

(1) WIDTH MAY VARY WITH LOCATION.

(2) HORIZONTAL CLEARANCE MIN WIDTH OF 1000mm FROM EDGE OF TRAIL.

(3) VERTICAL CLEARANCE MIN HEIGHT 2500m ABOVE TRAIL SURFACE.

(4) CLASS I TRAIL WIDTH 3000mm MIN.

(5) CLASS II TRAIL WIDTH 2500mm MIN.

(6) PROPEX 4551 NON WOVEN GEOTEXTILE REQUIRED IF MINIMUM COMPACTION CANNOT BE REACHED.

(7) CONSTRUCTION JOINTS FOR CONCRETE TRAIL SURFACE ARE TO BE LIMITED TO 3.0m SPACING.

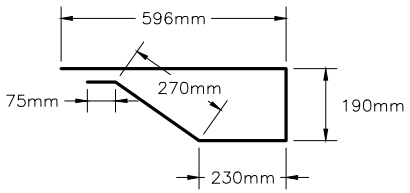
(8) ADJACENT GRADES ARE TO SLOPE AWAY FROM THE TRAIL.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

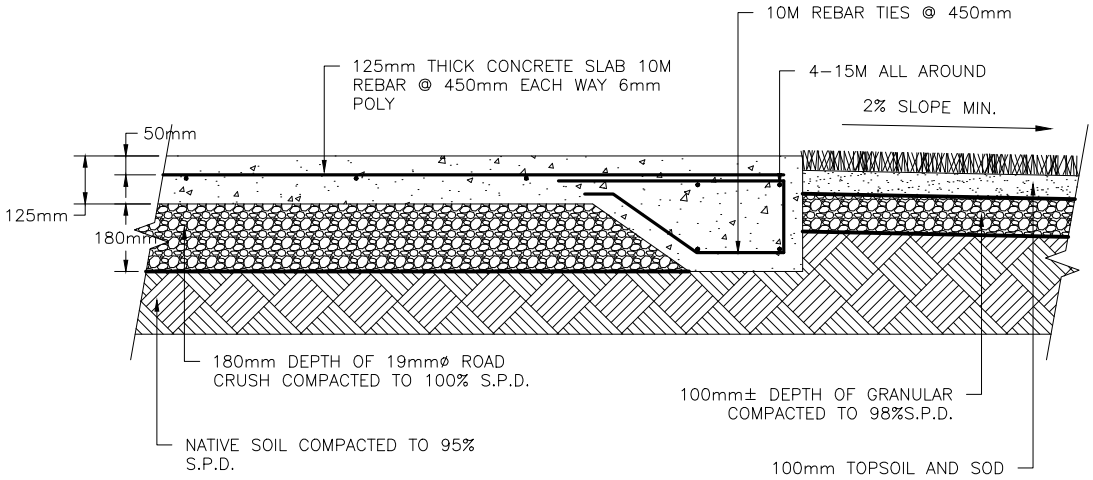
ASPHALT TRAIL DETAIL

Time: 8:18am
Date: Mar 19, 2021
File: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-801.dwg by
Xrefs:

STANDARD DETAIL:	10-802
DATE: JAN. 2021	REV: 2



TIE DETAIL



SECTION AT EDGE OF SLAB

NOTES:

(1) CONCRETE SHALL BE TYPE HS, 32MPa @ 28 DAY STRENGTH.

(2) AIR ENTRAINMENT 5 TO 8%.

(3) NO FLY ASH ADDED.

(4) POUR @ MAXIMUM 100mm SLUMP.

(5) POWER FLOAT SURFACE TO A MEDIUM SMOOTH FINISH.

(6) IF DAYTIME TEMPERATURE EXCEEDS 15°C SPRAY WITH CURING COMPOUND.

(7) DO NOT ALLOW NEWLY POURED CONCRETE TO FREEZE FOR AT LEAST 8 DAYS.

(8) BASE GRANULAR TO BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.

(9) SAW CUT TO BE 25mm DEEP WITH A SPACING OF 4.5m TO 6m SPACING EACH WAY (EVEN SPACING DESIRED). FILL SAW CUTS WITH SIKA-FLEX 2CSL.

(10) CROWN CENTRE OF RINK SLAB WITH SLOPE BOTH SIDES AT 0.5%.

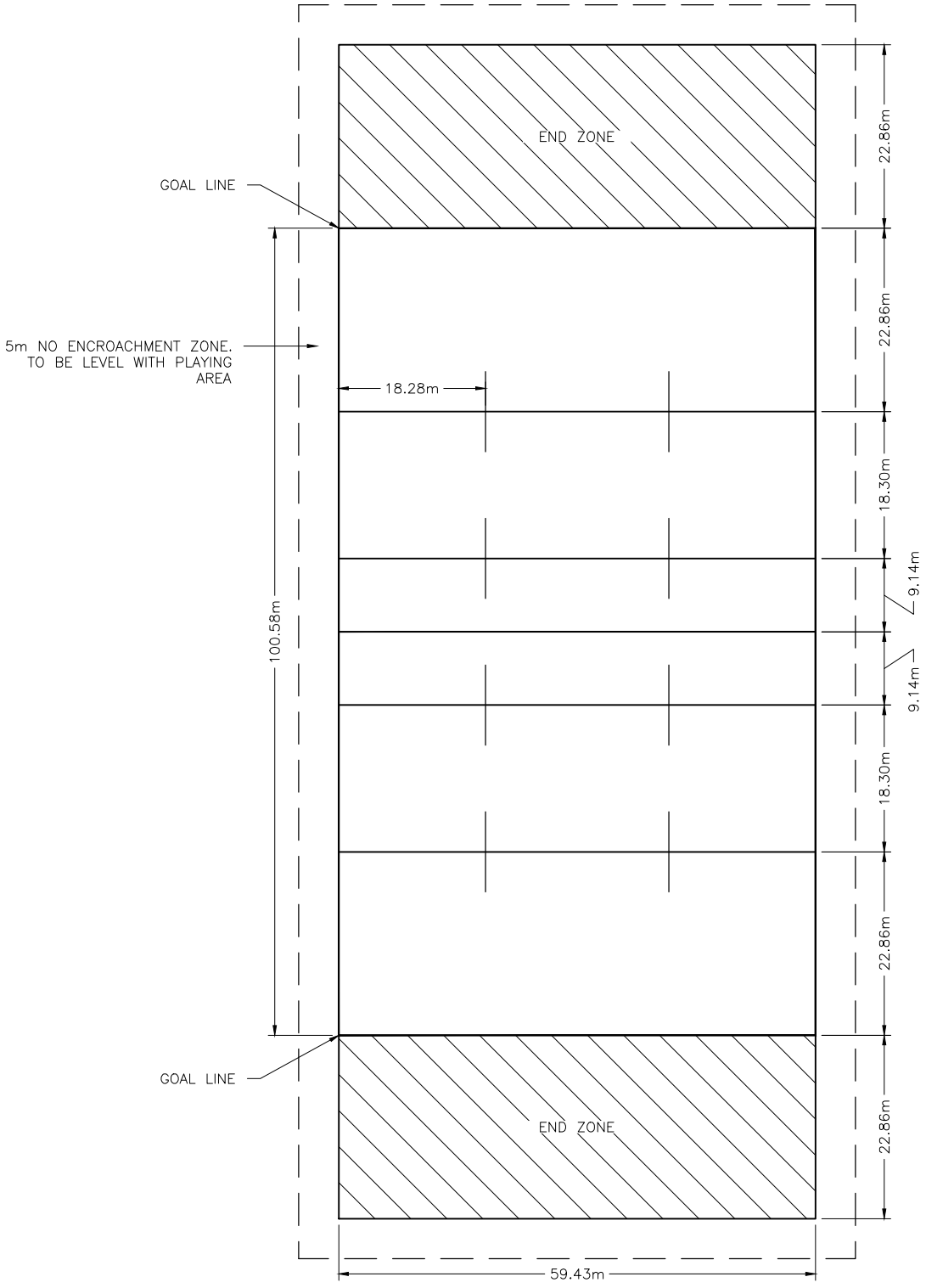
(11) CROWN CENTRE OF MULTI-PURPOSE PAD WITH SLOPE TO ALL 4 SIDES AT 0.5%.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

CONCRETE FOR MULTI-PURPOSE PAD

Time: 9:53am
Date: Feb 12, 2021
File: x:\161\active\161108920\drawing\sheet_files\figures\section 10\10-802.dwg by
Xrefs:

STANDARD DETAIL:	10-900
DATE: JAN. 2021	REV: 2



NOTES:

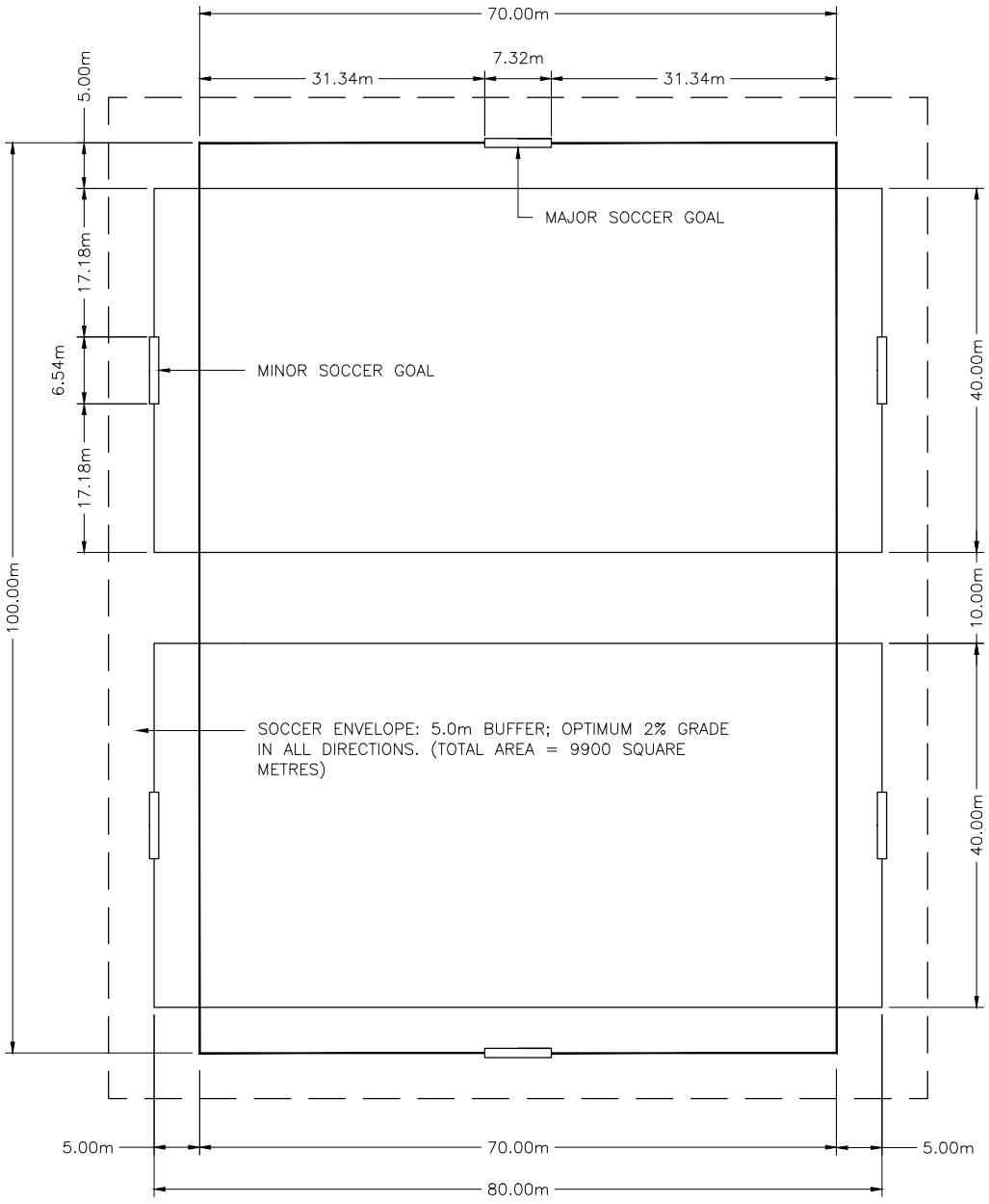
(1) 1.5% GRADE IN ALL DIRECTIONS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

FOOTBALL FIELD LAYOUT

Time: 12:38pm
Date: Feb 12, 2021
Files: W:\161\active\161108920\drawing\sheet_files\figures\section 10\10-900.dwg by
Xrefs:

STANDARD DETAIL:	10-901
DATE: JAN. 2021	REV: 2



NOTES:

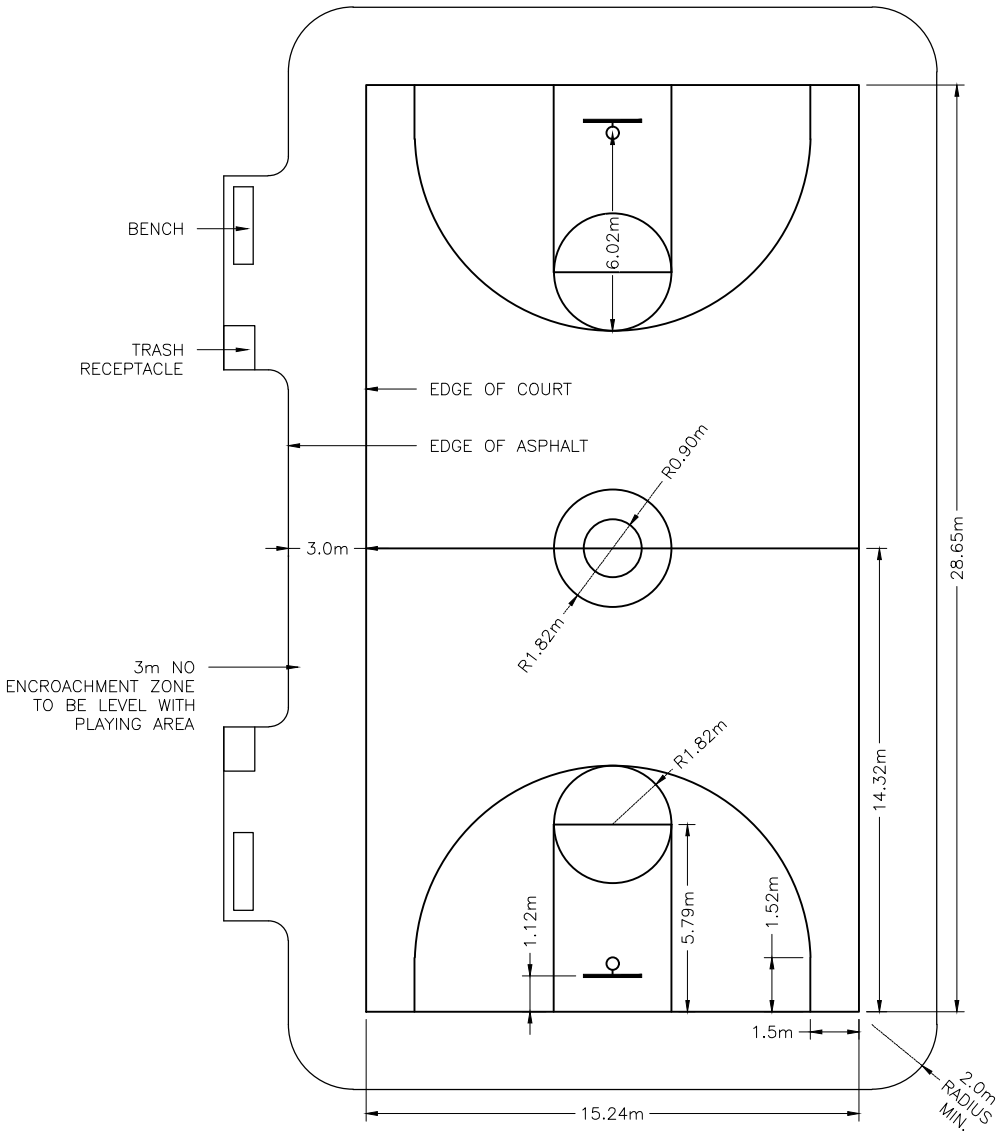
(1) 1.5% GRADE IN ALL DIRECTIONS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

COMBINATION MAJOR / MINOR SOCCER FIELDS

Time: 10:29am
Date: Feb 12, 2021
Files: W:\161\active\161108920\drawing\sheet_files\figures\section 10\10-901.dwg by
Xrefs:

STANDARD DETAIL:	10-902
DATE: JAN. 2021	REV: 2



NOTES:

(1) REFER TO STANDARD DWG. NO. 10-801 FOR ASPHALT CROSS SECTION.

(2) REFER TO STANDARD DWG. NO. 10-702 FOR BENCH NODE DETAILS.

(3) HOOP SPECIFICATIONS AND INSTALLATION AS PER BLUE IMP ULTIMATE BASKETBALL HOOP OR APPROVED EQUAL.

(4) ALL COURT LINES TO BE 75mm WIDE AND WHITE.

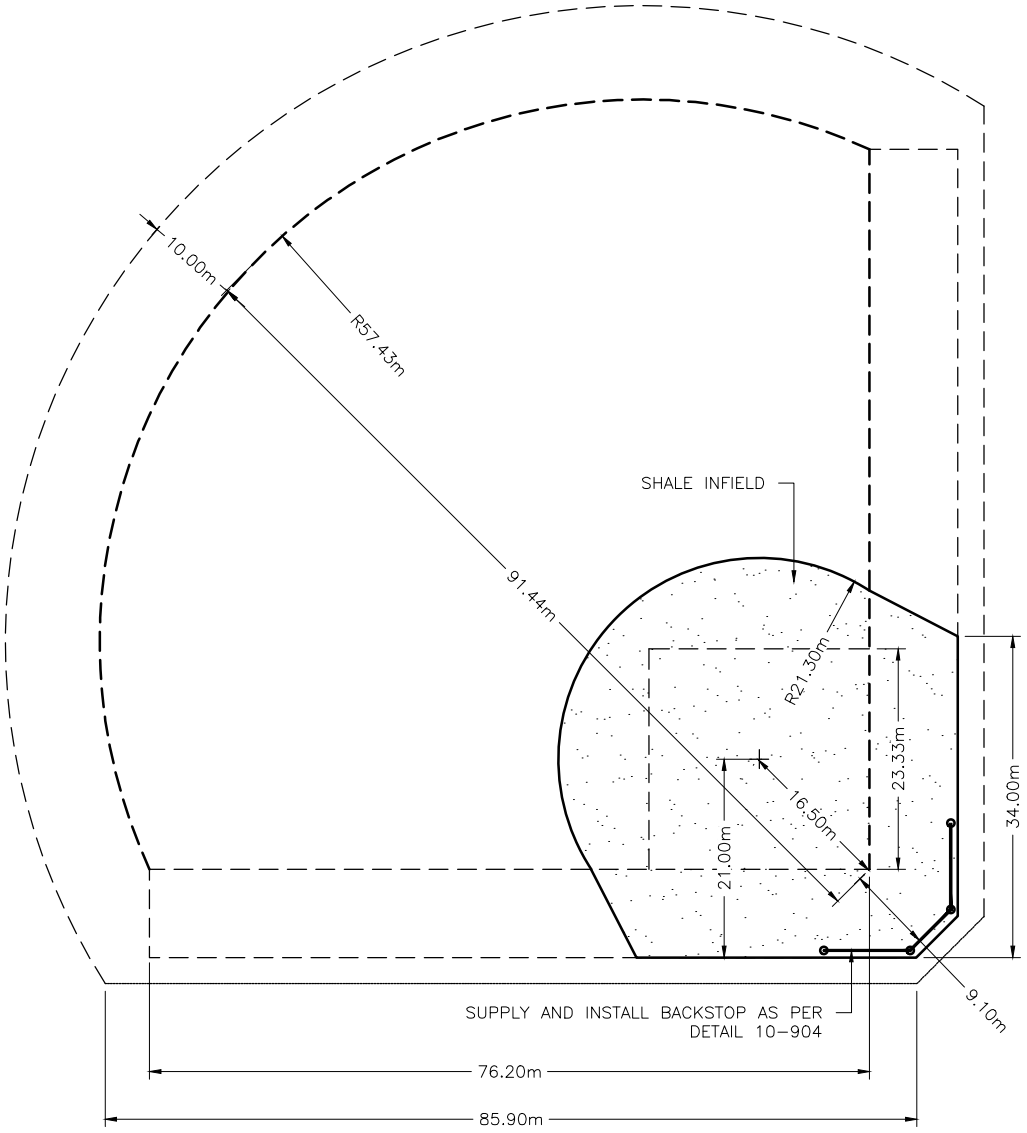
(5) MEASURE TO INSIDE EDGE OF COURT BOUNDARY LINES.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BASKETBALL COURT LAYOUT

Time: 10:30am
Date: Feb 12, 2021
Files: W:\161\active\161108920\drawing\sheet_files\figures\section 10\10-902.dwg by
Xrefs:

STANDARD DETAIL:	10-903
DATE: JAN. 2021	REV: 2



NOTES:

(1) SOFTBALL ENVELOPE:

3.0m BUFFER, UNLESS OTHERWISE NOTED.

OPTIMUM 2% GRADE IN ALL DIRECTIONS.

TOTAL AREA INCLUDING BUFFER EQUALS 9,475 SQUARE METRES.

(2) SHALE INFIELD:

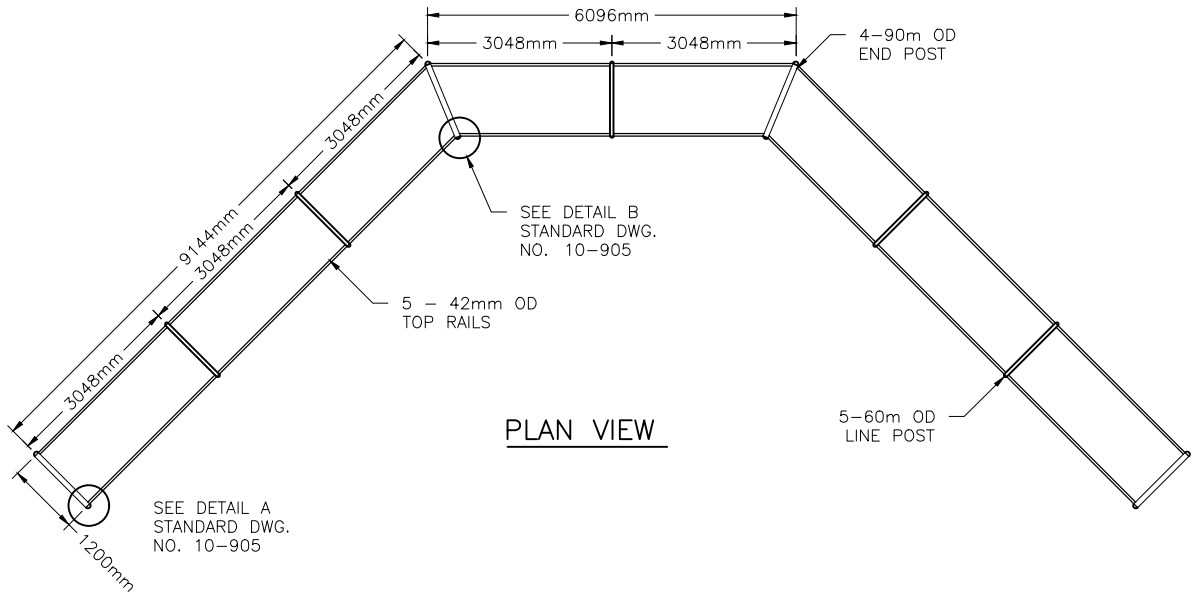
150mm MIN. DEPTH OF 6mm RED SHALE WITH FILTER FABRIC AND FREE FROM ANY FOREIGN MATERIALS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

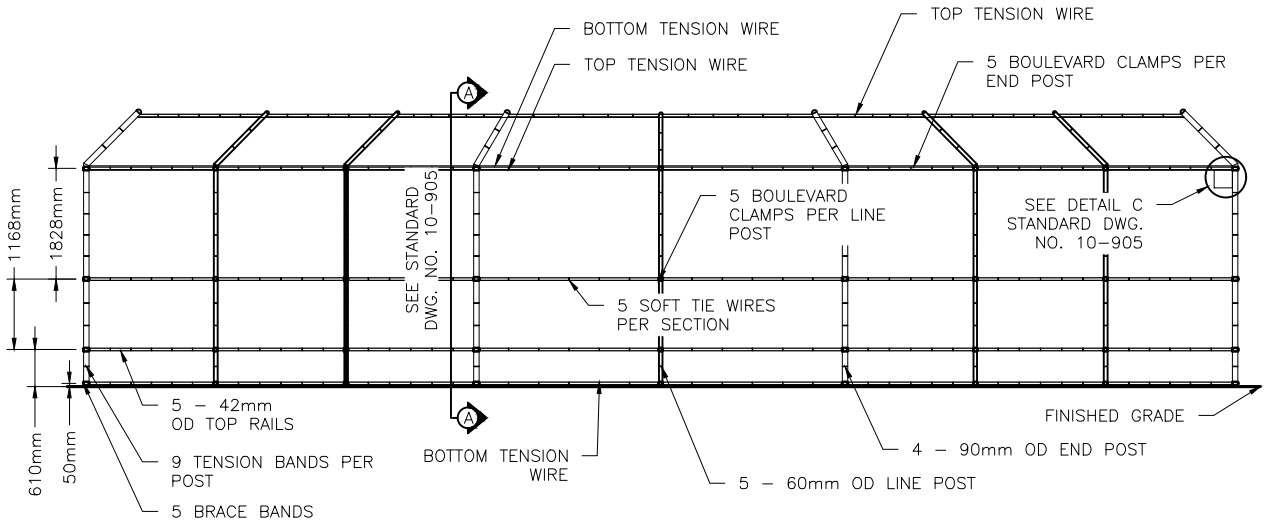
BALL DIAMOND DETAIL

Time: 10:38am
Date: Feb 12, 2021
File: W:\161\active\161108920\drawing\sheet_files\figures\section 10\10-903.dwg by
Xrefs:

STANDARD DETAIL:	10-904
DATE: JAN. 2021	REV: 2



PLAN VIEW



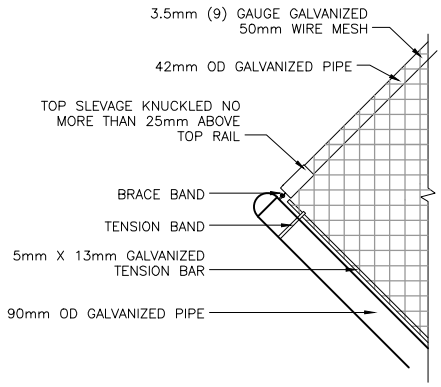
ELEVATION

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BACKSTOP LAYOUT DRAWING

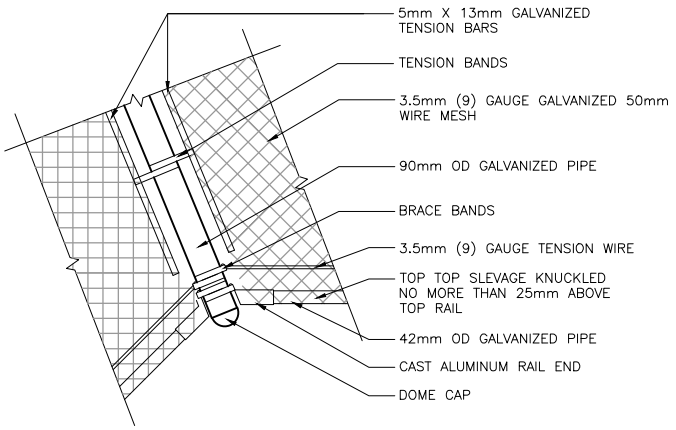
Time: 9:48am
Date: Feb 12, 2021
File: x:\161\active\161108920\drawing\sheet_files\figures\section 10\10-904.dwg by
Xrefs:

STANDARD DETAIL:	10-905
DATE: OCT 2016	REV: 1

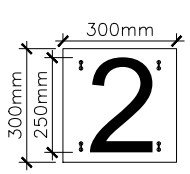


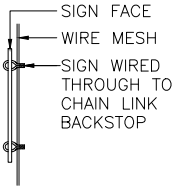
DETAIL A

TEMSION

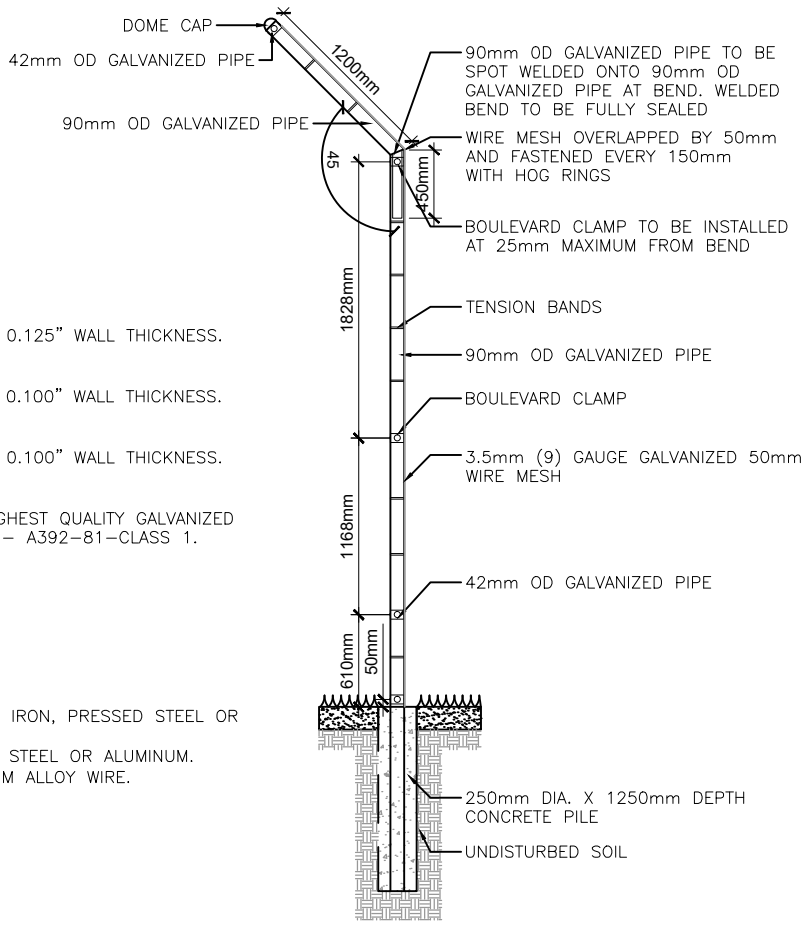


DETAIL B





DETAIL C



SECTION A–A

NOTES:

(1) TERMINAL POSTS:
88.99mm OD GALVANIZED PIPE, COMMERCIAL GRADE 0.125" WALL THICKNESS.

(2) LINE POSTS:
60.30mm OD GALVANIZED PIPE, COMMERCIAL GRADE 0.100" WALL THICKNESS.

(3) TOP RAILS:
42.20mm OD GALVANIZED PIPE, COMMERCIAL GRADE 0.100" WALL THICKNESS.

(4) FABRIC:
CHAIN LINK 50mmx3.5mm (9) GAUGE FROM THE HIGHEST QUALITY GALVANIZED WIRE OR VINYL COATED IN ACCORDANCE WITH ASTM – A392–81–CLASS 1.

(5) TENSION WIRE:
3.5mm (9) GAUGE GALVANIZED STEEL.

(6) BRACES:
42.2mm OD HOT DIPPED GALVANIZED STEEL PIPE.

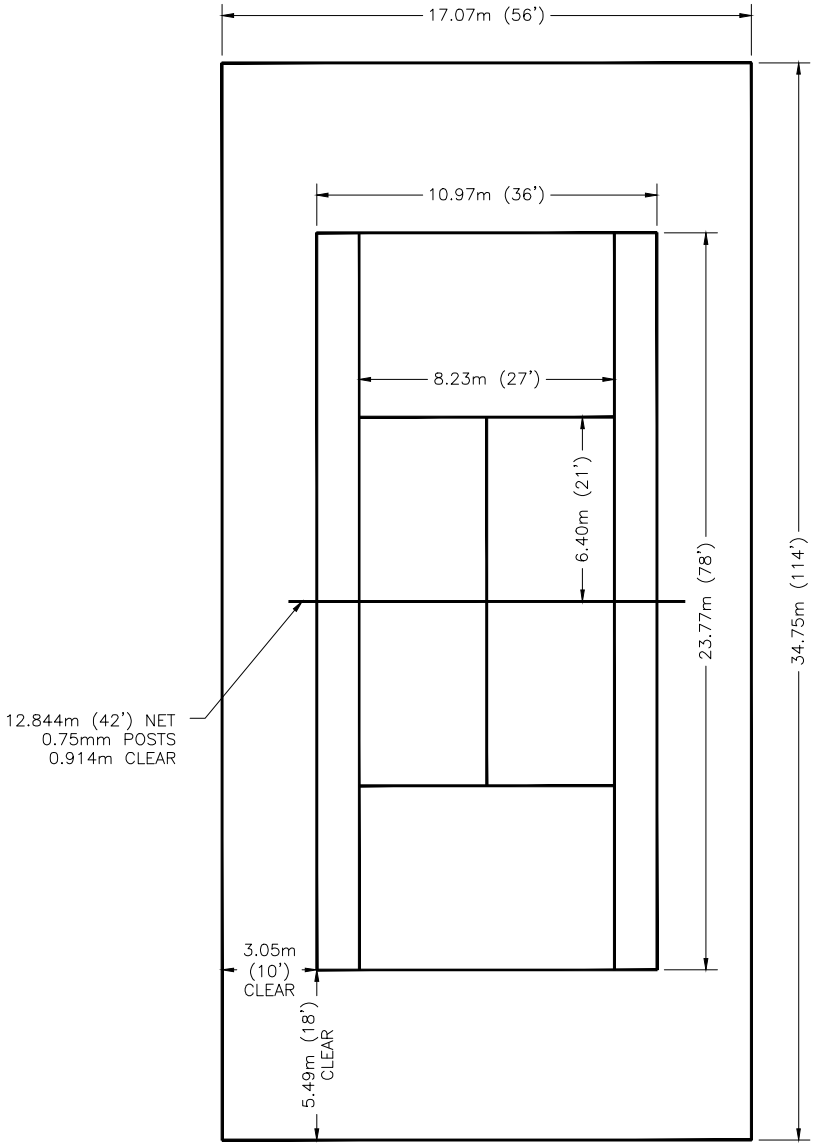
(7) FITTINGS:
ALL FITTINGS ARE MADE OF FIRST GRADE MALLEABLE IRON, PRESSED STEEL OR ALUMINUM, UNLESS OTHERWISE NOTED.
TIE WIRES SHALL BE 3.5mm (9) GAUGE GALVANIZED STEEL OR ALUMINUM.
FABRIC CLIPS SHALL BE 3.5mm (9) GAUGE ALUMINUM ALLOY WIRE.

(8) ALL DIMENSIONS ARE IN MILLIMETERS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BACKSTOP ASSEMBLY

STANDARD DETAIL:	10-906
DATE: MARCH 2021	REV: 0



NOTES:

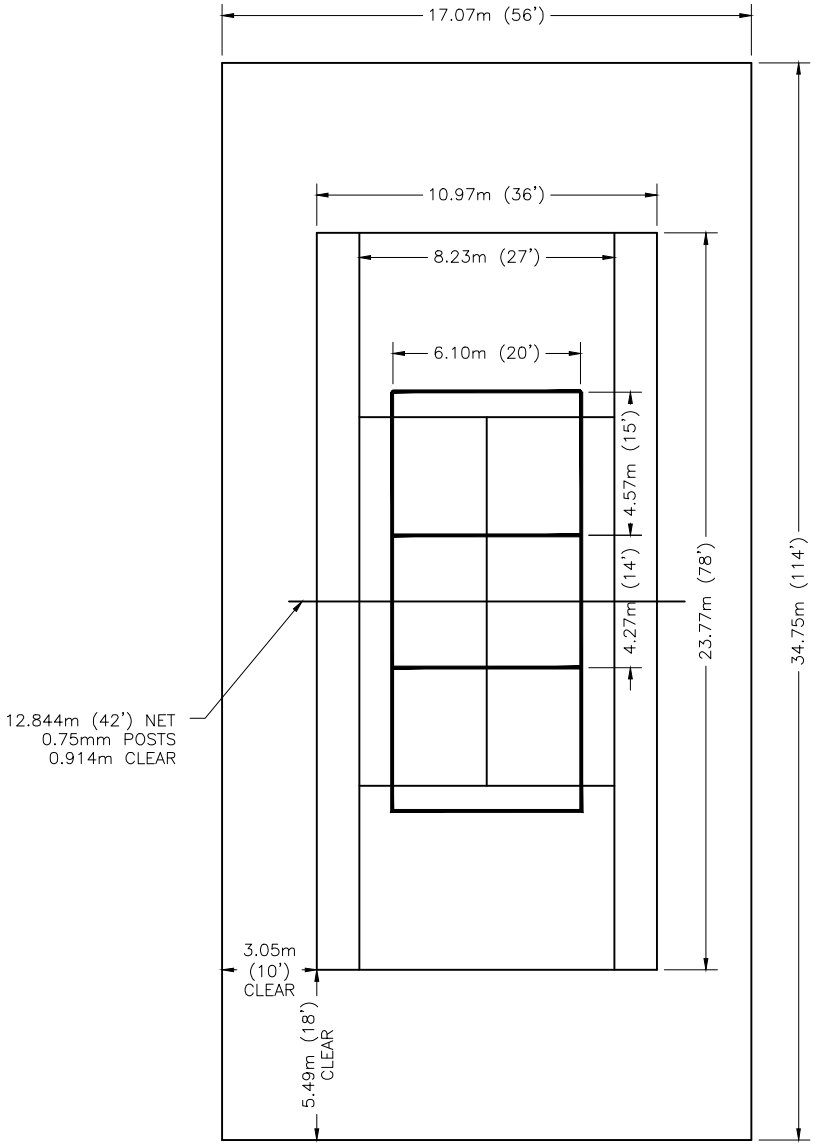
(1) ALL DIMENSIONS ARE TYPICAL AND ARE TO CENTERLINE OF LINE MARKING.
(2) ALL LINES TO BE WHITE 50mm WIDE.
(3) NET TO BE 1.067m HIGH AT POSTS & 0.914m HIGH AT CENTER.
(4) DIMENSIONS TO CANADIAN STANDARDS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

TENNIS COURT LAYOUT

Time: 2:02pm
Date: Mar 17, 2021
File: v:\161\active\116108920\drawing\sheet_files\figures\section 10\10-906.dwg by
Xrefs:

STANDARD DETAIL:	10-907
DATE: MARCH 2021	REV: 0



NOTES:

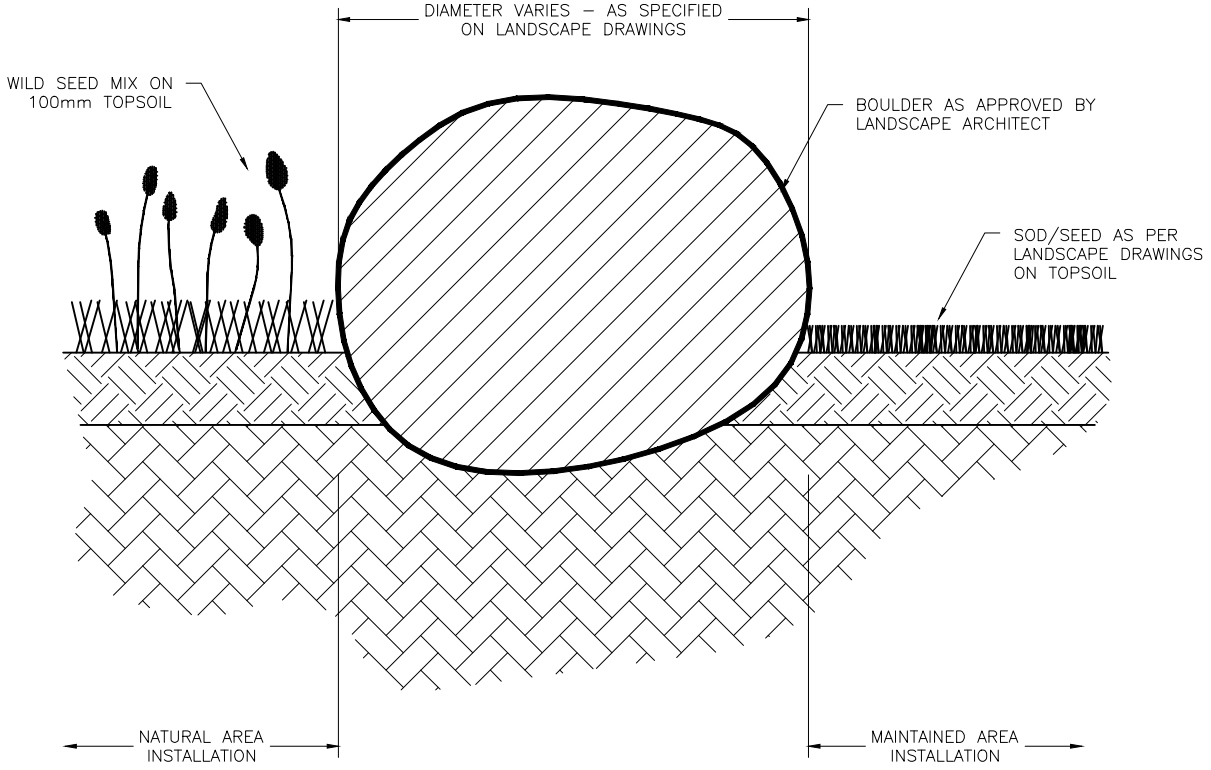
(1) ALL DIMENSIONS ARE TYPICAL AND ARE TO CENTERLINE OF LINE MARKING.
(2) ALL LINES TO BE WHITE 50mm WIDE.
(3) NET TO BE 1.067m HIGH AT POSTS & 0.914m HIGH AT CENTER.
(4) DIMENSIONS TO CANADIAN STANDARDS.

REGIONAL MUNICIPALITY OF WOOD BUFFALO

PICKLEBALL COURT LAYOUT

Time: 2:14pm
Date: Mar 17, 2021
File: x:\161\active\161108920\drawing\sheet_files\figures\section 10\10-907.dwg by
XrefS:

STANDARD DETAIL:	10-908
DATE: MARCH 2021	REV: 0



NOTES:

(1) BOULDERS TO BE PLACED PRIOR TO TOPSOIL
(2) PLACE BOULDER BY SLING, POSITIONED SO THAT WATER IS NOT TRAPPED ON UP SLOPE SIDE
(3) PLACE BOULDER AS INDICATED ON LANDSCAPE PLAN OR AS DIRECTED BY PARKS
(4) ENSURE BOULDERS ARE COMPLETELY SETTLED AND STABLE PRIOR TO BACKFILL BURY TO MINIMUM $\frac{1}{3}$ TOTAL HEIGHT
(5) BOULDER TO HAVE SMOOTH WORN SURFACE. PROVIDE SAMPLE BOULDER OR ACCESS TO SOURCE FOR PARKS REVIEW PRIOR TO DELIVERY TO SITE

REGIONAL MUNICIPALITY OF WOOD BUFFALO

BOULDER INSTALLATION

Time: 8:50am
Date: Mar 19, 2021
File: X:\161\active\161108920\drawing\sheet_files\figures\section 10\10-908.dwg by
Xref:

11 Testing Procedures

11.1 GENERAL

1. It shall be the responsibility of the Consulting Engineer to ensure that the Contractor properly tests all aspects of each project.
2. The Developer shall submit all test data performed by the accredited testing company to the Municipality on an on-going basis and prior to issuing the Construction Completion Certificate.
3. Failure to receive test results will be considered sufficient cause for not accepting such work.
4. Additional testing may be required at the direction and discretion of the Municipality. Where materials and workmanship pass these additional tests, the Municipality will bear the costs for testing. Where materials and workmanship fail these additional tests, the Developer shall bear the cost of testing, remediation, investigation, and all subsequent tests until compliance is achieved.

11.2 MATERIAL TESTING - ROADWAYS

1. Subgrades, construction materials and construction Standards shall be verified with a representative number of standard tests.
2. The Developer shall forward copies of such test results on an ongoing basis to the Municipality and prior to issuing the Construction Completion Certificate.
3. The Developer shall engage a qualified material testing consultant to take representative samples of all materials to be incorporated in the pavement structure, prepare mix designs for approval by the Municipality and to carry out quality control testing during construction.
4. Refer to the Regional Municipality of Wood Buffalo Standard Construction Specifications for further information.

11.3 TESTING – STORM AND SANITARY SEWERS

Testing of installed pipes shall depend on the elevation of existing ground water and shall consist of at least a video inspection test on all gravity sanitary and storm mains, with additional testing at the direction and discretion of the Municipality:

11.3.1 Video Inspection Test

1. Where required, CCTV inspection of the sanitary and storm sewer improvements shall be completed prior to application for a Construction Completion Certificate and a Final Acceptance Certificate. A CCTV shall be in digital mpeg2 format at a minimum resolution 640x480 and a data rate of 6000 kbps (or the latest version). If CCTV inspection reveals any deficiencies, then these deficiencies shall be remedied to the satisfaction of the Municipality.

2. A digital video shall be provided accompanied by an inspection report. The report shall be a record of the exact location of each leak or fault discovered by the CCTV (e.g., open joints, broken, cracked, deformed or collapsed pipe, presence of grease, roots, debris, accumulation, obstruction, infiltration, water depth variations and other points of significance).
3. The report shall also include the location of all service connections together with a still image of each service connection.

11.3.2 Leakage Testing

Where required, Leakage Testing shall be conducted by means of either Infiltration Test, or Exfiltration Test. Leakage testing shall be conducted at CCC. No leakage testing is required at FAC.

All leakage testing shall be conducted after the service connections to the main have been installed. Service connections include in-line tees, wyes and saddles.

11.3.2.1 Infiltration Test

1. Shall be performed when existing ground water level is 1m or more above top of pipe, measured at the highest point in the line.
2. Quantity of infiltration shall be measured by means of a V-notch weir or meter placed at the low end.
3. Discontinue pumping operations for at least 3 days before test measurements are to commence.
4. Measure rate of flow over minimum 1 hour, with recorded flows for each 5-minute interval.

11.3.2.2 Exfiltration Test

1. Shall be performed when existing ground water level is less than 1m above top of pipe. 1m over the interior crown of the pipe measured at the highest point of the test section, or water in the manhole is 1m above the static groundwater level, whichever is greater.
2. Pipe shall be filled with water such that there is a head of pressure. Pressures in excess of 7.6m water head at the lowest point are not recommended.
3. Duration of test is two (2) hours.

11.3.3 Allowable Leakage for Gravity Sewers

1. Infiltration and exfiltration: not to exceed the following limits in L per hour per 100m of pipe, including service connections.

Nominal Pipe Diameter in mm	Plastic Pipe[1]	Concrete pipe[2]
100	1.91	9.32
125	2.39	11.65
150	2.88	13.98
200	3.83	18.64
250	4.79	23.3
300	5.75	27.96
350	6.71	32.62
400	7.67	37.28
450	8.63	41.94
500	9.58	46.6
550	10.54	51.26
600	11.5	55.93
700	13.42	65.24
800	15.33	74.57
900	17.25	83.89
1000	19.17	93.21
1100	21.12	102.53
1200	23.04	111.85

Notes: **(1)** Uni-Bell Handbook – 4.6 1/mm of diameter/km/day
(2) Concrete Pipe Handbook – 22.37 1/mm of diameter/km/day

2. Values shown in columns 2 and 3 are in litres per hour per 100 metres of pipe.
3. Repair and retest sewer lines as required, until test results are within limits specified.
4. Repair visible leaks regardless of test results.

11.3.4 Deflection Testing

1. At the direction and discretion of the Municipality, all plastic sewers 200mm diameter and larger to be mandrel tested.
2. Mandrel to be a cylindrical shape, minimum length of cylinder 1.5 times the pipe diameter, and a minimum outside diameter of the cylinder to be not less than 95% of the inside diameter of the sewer.
3. Mandrel to be pulled by hand through all sections of sewer.
4. Mandrel materials to be steel.
5. Deflection testing to be conducted within 30 days of pipe installation.
6. If the mandrel is unable to pass through the pipe, the Contractor is to measure the exact inside diameter of the pipe with a deflectometer. If the pipe deflections are found to exceed 7.5%, the pipe is to be replaced.

11.3.5 Testing of Force Mains

Force mains shall be tested as described for watermains.

11.4 TESTING WATERMAINS

11.4.1 Pressure and Leakage Test

1. Test completed mains after services are installed and backfill is complete at least five (5) days after placing concrete for thrust blocks and in accordance with AWWA Standards.
2. Test in sections containing no more than 500m.
3. Fill the system with water and expel air at services and hydrants. Install temporary taps wherever necessary to expel air and plug after completion.
4. Apply test pressure by means of a test pump with a measurable volume container.
5. Maintain test pressure for a period of two (2) hours. Test pressure shall be the greater of 1,035kPa (150 psi) or 1.5 times the normal operating pressure.
6. Table 11.1 outlines a leakage allowance chart which forms the basis for the testing of all watermains.
7. For testing of PVC sanitary force mains (Section 11.3.6), the test pressure shall be the greater of 690kPa or two (2) times the operating pressure.

Leakage Allowance Time Leakage Allowance in Litres Per 100 Joints Per Hour		
Pipe Size	Test Pressure (kPa)	
	690	1035
150 mm	3.10	3.76
200 mm	4.09	5.02
250 mm	5.14	6.27
300 mm	6.14	7.52
350 mm	7.20	8.78
400 mm	8.18	10.00
450 mm	9.24	11.28
500 mm	10.22	12.56
600 mm	12.28	15.05

Above leakage allowances calculated from the following formula from AWWA Manual No. M23 (PVC Pipe – Design and Installation):

L =	allowable leakage, L/hr
N =	total number of joints
D =	pipe diameter in mm
P =	square root of the test pressure in kPa

- Leakage allowance for new construction of materials other than PVC shall be in accordance with the applicable AWWA standard or as specified by the Engineering Department.

11.4.2 Flushing

1. Upon completion of pressure and leakage testing, watermains shall be thoroughly flushed to remove all foreign matter.
2. Water systems which will not provide watermain flushing velocities of at least 1.0 m/s shall be flushed using foam pigs prior to disinfecting.

11.4.3 Disinfection

1. Disinfection shall be carried out in accordance with Standards outlined in AWWA C651, latest revision thereof. Chlorination levels after chlorinating shall be a minimum of 10mg/L after 24 hours of exposure in watermain.
2. Bacteriological testing shall be carried out and the results shall be acceptable to the local Health Authority and the Municipality.
3. Following disinfection, all watermains shall be thoroughly flushed. Extreme care shall be exercised to ensure that no contamination of any adjacent works and existing water systems occurs. In addition, discharge of water during flushing operations shall be undertaken in such a manner as to minimize erosion of or damage to adjacent property.
4. All testing results shall be documented and submitted to the Municipality for approval prior to commissioning of the system and the issuance of a construction completion certificate.

11.5 TESTING – RESERVOIRS

11.5.1 Water Tightness

1. Prior to testing, all visible cracks shall be sealed in an approved manner.
2. All water tightness tests shall be conducted before the placing of backfill material. Tests shall be conducted as follows:
    a. Fill reservoir to overflow level.
    b. Allow to stand for 72 hours.
    c. Refill to overflow level.
    d. Measure water elevation.
    e. At the end of a further 72-hour period, again measure water elevation.
    f. Inspect exterior for visible dampness or leakage as measured by drop in water level.
3. Total leakage as measured by the drop in water level during the second 72-hour test period shall not exceed one-tenth of one percent of the reservoir volume. In addition, there shall be no visible exterior dampness or leakage.
4. If any test shows leakage, the structure shall be emptied, defects repaired, and the test repeated until a satisfactory test has been achieved.
5. The water used for testing shall be clean and to an approved standard and supplied at the Developer’s cost.

11.5.2 Disinfection

1. Prior to disinfection, the structure shall be thoroughly cleaned and all dirt and loose material removed.
2. The structure should be disinfected, only after a water tightness test has been performed and accepted, using either of the two methods listed below:
    a. Spray and swab all interior surfaces, including the roof, with concentrated chlorine water solution. The minimum strength solution shall be 200mg/L of chlorine in water.
    b. Disinfect structure by filling with water containing a minimum of 10mg/L of chlorine. Fill structure such that water is in contact with underside of roof structure. Residual chlorine concentration after 24 hours to be 10 mg/L. Retain water in structure for 72 hours. Dechlorinate prior to discharging.
3. Disinfect again those areas within the structure which have been repaired or otherwise contaminated subsequent to initial disinfection.
4. 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.

11.6 COMMISSIONING, TESTING AND WARRANTY - FACILITIES

After completion of construction, the Developer shall commission the station and demonstrate to the satisfaction of the Municipality that all components and systems are capable of operating as intended. Commissioning shall be done under the supervision of a fully qualified representative of the manufacturer of each piece of equipment. Operating and representative(s) from the Municipality shall be trained by the Manufacturer’s representative in all aspects of the facility’s operation and maintenance. Refer to Section 9 for additional requirements.

The Developer shall warranty the works to be free of any defects in workmanship or materials for a period of two (2) years from the date of acceptance.

12 Erosion and Sediment Control Measures

12.1 EROSION AND SEDIMENT CONTROL OBJECTIVES

Soil erosion is the removal and loss of soil by the actions of wind, rainfall, and runoff. In construction activities, soil erosion is caused by the force of falling and flowing water, resulting in the detachment and transport of soil particles. Erosion is a temporary phenomenon that has the potential to carry significant amounts of sediment into storm sewers and watercourses during and immediately after rainstorm events.

Sedimentation is 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 storm water ponds.

The main objective of erosion and sediment control is to prevent sediment pollution in the various watercourses. Secondarily, it is to prevent nuisance airborne dust or tracked-on dirt to roadways and surrounding neighbourhoods. Most of these concerns related to urban development are because of construction activities. An Erosion and Sediment Control (ESC) Plan is to be accepted by the Municipality prior to the start of any site clearing and grading.

Erosion and sediment control techniques are part of Best Management Practices (BMP's). BMP's operate by trapping storm water runoff and detaining it until unwanted pollutants such as sediment, phosphorous and other harmful contaminants can settle out or be filtered through underlying soils. The trapped pollutants are then removed through regularly scheduled maintenance.

Therefore, any preventative measures that will reduce erosion and sedimentation are beneficial.

12.2 REFERENCE MATERIAL

The following reference materials (current editions) have been used in preparing this Section of the Design Guidelines and should be referred to for further detail:

- Alberta Transportation – Design Guidelines for Erosion and Sediment Control for Highways
- Alberta Transportation – Field Guide for Erosion and Sediment Control for Highways
- Alberta Transportation - Fish Habitat Manual
- Albert Transportation – Navigable Waters Protections Act Manual
- The City of Calgary – Guidelines for Erosion and Sediment Control
- The City of Calgary – Field Manual for Effective Erosion and Sediment Control
- The City of Edmonton – Erosion and Sediment Control Guidelines
- The City of Edmonton – Erosion and Sediment Control Guidelines Field Manual

12.3 REGULATORY REQUIREMENTS

There are several federal and provincial acts and regulations government activities that cause, or can cause harm to the environment, including construction projects that result in erosion and/or sedimentation. Regulatory agencies also publish codes of practice, guidelines and standards that set out requirements for undertaking certain types of activities. Most legislation and other types of regulatory tools refer to preventing the release of harmful or deleterious substances, including silt, to the environment.

The Federal Department of Fisheries and Oceans (DFO) operates in Alberta to enforce relevant federal legislation. Alberta Environment enforces relevant provincial legislation in collaboration with DFO enforcement of federal legislation.

12.3.1 Federal Legislation

1. **Navigable Water Protection Act**

   The Navigable Water Protection Act, R.S. 1985, c. N-22 applies to in-stream work involving construction or placement in, on, over, under, through or across any navigable water. “Navigable waters” includes a canal and any other water created or altered as a result of construction of any work. Reference section 22, but other sections may also affect municipal development.

2. **Fisheries Act**

   The Fisheries Act. R.S. 1985, c. F-14, exists to protect fish and fish habitat.

   Silt amongst the most common types of deleterious substances released into waterways.

   Reference sections: 34, 35, 36, 38 and 42, but other sections may also affect municipal development.

3. **Migratory Birds Convention Act and Regulations**

   The purpose of the Migratory Birds Convention Act, 1994, c. 22 and the Migratory Birds Regulations, C.R.C., c 1035 are to protect migratory birds and migratory bird habitat. The Act and Regulations apply to various types of birds, as follows:

   Migratory game birds, including ducks, geese, swan, cranes, shorebirds, and pigeons.

   Migratory insectivorous birds, including chickadees, hummingbirds, robins, swallows, and woodpeckers.

   Other migratory non-game birds, including gulls, herons, and loons.

   A complete list of birds is included in Schedule 1 of the Act. It is prohibited to deposit or permit to be deposited oil, oil wastes or any other substances harmful to migratory birds in any waters or any area frequented by migratory birds.

5. **Canadian Environmental Protection Act**

   The Canadian Environmental Protection Act, 1999, c. 33 (CEPA), targets pollution prevention and protection of the environment, human life and health from the risks associated with toxic substances.

   Reference sections 64 and 95 to 99, but other sections may also affect municipal development.

12.3.2 Provincial Legislation

1. **Alberta Environmental Protection and Enhancement Act**

   The Environmental Protection and Enhancement Act, Chapter E-12 exists to support and promote the protection, enhancement, and wise use of the environment.

   Reference: 108 to 112 and 118, but other sections may also affect municipal development.

2. **Water Act**

   The Water Act, Chapter W-3 regulates the allocation, protection, and conservation of water in the Province of Alberta and is administered by Alberta Environment (AENV).

   Reference Section 36, but other sections may also affect municipal development.

   The Water (Ministerial) Regulation, A.R. 205/98, Schedule 1, lists the activities that are exempt from the approval requirement.

3. **Public Lands Act**

   The Public Lands Act, R.S.A. 2000, c. P-30 applies to public lands under the administration of the Minister of Sustainable Resources and includes all naturally occurring bodies of water.

   Reference to Section 3, but other sections may also affect municipal development.

   The extent of Provincial ownership of the bed and the shore is limited by the bank of the body of water, which is defined in the Surveys act R.S.A. 2000, Section 17 – Drawings.

   Approval is required prior to developing or modifying the beds, shores, or banks of a water body.

4. **Soil Conservation Act**

   The Soil Conservation Act, R.S.A. 2000, c. S-15 applies to all land within the Province of Alberta.

   Reference Section 3, but other sections may also affect municipal development.

   If a landowner is not taking appropriate measures to prevent soil loss or deterioration, or stop it from continuing, a soil conservation officer appointed under the Act can serve a notice ordering the landholder or owner to take remedial measures. If the remedial orders are not carried out, the officer may enter on the land and carry out the measures set out in the order.

12.4 PENALTIES FOR CONTRAVENTION OF ENVIRONMENTAL LEGISLATION

12.4.1 Continuation of a Contravention

Where a contravention is committed or continued more than one day, each day is considered a separate offence.

12.4.2 Release Information

The Environmental Protection and Enhancement Act and the Release Reporting Regulation deal with the release of substances into the environment and set out what must be reported, when, how and to who reports must be made. Additionally, individual approvals and Codes of Practice may have requirements for the reporting of contraventions of the terms and conditions of the approval or the sections of the Code of Practice.

Where the incident, release or contravention triggers a requirement to immediately report, then this report should be made to the Energy and Environmental Response Line as follows:

1. Verbal Reports can be phoned to 1.800.222.6514 (on a 24-hour basis)
2. A reference number will be provided at the time of the verbal report to confirm that the report of the release was made.
3. Written reports can be e-mailed to ESRD.info-Centre@gov.ab.ca

12.4.3 Due Diligence

Most environmental legislation provides for the “due diligence” (defined simply as “the exercise of reasonable care”) as a defense to the majority of environment offences. By ensuring due diligence is exercised, the responsible party may prevent the occurrence of a violation altogether.

12.4.4 Incident Report

Where the incident, release or contravention requires a report to Alberta Environment, a copy of that report is to be provided to the Municipality.

12.5 INTRODUCTION OF AN ESC PLAN

12.5.1 Goals and Objectives

The main objective of erosion and sediment control is to protect our watercourses from pollution primarily sediment pollution.

12.5.2 Responsibilities

Erosion and sediment control is the responsibility of the Developer/Contractor. It is not the responsibility of the Municipality to ensure that the ESC plan is appropriate for the level of work being proposed.

The Developer/Contractor shall promptly correct, at his own expense, all defects, damages, and deficiencies in the erosion and sediment control measures, whether related to materials, workmanship, operation, vandalism, or otherwise.

The Developer/Contractor shall maintain permanent erosion and sediment control measures until the Phase and/or project covered under a Development Agreement or Development Permit has received its last Final Acceptance Certificate.

12.5.3 Elements of an Effective ESC Plan

The following elements are to be considered in the preparation of an effective ESC plan:

1. **Minimize Needless Clearing and Grading**

   Some areas of a development site should never be cleared or graded, or these activities should be restricted. This includes stream buffers, forest conservation areas, wetlands, springs, highly erodible soils, steep slopes, and environmental areas.

2. **Protect Waterways and Stabilize Drainage Ways**

   Streams and waterways are particularly susceptible to sedimentation. Clearing adjacent to a waterway should not be permitted, and a silt fence should be installed along the perimeter of the buffer. Existing drainage ways should be identified; as these will likely be the major routes that eroded sediments will take to reach streams, rivers, and storm sewers. Drainage ways are also prone to erosion due to the high velocity of runoff. Erosion should be minimized.

3. **Phase Construction to Limit Soil Exposure**

   Large areas of grading should be avoided since this maximizes erosion potential. Construction phasing, where only a portion of the site is disturbed at one time, minimizes sediment load potential.

4. **Stabilize Exposed Soils Immediately**

   To provide soil stabilization, it is important to establish ground cover over the denuded area within a short period of time with the soils being exposed. Covers such as grass, mulch, erosion control blankets, hydro seeding and/or plastic sheeting can be used to achieve this.

5. **Protect Steep Slopes and Cuts**

   Steep slopes are the most highly erodible surfaces within construction sites. Steep slopes are generally defined as 6H:1V or greater. Where possible, clearing and grading of steep slopes should be avoided. Otherwise, special techniques, such as uphill flow diversion and silt fencing, should be used to prevent uphill runoff from flowing down the slopes.

6. **Install Perimeter Controls to Filter Sediment**

   Perimeter controls should be implemented at the edge of the construction site to retain or filter runoff before it leaves the site. Silt fences and earth dikes or diversion are two of the more common control methods.

7. **Employ Advanced Sediment Settling Controls**

   Even when the best ESC measures are employed, high concentrations of sediments may be discharged during larger storms. Therefore, the ESC plan should include some sediment traps or basins to allow captured sediments to settle out. To improve the trapping efficiency, these basins should be designed to incorporate such features as larger storage volumes, use of baffles, skimmer's and other outlet devices, and multi-cell construction. Regular inspection and maintenance are also critical to the operation of these practices.

8. **Ensure Contractors are Trained on ESC Plan**

   The most important element in the implementation of an ESC Plan is the training and experience of the contractors, as they are usually responsible for the installation and maintenance of the practices. In the end, everyone is responsible for the erosion and sediment control. Therefore, training and education is important for everyone, from the Developer to the Homebuilder. Everyone is working towards the same goal of protecting our waterways.

9. **Adjust ESC Plan at Construction Site**

   For an ESC Plan to be effective, it may have to be modified due to discrepancies between planned and as-constructed grades, weather conditions, Contractor altered drainage and unforeseen requirements. Regular inspections by the Consulting Engineer are needed to ensure that the ESC controls are working properly. Inspections should be conducted every seven days and following heavy rainstorms or snowfall events.

10. **Assess ESC Practices after Rainstorms or Snow Melt Events**

    After a rainstorm or snow melt, it is usually clear whether an ESC Plan worked or not. If the even was unusually large or intense, it is likely that many of the controls will require repair, cleanout or reinforcement., Therefore, a quick response to assess and correct damages of the control is required.

12.5.4 Design of an ESC Plan

An Erosion and Sediment Control Plan should indicate the Best Management Practices (BMP's) on the drawings. Requirements for an erosion and sediment control plan:

1. All construction projects that disturb soil require planning, implementation, inspection, and maintenance to control erosion and sedimentation.
2. In general, sites less than, or equal to 0.40 ha in overall size are considered "small sites" and can be controlled through the implementation and maintenance of good housekeeping and best management practises (BMPs).
3. Sites greater than or equal to 0.40 ha but less than or equal to 2 ha in overall size are considered "medium sites", and generally require some measures in addition to good housekeeping practises to divert clean runoff away from disturbed areas, capture and treat sediment-laden runoff, stabilize soils, and prevent sediment from leaving the site permitter or entering area storm drains. For medium sites, the Municipality may require submission of a report and/or drawings, depending on site erosion potential and the risk of off-site damage.
4. Sites with an overall size greater than 2 ha is considered a "large" site and require careful planning, implementation, inspection and maintenance of erosion and sediment controls in keeping with the size of the site, the construction activities, and the length of time for construction. The Municipality will require submission of both a report and drawings (including construction and maintenance details for erosion and sediment controls), and detailed planning, implementation, inspection, and maintenance of controls for as well as a construction schedule.

General principles should consider the following:

1. Prevent pollutant release. Source control BMP's should be selected as the first line of defense.
2. Erosion and sediment control measures, or other BMP's, should be selected based on the site characteristics and the construction plan.
3. Site drainage and soil conditions should be reviewed to determine the most significant factors for the site and planned construction.
4. Runoff should be diverted away from exposed areas where possible.
5. Existing vegetation should be preserved.
6. The extended of clearing and phased construction should be limited.
7. Natural drainage features shall be incorporated. Adequate buffers should be used to protect areas where flows enter the drainage system.
8. Minimize slope length and steepness.
9. Runoff velocities should be reduced to prevent channel erosion.
10. Prevent tracking of sediment off site.
11. Select appropriate control measures for the control of pollutants other than sediment.

12.5.5 Concern and Practices

There are many erosion and sedimentation concerns that arise due to construction activities. These include, but are not limited to the following:

1. Mud tracking from construction sites onto adjacent properties and roadways
2. Silt and debris washed into existing storm sewer (drainage) system.
3. Silt and debris transported to receiving watercourse by surface runoff and the sewer system.
4. Windblown dust

Good maintenance practices will help to minimize erosion and sediment concerns and should be considered when preparing the construction schedule. While some may be impractical under certain conditions, others should be considered based on suitability, practicality, and cost effectiveness.

1. Stockpiles should be located away from watercourses, environmentally sensitive areas, drainage courses, and existing adjacent developments. The stockpiles should be stabilized against erosion immediately following stripping operations. Stabilization can include but is not limited to establishment of a cover crop or hydro seed matrix consisting of see, fiber bond and tackifier.
2. All construction traffic should leave the site at designated point or points. Gravelling or paving (where practical) of frequently used access roads will help ensure that minimal material such as mud is tracked off-site. The access road should consist of a bed of non-erodible material (i.e., gravel) of sufficient length to ensure that a minimum of material (mud) is tracked off-site onto adjacent municipal roadways. Internal haul roads and/or track packs can also be designated and maintained to help reduce off-site tracking.
3. When storm sewers have been installed or are existing, measures should be undertaken to ensure sediment and debris does not get into the municipal storm sewer system. Both catch basins and manholes should be protected. This may be accomplished by sealing the openings, setting up sumps or weirs inside the structure of by providing appropriate inlet protection (filter fences, sediment traps, etc.). A temporary drainage system should be used with appropriate velocity controls and temporary storage areas for sediment control. This will ensure that sediment and debris does not get into the municipal storm sewer system and into the downstream waterways. Diligent efforts must be taken to ensure that the temporary drainage system does not flood adjacent properties.
4. Where on-site or downstream detention facilities are provided, use can be made of a quality control facility through placing temporary weirs or check dams) for sediment control during construction. Temporary detention facilities are to be in-place prior to the installation of site services, underground utility installation or the commencement of earth moving operations.

5. Dust control measures should be implemented to prevent wind transport of dust from disturbed soil surfaces. This may be accomplished serval ways:
    a. Vegetate, hydro seed, or mulch areas that will not receive vehicular traffic.
    b. Construct windbreaks or screens
    c. Site may be sprinkled with water or a chemical dust suppressant to control dust (care must be taken to prevent tracking of mud that may result)
    d. A combination of the above noted methods.
6. All accumulated sediment and debris should be removed as required. Once construction activities are complete, all related materials and temporary structures must be removed and properly disposed of.

12.6 BEST MANAGEMENT PRACTICES (BMP'S)

12.6.1 General

BMP's for erosion and sedimentation control are various methods that have been proven to work on past construction sites when they are properly planned and constructed.

These measures reduce erosion potential by stabilizing exposed soil or reducing surface runoff flow velocity. There are generally two types of erosion control BMP's that can be used in conjunction with the minimum requirement. They are as follows:

1. Source control BMP's for the protection of exposed surfaces
2. Conveyance BMP's for control of runoff

These measures reduce off-site sedimentation potential by promoting sedimentation before surface water flows leave the construction site. There are generally two types of BMP's that can be used in conjunction with the minimum requirements of an erosion control plan. They are as follows:

1. Filtering and Entrapment BMP's
2. Impoundment BMP's

12.6.2 Best Management Practices

The following list includes BMP's that would be most likely used in an urban setting. Non-inclusion of BMP's in this list does not mean that a BMP is not acceptable. Flexibility and good judgement is to be used when selecting BMP's appropriate for the site and situation.

12.6.2.1 Permanent Best Management Practices

Permanent BMP's to be incorporated in the final site storm water plan may include:

a. Storm Water Management Facility
b. Armouring
c. Vegetation
d. Constructed wetlands
e. Sediment (Grit) Separation Storm Water Treatment Units

For permanent ESC installation:

a. Make sure the proper vegetation is being used in each situation.
b. Pond and pipe situations are designed to overflow, therefore plan for the pond overflow situation. Know where the overflow will go and provide the required surface armour.

12.6.2.2 Erosion Control BMP's

Erosion control BMP's protect the soil surface and prevent soil particles from being detached by rain and wind. These tend to be the least expensive and most effective BMP's. Erosion control treats solid as a resource with value and works to keep it in place. Erosion control BMP's are the first line of defense against erosion and sedimentation. Temporary BMP's are intended to address temporary conditions, be easily removed or be biodegradable. The following list includes some f the current erosion control BMP's. Other erosion control BMP's may also be considered:

f. Preservation of existing vegetation
g. Construction sequence scheduling
h. Just-in-time grading
i. Slope treatments
j. Seeding
k. Mulches
l. Hydro-seeding and hydro-mulching
m. Erosion control netting
n. Rip-rap

12.6.2.3 Temporary Sediment Control BMP's

Sedimentation control BMP's help collect sediment on the site in selected locations and minimize the sediment transfer off the stie. Sedimentation controls are generally passive systems that rely on filtering or settling of soil particles out of the water or air. Sedimentation controls treat soil as a waste product and works to remove it from the transport system. Sedimentation control BMP's are the last line of defense against erosion and sedimentation. The following list includes some of the current sediment control BMP's. Other erosion control BMP's may also be considered:

o. Sedimentary basins
p. Sedimentary traps
q. Sedimentary barriers
r. Inlet protection measures
s. Stabilized construction entrance
t. Dust control
u. Brush/rock filter berms
v. Dewatering

12.6.3 BMP Installation

The sequence of BMP installation must minimize erosion and sedimentation. The following should be considered:

1. Established methods may not meet the objective of preventing erosion and sedimentation.
2. If the contractor can demonstrate that substitute materials can provide the same level of protection, then alternative methods may be considered.
3. Consider the proposed approach and methods in light of achieving the desired goal as well as the economics.

The Engineering Consultant and Contractor should consider the following when designing, installing and maintaining the BMP's:

1. Time the grading work to avoid rainy periods where possible (typically mid-June to early August)
2. Leave as much undisturbed vegetation as possible.
3. Minimize the duration of soil disturbance.
4. Disturb and then restore small areas rather than fewer large areas.
5. Protect soil stockpiles from eroding and trap sediment.
6. Break up slope lengths, reduce slope steepness, and control flow concentrations.
7. Emphasize erosion control by vegetating, mulching or stabilizing disturbed areas quickly.
8. Direct runoff away from disturbed areas.
9. Design and construct drainage channels and outlets to handle concentrated flows until permanent structures and vegetation are functional.
10. Use sufficiently sized temporary sediment basins, traps, etc.
11. Inspect and maintain control measures, especially before and after storms.
12. Install backup BMP's upstream of critical areas and have materials available for emergencies.
13. Keep good records.

BMP's will not work properly unless they are installed properly and in accordance with specifications and the manufacturer's recommendations. Regular inspection and maintenance of BMP's is required to keep them fully functional. Deficiencies in quality control can make the ESC situation worse and lead to disastrous failures.

12.7 EROSION AND SEDIMENT CONTROL REPORT

12.7.1 General

The Erosion and Sediment Control Report provides a description of the overall strategy for ESC. In conjunction with an Earthworks Development Permit, as a condition of a Development Permit and/or a Development Agreement the Developer or applicant will be required to prepare a detailed Erosion and Sediment Control Report to summarize the aspects of the project that are important for erosion and sediment control. The report should include discussion on the following topics:

1. Location and Site Characteristics
2. Proposed Development Characteristics
3. Erosion and Sediment Controls
4. Sediment Control Calculations
5. Inspection and Maintenance
6. Modifications to an ESC Plan
7. ESC Plan Checklist

12.7.2 Location and Site Characteristics

1. Describe the location of the proposed development, including a legal description of the site and a reference to adjacent properties and landmarks.
2. Describe the existing land use:
    a. General topography (slope and slope lengths within the site)
    b. Vegetation
    c. Soil types (particle size, erodibility)
    d. Extent and nature of development
    e. Drainage patterns

    Critical areas within the proposed development site that have the potential for serious erosion or sediment problems.
3. Identify neighbouring areas such as streams, lakes, residential, commercial and/or industrial areas, environmental and/or municipal reserves, escarpments, and/or roads that may be affected by the land disturbance.

12.7.3 Proposed Development Characteristics

1. Provide a general description of the proposed development with a brief description of the land disturbing activity.
2. Indicate the area and the amount of grading for each phase of development.
3. Describe the permanent storm water management system and the use of these facilities during the construction period.

12.7.4 Erosion and Sediment Controls

1. Determine runoff (snowmelt and rainfall) quantities from within the development area and from the upstream watershed area.
2. Provide a description of the methods that will be used to control erosion and sediment transport on the site. Provide detailed design information and calculations as required in Clause 6. Stabilization of soils should be the first line of defense.
3. Identify permanent and temporary control methods for each phase of development.
4. Determine the impact on the receiving water bodies if the erosion and sediment controls are breached or fail.
5. Indicate schedule of regular field checks to ensure ESC measures are operational and functional (e.g. check silt fence is upright, sediment trap not filled after an event, etc.)
6. Show the location, height and volume of stockpiles. Indicate erosion control measures to control sediment runoff from the stockpiles.
7. Indicate the types and scheduling of individual erosion control measures, including interim or short-erm measures (Less than 45 days duration)
8. Clearly indicate the measures to control sediment export off the development site.
9. Describe how the site will be stabilized after construction (site grading and servicing) is completed.

12.7.5 Sediment Control Calculations

The following calculations/specifications should be provided in the report:

1. Design criteria and calculation such as the design particle size for sediment basins
2. Calculations to demonstrate the design sediment removal efficiency from the runoff from the site as a percentage.

   Note: Calculations to determine soil loss using the Revised Universal Soil Loss Equation (RUSLE) can be found in Section 6 of the Alberta Transportation – Design Guidelines for Erosion and Sediment Control for Highways.
3. Seeding and vegetative specifications
4. Inspection and maintenance notes

12.7.6 ESC Plan Checklist

A checklist can assist in ensuring that all necessary elements of a comprehensive ESC Plan have been addressed. Included at the end of this section is an example a checklist of the minimum requirements for an ESC Plan.

12.7.7 Modifications to ESC Plan

The ESC Plan must be a stand-alone document that can be located on the construction site for use by site personnel, inspectors, and regulators. As site work progresses, the ESC Plan should be modified by the consultant and/or contractor, in consultation with municipality staff, to reflect changing conditions.

12.7.8 Inspection and Maintenance

1. Establish a schedule of regular inspections and expected repairs of erosion and sediment control devices.
2. Record changes to the ESC Plan due to changing conditions, revised phase boundaries, etc.
3. Included at the end of this section, is an example ESC Inspection/Maintenance Report

   Note: The Municipality considers that a Developer, project manager, and/or contractor who fails to provide and maintain an ESC Plan for the duration of the project may be considered in contravention of The Acts and Bylaws outlined above in this section.

Project Name
Name of Developer
Consultant
Legal Land Description
Civic Address (if applicable)

Note: The ESC Plan must be developed to apply to the specifics of the site and project, but as a minimum the ESC Plan must address the following information. (Note: an "X" appears if the information should appear/be addressed in the report, drawings, and/or calculations portions of the ESC Report and/or ESC Plan.)

Item	Report	Drawing		Calculations
		Site Plan	BMP Details	
Site Characteristics				
Nature of proposed development	X	X		
Size of proposed development	X	X		
Proposed site access locations	X	X		
Adjacent properties/landmarks	X	X		
Existing Land use				
Existing Use (agricultural, residential, etc.)	X	X		
General topography (slope gradients, lengths, orientation, etc.)	X	X		X
Drainage patters – provide topography map with contour intervals sufficient to show drainage patterns, drainage divides and flow directions	X	X		X
Vegetation (e.g., location and types of trees, shrubs, grass, rare vegetation, etc.)	X	X		
Soil types (grain size, erodibility, etc.)	X	X		X
Critical areas (protected vegetation, ravines, escarpments, etc.)	X	X		

Existing Land Use				
Neighbourhood areas that may be impacted by development (e.g., rivers, streams, lakes, residential/commercial/industrial/public service developments, parks, roads, etc.)	X	X		
Proposed Development				
General Description of proposed development	X			
Development phasing	X	X		
Clearing and grading phasing	X	X		X
Stockpile locations, heights, volumes, and timing	X	X		
Surplus topsoil disposal, including proposed haul routes	X	X		
Drainage flow directions and divides for each drainage area after each stage of development, including contours of finished grades	X	X		X
Location and description of permanent stormwater management facilities including storm drain inlets, pipes, outlets, waterways, swales, ponds, emergency flow routes, etc.	X	X	X	X
Erosion and Sediment Control Measures				
Erosion potential – slope lengths/gradients, soil, erodibility, evaluation summary	X		X	X
Erosion control – protection of exposed surfaces, runoff control, wind erosion	X		X	
Sediment control – filtering, impoundment, mud control (vehicle tracking), catch basin protection.	X	X	X	
Description, location, and timing of all temporary and permanent ESC measures, including construction details	X	X	X	
Describe good housekeeping measures	X		X	
Stockpile locations, heights, volumes, and timing	X	X		

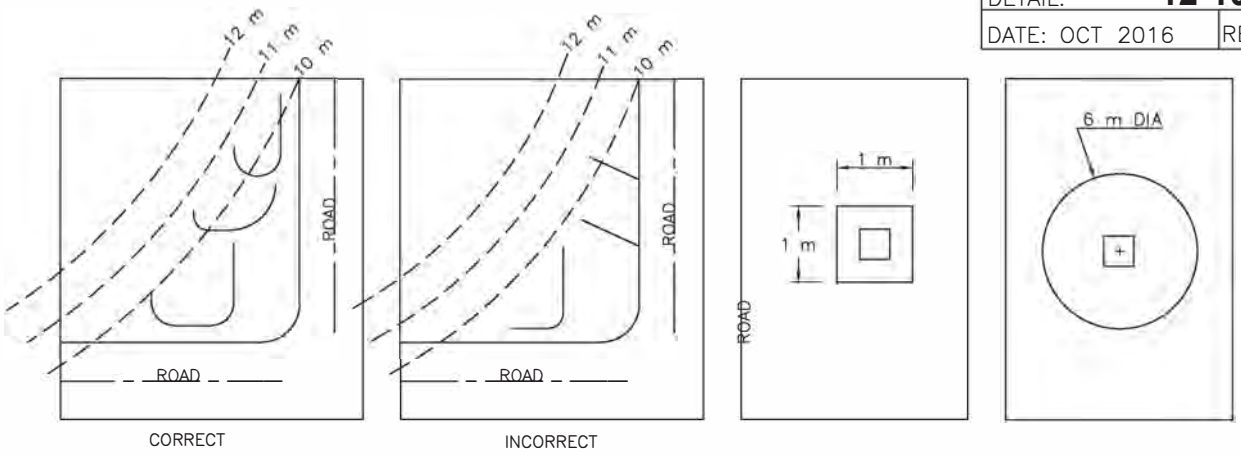
Erosion and Sediment Control Measures				
Cut/fill slope locations, heights, volumes and timing	X	X		
Exposed soil horizons, soil types (topsoil, fill, bedrock, clay, sand, etc.), locations and timing	X	X		
Temporary diversion of water on-site	X	X		
Winter operations/shut-down measures	X			
Control of spring runoff from adjacent lands	X	X	X	
Post-construction stabilization measures	X			
Seeding and mulching descriptions and locations	X	X		
Signage, Inspection and Maintenance				
Signage (Private property/No trespassing/No unauthorized personnel beyond this point, etc.)	X			
Schedule and records of regular inspections and expected maintenance of ESC measures	X			
Records of inspections and maintenance after storm events	X			
Update ESC plan for changing conditions	X			

SAMPLE ESC INSPECTION/MAINTENANCE REPORT				
Project Name:				
Inspection Date/Time:			Date of Last Inspection:	
Inspected by:				
Verbal/Written Notification given to:			Date:	
Current Weather:		Weather Forecast		
mm of rain last week:		mm of rain in last 24 hours		
Stage of construction				
Contractors on site				
Construction activities on site				
Inspection Checklist	Yes	No	Comments	Action Required
Has 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 Sediment Control BMP's in place and functioning adequately?				
Are Transport Control BMP's in place and functioning adequately?				
Are Erosion Control BMP's in place and functioning adequately?				

12.7.9 Standard Drawings – Erosion and Sediment Control

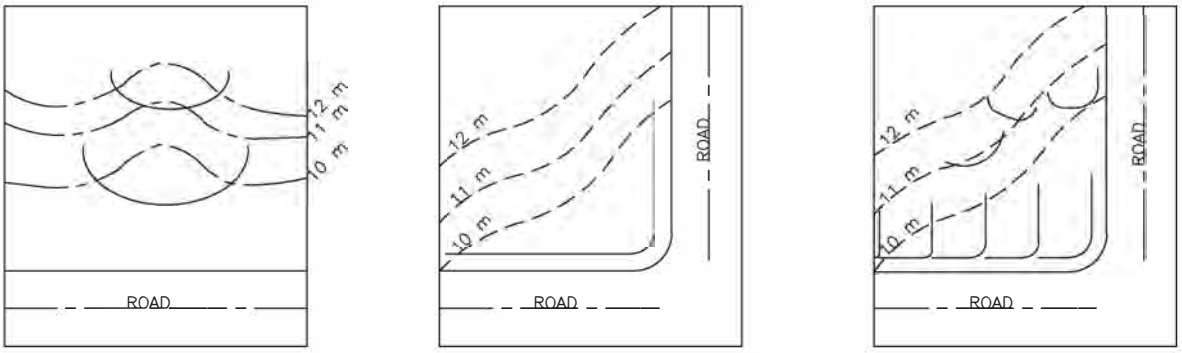
Dwg. No.	Title
12-100	Silt Fence Configuration
12-101	Silt Fence (Trench Method)
12-102	Rolled Erosion Control Channel Installation
12-103	Rolled Erosion Control Products Slope Installation

STANDARD DETAIL:	12-100
DATE: OCT 2016	REV: 0



"J" CONFIGURATION

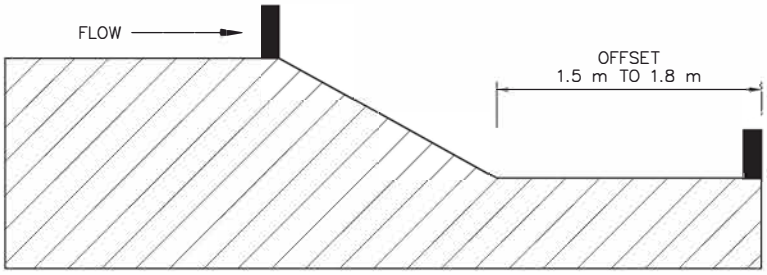
SILT FENCE BARRIER AT STORM INLET



"SMILE" CONFIGURATION

AVOID LONG INSTALLATION

COMBINATION OF "SMILE" AND "J" CONFIGURATIONS



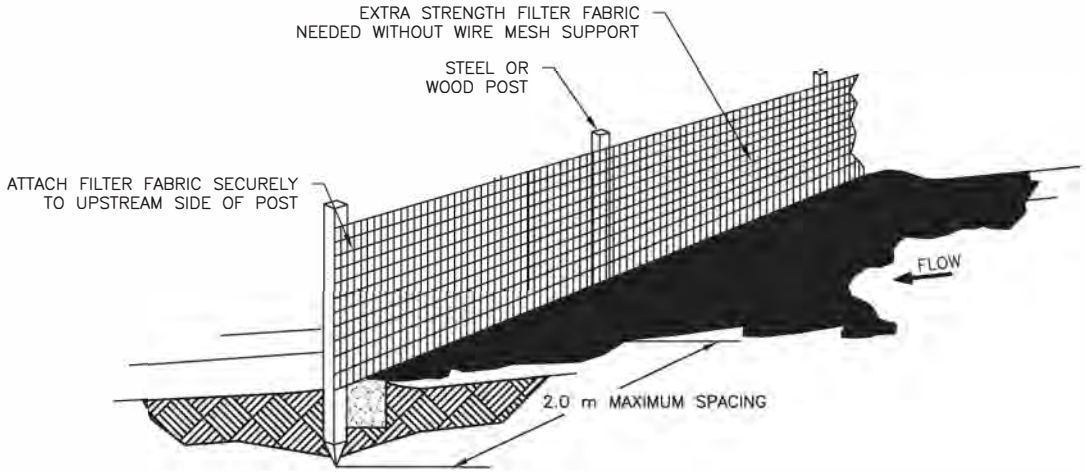
NOTE:

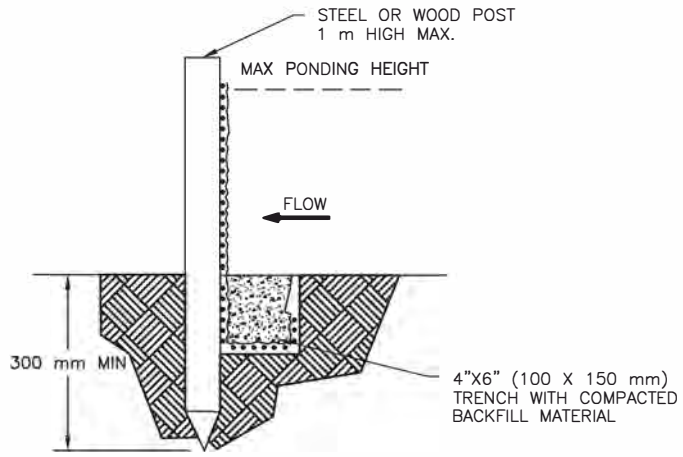
(1) THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

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SILT FENCE CONFIGURATION

STANDARD DETAIL:	12-101
DATE: OCT 2016	REV: 0





TRENCH METHOD DETAIL

NOTES:

(1) SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.

(2) INSEPCT AND REPAIR FENCE DAILY AND AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN ACCUMULATED SILT REACHES 200 mm.

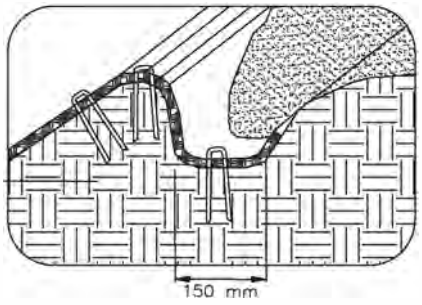
(3) REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF SITE.

(4) THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER OR ENGINEER.

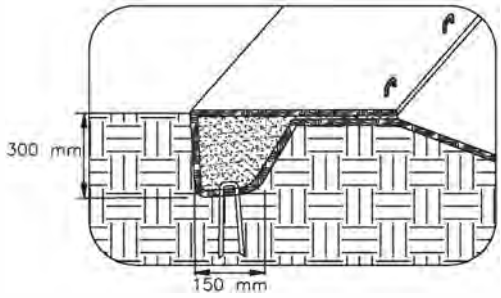
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SILT FENCE (TRENCH METHOD)

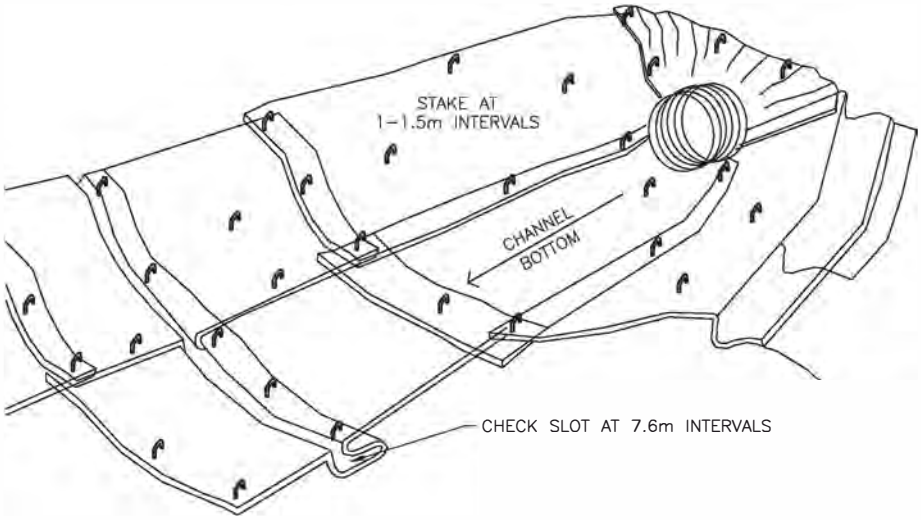
STANDARD DETAIL:	12-102
DATE: OCT 2016	REV: 0

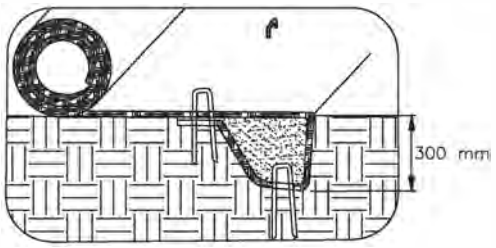


LONGITUDINAL ANCHOR TRENCH

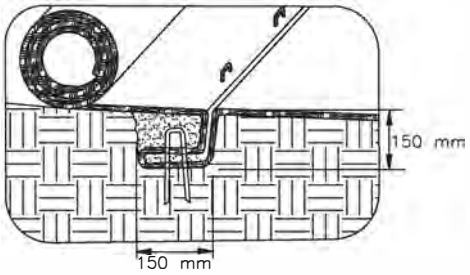


TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH





INITIAL CHANNEL ANCHOR TRENCH



INTERMITTENT CHECK SLOT

NOTES:

(1) CHECK SLOTS TO BE CONSTRUCTED PER MANUFACTURER SPECIFICATIONS

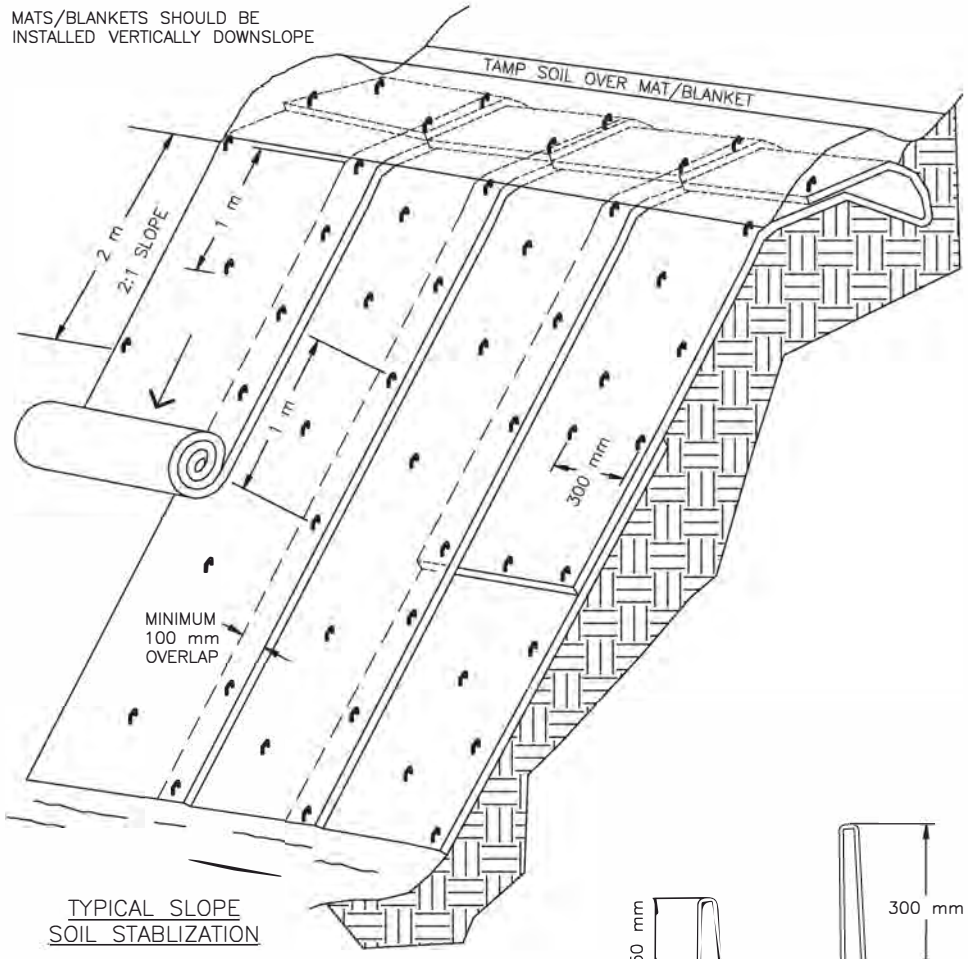
(2) STAKING OR STAPLING LAYOUT PER MANUFACTURERS SPECIFICATIONS.

(3) THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DESIGNER/ENGINEER.

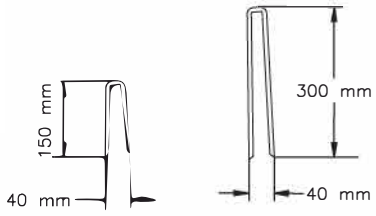
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ROLLED EROSION CONTROL CHANNEL INSTALLATION

STANDARD DETAIL:	12-103
DATE: OCT 2016	REV: 0



TYPICAL SLOPE SOIL STABLIZATION



STAPLES

NOTES:

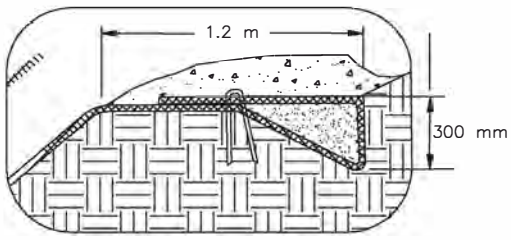
(1) SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.

(2) APPLY PERMANENT SEEDING BEFORE PLANTING BLANKETS.

(3) LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

(4) CHECK SLOTS, STAKING, STAPLING AND OTHER CONSTRUCTION DETAILS PER MANUFACTURERS SPECIFICATIONS.

(5) THIS FIGURE IS PROVIDED FOR GUIDANCE ONLY AND DOES NOT CONSTITUTE A DESIGN. A SITE SPECIFIC DESIGN IS REQUIRED FROM DEISGNER/ENGINEER.



BERM

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ROLLED EROSION CONTROL PRODUCTS SLOPE INSTALLATION