Lac La Biche County

Policy

TITLE: General Municipal Servicing Standards (GMSS)

POLICY NO: PW-31-003

RESOLUTION: 20.340

EFFECTIVE DATE: April 28, 2020

DEPARTMENT RESPONSIBLE: Public Works

NEXT REVIEW DATE: April 28, 2023

POLICY STATEMENT:

In order to enhance the safety and usage of County Infrastructure, Lac La Biche County wishes to develop General Municipal Servicing Standards as a guideline for development and construction of County's sponsored Infrastructure and land development projects.

"Original Signed"
Chief Administrative Officer

May 1, 2020
Date

"Original Signed"
Mayor

May 4, 2020
Date

SPECIAL NOTES/CROSS REFERENCE: General Municipal Servicing Standards Procedure PW-31-003

AMENDMENT DATE:

Lac La Biche County

Procedure

TITLE: General Municipal Servicing Standards

POLICY NO: PW-31-003

EFFECTIVE DATE: April 28, 2020

DEPARTMENT RESPONSIBLE: Public Works

NEXT REVIEW DATE: April 28, 2023

GENERAL GUIDELINES:

The objective of the General Municipal Servicing Standards is to provide a clear guiding frame-work for managing the scope, quality, time, cost, risk, and human resources of corporate projects for designers and developers in the design of Municipal infrastructure within Lac La Biche County. These standards are intended to ensure that new Municipal infrastructure is acceptable to the County with regards to overall quality, safety & environmental considerations, functionality, operation & maintenance requirements and life cycle cost. The Developer and Consultant are responsible for ensuring that Municipal infrastructure is designed and constructed to achieve the County's objective in this regard.

Council expects its Capital and Development projects to be conducted within a comprehensive multi-step approach to enhance effectiveness, efficiency and clarity. Council requires that an effective program be delivered in the context of a broad range of resources and competencies working together.

DEFINITIONS:

- **GMSS**
  - General Municipal Servicing Standards
- **Construction Completion**
  - When the entire construction work has been performed to the requirements of the Development Agreement or Construction Contract.
- **Construction Completion Certificate**
  - The certificate issued by the County for the municipal improvements, or a portion thereof. These improvements must be constructed and installed by the Developer to the satisfaction of the Development Agreement or Construction Contract.
- **Construction Contract**
  - The legal agreement between the Contractor and the County which specifies the financial obligations, and terms and conditions for the construction and warranty of municipal improvements necessary for public capital improvement.

- **Council**
    - The Municipal Council of Lac La Biche County.
- **County**
    - The Municipal Corporation of Lac La Biche County and those authorized to act on behalf of them.
- **Consultant / Engineer**
    - Shall mean the Professional Engineer as defined in the Engineering and Geoscience Professional Act of Alberta. responsible for the design where applicable throughout the GMSS, this term may refer to or include the Landscape Architect or the developers designated representative.
- **Contractor**
    - Shall mean the person, firm or corporation that undertakes the installation of Municipal infrastructure on behalf of County or Developer.
- **Developer**
    - An entity or person, and their representatives, that develop private or public lands in the County.
- **Development Authority**
    - As defined in the Lac La Biche County Land Use Bylaw.
- **Development Agreement**
    - A Development Agreement is a legal agreement between the Developer and the County which specifies the financial obligations, and terms and conditions for the construction and warranty of municipal improvements necessary to service land approved for development.
- **Municipal Infrastructure**
    - Includes roads, utility network, landscaping and other surface or underground improvements to be owned and / or operated by the County.
- **Engineering Drawings**
    - Shall mean the detailed engineering drawings & specifications prepared by the Engineer for Land development or County Capital Projects.
- **Environmental Site Assessment**
    - As defined in the Alberta Environmental Site Assessment Standard, Alberta Government.
- **Final Acceptance**
    - When the entire work has been performed to the requirements of the Development Agreement

or Construction Contract.

- **Land Use Bylaw**
  - Latest authorized revision of the Lac La Biche County Land Use Bylaw.
- **Permit to Practice**
  - Means "permit holder" as defined in the Engineering and Geoscience Professions Act of Alberta.
- **County's Engineer**
  - Senior Manager, Public Works or his/her designate.

PROCEDURE:

1. The General Municipal Servicing Standards (GMSS) is intended to provide specific guidelines to assist the County and Developer in the planning, design, preparation and submission of plans and specifications for construction of municipal infrastructure and systems (roads, water distribution systems, low- pressure/gravity sewer systems, stormwater management facilities) that will meet the servicing requirements for commercial, industrial and residential subdivision development within the County.

2. The General Municipal Servicing Standards (GMSS) have been developed with three goals in mind:

   i. To ensure that the County is provided with a quality product that will meet an acceptable long-term life expectancy while maintaining cost efficiency and practicality so as not to prohibit land development.
   ii. To minimize the maintenance requirements associated with land development.
   iii. To ensure that lac La Biche County capital project contracts are included and that the objective is to ensure that all infrastructure work within the County is constructed / performed to a consistent standard.

3. The General Municipal Servicing Standards should only be considered as a minimum requirement. The Developer or Contractor remains fully responsible for the design and construction of Municipal infrastructure according to accepted engineering practice and standards that address and meet the specific needs and site conditions of the development or project. Certain site-specific conditions may warrant the use of standards that are more stringent.

4. The General Municipal Servicing Standards, as well as the latest editions of any referenced legislation or document, form part of the requirements for the design and construction of any project within the County.

5. The Developer must at its own cost and expense, provide the design and construction of the required Municipal improvements, including necessary off-site upgrades and utility over sizing associated with the development as stated in the development agreement.

6. The Developer or Contractor is responsible for obtaining all necessary permits required for the undertaking of the project prior to the construction, Developer or Contractor must seek approval of all engineering drawings, reports and permits from Lac La Biche County or any other utility or other government organization as per requirement.

7. Upon completion of all Municipal improvements, the Developer or Contactor must give notice to the County and arrange for inspections. Upon the receipt of a Construction Completion Certificate request from the Developer, the County must inspect the municipal improvements, prepare a deficiency list, and forward it to the Developer and County's Engineer or Planning and Development department.

8. All deficiencies must be rectified at the developers cost to the satisfaction of the contract or development agreement prior to the acceptance and approval of the Construction Completion Certificate by the County.

9. The Warranty Period for the municipal improvements must commence upon acceptance of the Construction Completion Certificate by the County and will cease upon the issuance of the Final Acceptance Certificate. The Warranty Period must be governed by the terms outlined in the development agreement or contract and the Developer or Contractor must provide, for the duration of the warranty period, an irrevocable letter of credit or equivalent as required by the County.

"Original Signed"
Chief Administrative Officer

May 1, 2020
Date

SPECIAL NOTES/CROSS REFERENCE: General Municipal Servicing Standards Policy PW-31-003

AMENDMENT DATE:

Lac La Biche County

welcoming by nature.

GENERAL MUNICIPAL SERVICING STANDARDS

JULY 2019

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SECTION I STREET LIGHTING

SECTION A GENERAL

A.1 INTENT

.1 The General Municipal Servicing Standards (GMSS) is intended to provide specific guidelines to assist the County and Developer in the design, preparation and submission of plans and specifications for construction of municipal improvements and systems (roads, water distribution systems, low-pressure/gravity sewer systems, stormwater management facilities) that will meet the servicing requirements for commercial, industrial and residential subdivision development within the County.

.2 The General Municipal Servicing Standards (GMSS) have been developed with two goals in mind:

.1 The GMSS ensure that the County is provided with a quality product that will meet an acceptable long-term life expectancy while maintaining cost efficiency and practicality so as not to prohibit land development.

.2 To minimize the maintenance requirements associated with land development.

.3 The General Municipal Servicing Standards presented in this document should only be considered as minimum requirements. The Developer remains fully responsible for the design and construction of municipal improvements according to accepted engineering practice and standards that address and meet the specific needs and site conditions of the development. Certain site-specific conditions may warrant the use of standards that are more stringent.

.4 The General Municipal Servicing Standards, as well as the latest editions of any referenced legislation or document, form part of the requirements for the design and construction of any project within the County.

A.2 DEFINITIONS

.1 **Construction Completion**

.1 When the entire construction work has been performed to the requirements of the Development Agreement or Construction Contract.

.2 **Construction Completion Certificate**

.1 The certificate issued by the County for the municipal improvements, or a portion thereof. These improvements must be constructed and installed by the Developer to the satisfaction of the County.

.3 **Construction Contract**

.1 The legal agreement between the Contractor and the County which specifies the financial obligations, and terms and conditions for the construction and warranty of municipal improvements necessary for public capital improvement.

.4 **Council**

.1 The Municipal Council of Lac La Biche County.

.5 **County**

.1 The Municipal Corporation of Lac La Biche County and those authorized to act on behalf of them.

.6 **Developer**

.1 An entity or person, and their representatives, that develop private or public lands in the County.

.7 **Development Authority**

.1 As defined in the Lac La Biche County Land Use Bylaw.

.8 **Development Agreement**

.1 A Development Agreement is a legal agreement between the Developer and the County which specifies the financial obligations, and terms and conditions for the construction and warranty of municipal improvements necessary to service land approved for development.

.9 **Engineer**

.1 As defined in the Engineering and Geoscience Professions Act of Alberta.

.10 **Environmental Site Assessment**

.1 As defined in the Alberta Environmental Site Assessment Standard, Alberta Government.

.11 **Final Acceptance**

.1 When the entire work has been performed to the requirements of the Development Agreement or Construction Contract.

.12 **Land Use Bylaw**

.1 Latest authorized revision of the Lac La Biche County Land Use Bylaw.

.13 **Permit to Practice**

.1 Means “permit holder” as defined in the Engineering and Geoscience Professions Act of Alberta.

.14 **Public Utility Lot**

.1 As defined in the Municipal Government Act of Alberta

.15 **Subdivision Authority**

.1 As defined in the Lac La Biche County Land Use Bylaw.

A.3 DEVELOPER’S RESPONSIBILITY

.1 The Developer must at its own cost and expense, provide the following:

.1 Design and construction of the required municipal improvements, including necessary off-site upgrades and utility over sizing associated with the Development.

.2 Quality control and materials testing, by an independent, qualified, third-party engineering firm, during utility installation and roadway construction. Certification by the third party that the construction has been completed in accordance with the approved drawings and specifications will be required.

.3 Legal and all other costs incurred by the County for the preparation and execution of the Development Agreement.

.4 The engineering and inspection costs incurred by the County, for the review and approval of the design and construction of the required municipal improvements.

.5 Acquisition of additional land for road widening and municipal services as required.

.6 Registration with Alberta Land Titles all easements including plans and documents for the construction of municipal improvements outside of the municipal right-of-way.

.7 A plan of the subdivision in accordance with the plan approved by the County's Subdivision Authority must be registered at the Land Titles Office.

.8 The Developer will supply both digital and hard copy of the Plan of Subdivision drawings and as-built drawings for the development or subdivision infrastructure to the County.

.2 The Developer must be responsible for satisfying all statutory requirements governing such works and obtaining approvals for compliance with those requirements from the authorities having jurisdiction. Where conflicts or inconsistencies with the GMSS and referenced documents arise due to compliance with or amendment of statutory requirements, the Developer must be responsible for satisfying the more stringent requirement.

.3 It is the Developer's responsibility to satisfy the requirements established in the GMSS unless stated otherwise. All design criteria, materials, installation and testing, must be in accordance with local building codes, design guides and legislation.

.4 It is the Developer's or their consultant's responsibility to obtain, at their own cost copies of the referenced documents from the applicable authority.

.5 The Developer must enter into a Development Agreement with the County prior to the construction and installation of municipal improvements. There must be no Building Permit issued for any construction on a lot within the subdivision until all municipal improvements are in place and accepted by the County and endorsement of the subdivision plans and registration at Alberta Land Titles is completed.

A.4 CHANGES IN DESIGN STANDARDS

.1 It is the Developer's responsibility to ensure that design and construction follow the latest edition of the General Municipal Servicing Standards including any revisions thereto up to the date of acceptance of the detailed design.

A.5 INSPECTIONS AND FINAL ACCEPTANCE

.1 Upon completion of all municipal improvements, the Developer must give notice to the County and arrange for inspections. Upon the receipt of a Construction Completion Certificate from the Developer, the County must inspect the municipal improvements, prepare a deficiency list, and forward it to the Developer.

.2 All deficiencies must be rectified to the satisfaction of the County prior to the acceptance and approval of the Construction Completion Certificate by the County.

.3 The warranty period must commence upon acceptance and approval of the Construction Completion Certificate. During this period, the Developer must repair any defect in material or workmanship.

A.6 WARRANTY PERIOD

.1 The Warranty Period for the municipal improvements must commence upon acceptance of the Construction Completion Certificate by the County and will cease upon the issuance of the Final Acceptance Certificate. The Warranty Period must be governed by the terms outlined in the Development Agreement. Warranty periods generally extend for:

.1 Two (2) years for site clearing, topsoil stripping, stockpiling, grading, erosion and sediment control and storm ponds.

.2 Two (2) years for all surface work related to roadway construction including road structure, curb, gutter, sidewalks, walkways, trails, ditches, swales and other storm drainage structures with the exception of the final lift of asphalt and pavement markings.

.3 Two (2) years for the final lift of asphalt and pavement markings.

.4 Two (2) years for all underground utilities and related above-ground components such as valves, hydrants, manhole and catch basin covers. Two (2) years for trench settlement.

.5 Two (2) years for all power and street lighting components.

.6 Two (2) years for landscaping features.

.7 One (1) year for topsoil placement and seeding.

.2 Where there is a delay in the application of the final layer of asphalt on the internal roads and approaches, the warranty period for the internal roads and approaches must be extended for a period of twelve (12) months from the date of acceptance of the Construction Completion Certificate by the County for the final layer of asphalt.

.3 The Developer must provide, for the duration of the warranty period, an irrevocable letter of credit as required by the County.

A.7 UTILITY, PIPELINE AND RAILWAY CROSSINGS

.1 The Developer must be responsible for obtaining a crossing agreement when a crossing of utility, roadway, pipeline or railway is required for the installation of the municipal improvements.

.2 The Developer must comply with all terms and conditions of the crossing agreement and make an application to transfer the agreement to the County's name prior to the application for a Construction Completion Certificate.

A.8 FRANCHISE UTILITIES

.1 Franchise Utilities are those utilities provided by a service company.

.2 The Developer must be responsible for all coordination with Franchise Utilities including design and installation. The Developer must be responsible for any deficiencies noted because of installation such as curb damage, trench settlement or final boulevard grading.

A.9 EASEMENT AND RIGHT OF WAY

.1 The Developer must be responsible for obtaining all easements and right of ways for the installation of municipal improvements located outside of the normal right-of-way or utility lot. All permanent easements, including plans and documents, must be registered at the Land Titles Office naming the County as the grantor prior to application for a Construction Completion Certificate.

A.10 PERMITS AND LICENSES

.1 The Developer must be responsible for obtaining all permits and licenses in compliance with the Local, Provincial and Federal Government statutory requirements.

SECTION B GUIDELINES FOR GENERAL COMPLIANCE

B.1 SUBMISSION REQUIREMENTS FOR LOT/SITE GRADING PERMIT

.1 Pursuant to the Land Use Bylaw the following technical information is required to be submitted in support of a Development Permit application to begin site stripping, stockpiling of topsoil and cut and fill operations only:

.1 For multi-lot subdivision development, the subdivision application must be approved by the Subdivision Authority prior to the submission of engineering drawings for review and approval.

.2 For large-scale industrial/commercial development where site grading may be desirable in advance of all other approvals at the discretion of the Development Authority may issue a development permit for site grading.

.3 For excavations other than for construction or building purposes, including, but not limited to, sand and gravel, topsoil stripping, peat moss, and construction of artificial bodies of water.

.4 In accordance with legislation and as accepted by the County, appropriate measures must be implemented to prevent soil loss or deterioration from taking place or to stop soil loss and deterioration from continuing.

.2 Development Permit submission requirements are:

.1 Provide a general site plan illustrating existing contours at 0.5 m intervals preferred not to exceed 1.0 m maximum. Elevations will be relative to a geodetic datum. Reference benchmarks are to be detailed on the plan.

.2 Provide a conceptual site plan illustrating proposed site stripping, cut and fill requirements and proposed contour elevations. The Developer is responsible for the completion of rough grading for the entire development or subdivision area including road rights-of-way, laneways, drainage/utility easements, municipal reserve and all lots. Indicate on the plans the benchmark used in the control of construction for the project. Other information to be shown includes stockpiling and windrow placements.

.3 The results of a geotechnical/hydrogeological investigation, completed by a qualified geotechnical engineering firm, to a level that will allow the County to generally assess the site geotechnical/hydrogeological conditions and their effect on the development or subdivision. The report should outline any findings of contamination that may exist and any general recommendations.

.4 For subdivision lots or development sites that require 1.0m or more fill a geotechnical evaluation and engineering requirements for each lot/site is to be submitted to support the development of each lot/site. Identify each lot on the conceptual subdivision plan. The Developer is responsible for the supply, placement and compaction of necessary fill for rough grading. The rough grades should ensure that the overall drainage plan is satisfied. No standing water or areas where water may pool or pond will be permitted.

.5 A Phase I Environmental Site Assessment of the subdivision or development area. A Phase II Environmental Site must be required if recommended in the Phase I Assessment.

.6 If a creek, river or other major watercourse crosses the site, a plan of the floodplain and a letter outlining the recommended measures to ensure that the development would not be exposed to flooding is required.

.7 Overall conceptual plans and description for the proposed subdivision or development area are required for review and approval; road layouts, water and sanitary sewer servicing and stormwater management plan. The stormwater management plan is to address the capacity of existing systems and the requirements to accommodate the new flows are required to be completed with supporting calculations submitted for review.

.8 Any subdivision or development involving pipeline and or power line transmissions and or public utility right-of-way must be sited to comply with all relevant Federal and Provincial Government legislation and standards. Crossing agreements are to be provided with the application.

.3 The standard drawing size of 841 mm by 594 mm (or another standard sheet size) must be used for all plan submissions with a scale of 1:1000 (index plan may be a reduction of the standard scale to allow the plan to fit the standard size sheet).

.4 The County may require other submissions as part of the application which the Developer must submit.

.5 The County may require the Developer to submit a historical resource impact assessment to identify any significant historic resources within the boundaries of the proposed development including a review for archaeological and palaeontological resources, in consultation with the Government of Alberta.

B.2 PREREQUISITES TO REVIEW OF ENGINEERING DRAWINGS

.1 The subdivision plan must be approved by the County prior to the submission of engineering drawings for review and approval.

.2 The engineering drawings must be prepared, signed and sealed by an Engineer registered in the Province of Alberta and must be stamped with a Permit to Practice seal.

.3 The submission of drawings must be accompanied by all supporting documents, reports, studies, calculations or any other information as required by the County.

B.3 ENGINEERING DRAWING SUBMISSION & APPROVAL PROCEDURE

.1 The Developer must submit complete engineering drawings at least eight weeks prior to the start-up of construction. The County is not responsible for any delay of approval if submissions are incomplete or found to contain errors or omissions.

.2 Initially, the Developer must submit four (4) complete sets of drawings and three (3) copies of specifications, as-well-as a digital copy to the County together with all supporting documents and reports.

.3 The County must respond to the Developer's initial submissions within four weeks and return one set of drawings and specifications to the Developer with comments for revision.

.4 The Developer must promptly revise the engineering drawings to the satisfaction of the County and re-submit four (4) complete sets of revised drawings and specifications and one (1) digital

copy MicrostationCAD version 8 (.DGN format), with any additional information as required by the County for approval.

.5 Upon acceptance of revised drawings, the County must return one complete set of drawings to the Developer with an approval letter for construction.

.6 The Developer must not proceed with construction until the engineering drawings have been approved for construction.

.7 The County's approval for construction does not relieve the Developer of responsibility for the adequacy of the designs or the liability arising thereof.

B.4 GENERAL REQUIREMENTS FOR ENGINEERING DRAWINGS

.1 Each drawing must include the following:

.1 A suitable title block, identifying:

.1 Name of the project,

.2 County File No.

.3 Draft or Revision No.,

.4 Revision Date and,

.5 Date of drawings issued;

.2 The scale of the drawing;

.3 A north direction indicator;

.4 An appropriate space for the professional seal and Permit to Practice

.2 All dimensions and measurements shown in the engineering drawings must be in metric units. All elevations shown in the engineering drawings must be referenced to geodetic datum and must be noted as such.

.3 Geodetic Datum, surveys and plans are to be prepared utilizing North American Datum NAD83 (Adopted).

.4 The standard drawing size of 841 mm by 594 mm must be used.

.5 All lettering must be a minimum of 2 mm (0.08") high.

.6 It is suggested that abbreviations and drawing symbols used in the engineering drawings be consistent with those used by the City of Edmonton.

.7 The engineering drawings are to provide a complete description of all existing and proposed municipal improvements, including any provisions for future extensions of utilities and systems.

.8 The engineering drawings must include:

.1 Cover Sheet of standard size, indicating the name of the subdivision development and Developer; and the legal location or address of the subdivision.

.2 Index Plan of standard size, duplicating the legal plan, indicating drawing sheet number and related title.

.3 Topography and Land Use Plan, indicating the existing contours at 0.5 m intervals and the proposed land uses.

.4 Lot Grading Plan, indicating the proposed lot corner elevations, the proposed finished grades at the buildings and the direction of surface drainage on the lots, streets and swales. Proposed building elevations and sewer service invert elevations must be shown. All lots on fill, disturbed or unsuitable soil must be identified on the lot-grading plan. The plan should indicate minimum rough grading requirements to be completed by the Developer. Rough grades must ensure that the overall drainage concept is satisfied. No standing water or areas where water may pool or pond will be permitted at the rough grading stage.

.5 Roadway Overall Plan, indicating all walks, lanes, roadway widths and alignments.

.6 Drainage Basin, an overall drainage basin plan is required adjacent to all roadways, showing 1.0m contours, existing overland drainage routes, and flood plains/ponding areas.

.7 Pavement Marking and Signage Plan, indicating pavement marking and proposed signage locations and specifications.

.8 Sanitary, Storm and Water Main Overall Plan, indicating the alignments and sizes of sanitary sewers, storm sewers and water mains and services, locations of manholes, catch basins, valves, hydrants and other proposed underground utilities.

.9 Gas, Power and Telecommunication Overall Plan(s), indicating the alignment of gas, power, telephone, underground cables and utility easements if applicable.

.10 Landscaping Plan, identifying street names and landscape amenities including fencing, signage, screening berms, Canada Post mailboxes and pads, entrance features, entrance sign location and specifications and name and location of all trees and shrubs. The plan must include up to three alternative names for each street. Street naming approval will be completed by County Council. The County reserves the right to select or reject proposed names.

.11 Detailed Plans & Profiles for Roadways, showing:

- .1 Road right-of-way width, roadway width offset from the property line and horizontal curve data.
- .2 Original ground profiles & chainages.
- .3 Proposed centreline profiles & chainages.
- .4 Proposed top of curb elevations.
- .5 Proposed catch basin locations and inlet elevations.
- .6 Vertical curve data.
- .7 Elevations of shallow utilities at road crossings.
- .8 Pavement structure.

.12 Detailed Plans & Profiles for Water, Sanitary and Storm Sewers, showing:

- .1 Horizontal alignment and separation distances between each utility.

.2 Water main plan showing pipe sizes, location of hydrants, valves and fittings.

.3 Water main profiles showing grades, cover, pipe sizes, pipe materials and class of pipe bedding.

.4 Storm and sanitary sewer plan showing pipe sizes and manhole locations.

.5 Storm and sanitary sewer profiles showing pipe sizes and materials, manhole invert elevations, length of pipe, grades between manholes and class of bedding.

.6 Location of services and invert elevations at the property line.

.7 Elevations of oil and gas pipeline crossings.

.13 Drawing scales should be determined based on good engineering practice and as approved by the County.

B.5 REPORTS AND STUDIES

.1 The Developer must provide all relevant reports and studies in the submission of engineering drawings (if not previously provided) including:

.1 Geotechnical/hydrogeological report to identify;

.1 Existing soil and sub-soil conditions, groundwater tables, limits of any site contamination, top of bank setbacks adjacent creeks or ravines with stability problems.

.2 Recommended pavement structure construction based on in-situ conditions and projected traffic volume. A 20-year structure recommended by a geotechnical Engineer is required; however, minimum pavement structure thickness as illustrated on the cross-sectional standard drawings must be maintained.

.3 Construction methods and procedures for trenching and backfill requirements for buried infrastructure, storm drainage facilities and service requirements for proposed private servicing requirements and building foundation requirements.

.2 Engineering design brief including design calculations and analysis of the proposed municipal improvements.

.3 Environmental impact assessment may be required for any development depending on the circumstances.

B.6 AS-CONSTRUCTED RECORD DRAWINGS

.1 Within six (6) weeks following the issuance of the Construction Completion Certificate, the Developer must submit to the County a set of as-constructed record drawings in a digital format MicrostationCAD of the latest version together with three sets of blueprints.

.2 All drawings must indicate “As-Built” or “As-Constructed” and must be stamped, signed, sealed and dated by an Engineer.

SECTION C LAND USE DISTRICTS AND LEVEL OF SERVICE

C.1 INTENT

.1 This section is intended to assist the County and Developer with a general guideline outlining the level of service for a development based on the land use district. The Developer may use this section to determine the most appropriate servicing standards presented in the following sections.

.2 The level of service applicable to any development is subject to review by the County. The County reserves the right to require a higher level of service for any development.

.3 The guidelines and standards presented in this document should only be considered as minimum requirements. The Developer remains fully responsible for the design and construction of municipal improvements according to accepted engineering practice and standards that address and meet the specific needs and site conditions of the development. Certain site-specific conditions may warrant standards that are more stringent be met.

.4 It is the Developer's responsibility to satisfy, in addition to these requirements, all regulations and conditions required by referenced legislation or document, Municipal By-Laws, and Provincial and Federal Government Authorities.

.5 Should the need arise where any of the following standards cannot be met, a written request describing the variance complete with supporting documentation must be forwarded to the County for review. The request will be reviewed, and a written reply returned with the final decision.

C.2 LAND USE DISTRICTS

.1 Land Use Districts are defined and described in the Land Use Bylaw.

C.3 LEVEL OF SERVICE

.1 Roadways

.1 The Developer must be responsible for determining an estimated annual average daily traffic (AADT) generated by the development to determine the required cross-sectional elements and pavement structure. Section G provides a geometric design table and cross sections for the various roadway classifications.

.2 Water Systems

.1 Developments may require one of the following types of water distribution systems:

.1 Private Water Systems

.1 Private water systems consist of individual wells or water cisterns. Systems must be designed and installed according to the Canadian Plumbing Code and applicable Alberta Regulations. Water analysis is to be to potable water standards.

.2 The County will not permit the construction of communal water systems, which are designed to incorporate a water supply from an on-site well.

.2 Piped Water Distribution Systems

.1 Piped water distribution systems may consist of a piped network at normal operating pressure or a trickle system that delivers water at lower than normal operating pressure. The specific type of system will depend on the layout, size and type of development as well as the existing infrastructure in the area.

.2 All piped systems must be designed and installed according to the standards outlined in this document. Other applicable standards include the AWWA Standards, the Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems and the Fire Underwriters Survey; Water Supply for Public Fire Protection.

.3 Sanitary Sewer Systems

.1 Developments may require one of the following types of sanitary sewer systems:

.1 Private Sewage System Residential Development

.1 Private Sewage systems may consist of any sewage collection or treatment system located entirely within private property. Systems may consist of septic tanks or holding tanks, disposal fields, treatment mounds, sewage lagoons, mechanical treatment units and related piping. All private sewage systems must be designed and installed in accordance with the Alberta Private Sewage Treatment and Disposal Regulations and Canadian Plumbing Code.

.2 An Information Package for Residential Property Owners is available from the County Office, which outlines design, material and installation standards and requirements for private sewage disposal systems.

.2 Private Sewage System Non-Residential

.1 A private sewage disposal system that is designed to receive more than 5.68m^3 of sewage per day must be designed for the specific site by a qualified professional engineer or an individual who holds a certificate of competency acceptable to the Administrator as appointed pursuant the Safety Codes Act.

.3 Communal Piped Sewage System

.1 Piped sewage collection systems may consist of either gravity lines or low-pressure lines. The specific type of system will depend on the layout, size and type of development as well as the existing infrastructure in the area. All communal sewage systems including municipal and co-op systems must be designed and installed according to the minimum standards outlined in this document. Other applicable standards include the Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems and Rural Utilities Act.

.4 Stormwater Management Systems

.1 The type of stormwater management system will largely be dictated by the roadway standards. All urban cross sections with curb and gutter will require a piped storm sewer system. Under certain circumstances, a combination of piped system and overland drainage may be accepted for an urban type development. Rural cross sections will employ an overland drainage system consisting of ditches and swales.

.2 All stormwater management systems will comply with the standards outlined in this document. Other applicable standards include the Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems.

.3 The Developer is responsible for the supply, placement and compaction of necessary fill for rough grading for the entire subdivision area including road right-of-way's, laneways, drainage/utility easements, municipal reserve and all lots. The rough grades should ensure that all stormwater is properly directed and managed regardless of the stage of lot development on either public or private property. No low areas that could promote standing water will be permitted at the rough grading stage.

SECTION D WATER DISTRIBUTION SYSTEM

D.1 GENERAL

.1 The Developer is responsible for ensuring that the water system is designed and constructed according to accepted engineering practice. These guidelines are intended as a guide only and must not be considered as a substitute for a detailed material and construction specification to be prepared by the Developer.

.2 Organizations issuing standards:

.1 ASTM – American Society for Testing and Materials

.2 AWWA – American Water Works Association

.3 CSA – Canadian Standards Association

.4 ABC – Alberta Building Code (firewater requirements for new construction)

.5 AFC – Alberta Fire Code (firewater requirements for new construction)

.6 NFPA – National Fire Protection Association

.7 Fire Underwriters Survey

.8 Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems

D.2 FLOW REQUIREMENTS

.1	Average Daily Demand	320 L/person/day
.2	Population Density (residential)	3.5 persons/residence
.3	Maximum Daily Demand	2 x Average Demand
.4	Peak Hourly Demand	4 x Average Demand
.5	Minimum Residual Water Pressure During Peak Hour Flow	280 kPa (40 psi)
.6	Minimum Residual Water Pressure During Maximum Day + Fire Flow	140 kPa (20 psi)
.7	Minimum Residual Water Pressure During Maximum Day Flow (for operation of residential fire sprinklers)	350 kPa (50 psi)

.8 Fire Flow: The County recognizes that due to the nature and limited extent of existing infrastructure and the high cost associated with developing off-site improvements necessary to support required flows of water for fire protection purposes, that the municipality will not provide the infrastructure necessary to deliver water flows required for fire protection in non-hamlet areas. Existing residential or industrial developments outside of the hamlet areas that have fire flow rates are to have fire flow rates maintained.

.1 Fire flow requirements will be required in the hamlet areas but not areas outside of the hamlets. Fire flow requirements must be in accordance with the Alberta Building Code, NFPA

1142 Standards and with the Insurer's Advisory Organization Standards. Generally, these are:

.1	Single Family Residential	3.64 m3/min.	(800 igpm)
.2	Town Houses	5.45 m^3/min.	(1200 igpm)
.3	Walk-up Apartments	9.10 m^3/min.	(2000 igpm)
.4	Schools	5.45 m^3/min.	(1200 igpm)
.5	Commercial	11.40 m^3/min.	(2500 igpm)
.6	Industrial	13.64 m^3/min.	(3000 igpm)

.2 Developers will be required to size any piped water distribution system such that the system can accommodate fire flow volumes if required off-site infrastructure is developed in the future.

.9 If municipal fire protection is required in the Development Agreement, piped systems must be designed to meet the fire flow requirements published by the Fire Underwriters Survey for the anticipated type of occupancy. Off-site improvements required by the Developer will be assessed on a case-by-case basis.

.10 Automatic sprinkler protection conforming to NFPA 13 standards is encouraged for all developments if the minimum flow and residual pressure requirements can be met.

.11 Where required by the Alberta Building Code, the Developer will design dedicated self-contained fire water storage and delivery systems in accordance with the Code and NFPA 1142 Standards for the building type and occupancy.

D.3 STORAGE REQUIREMENTS

.1 Municipal potable water reservoirs must be designed and constructed as an underground concrete reservoir and sized to accommodate 2 times maximum day demand when no fire storage is required.

.2 When fire storage is required, potable water reservoirs must be sized to accommodate the larger of:

.1 S = (A + B + C);

Where

S = Total storage requirement (m3)
A = Fire storage (m3)
B = Equalization storage = 25% of the maximum daily demand (m3)
C = Emergency storage = min. 15% of the average daily demand (m3)

.2 Disinfection contact time storage required to meet Provincial Government requirements; or

.3 2 x Maximum Day Demand

.3 All municipal water storage facilities must be designed with security features acceptable to the County. All fences, doorways and hatches must be lockable. Access must be restricted to authorized personnel.

D.4 PIPE SIZING

.1 Sizing of watermains must be determined by hydraulic network analysis. Results must be submitted to the County for approval.

.2 The minimum size for a distribution main must be 150mm for residential areas and 200mm for commercial and industrial areas. Lines must be sized to accommodate the anticipated land use.

.3 Where mains run for 200m or over without ties to other mains, the minimum pipe size must be 200mm.

.4 For lengths of pipe containing two or more hydrant connections without ties to other mains, the minimum pipe size must be 200mm.

.5 The maximum velocity under normal operating conditions must not exceed 3.0 m/s.

.6 Hazen-Williams “C” value must be 140 for PVC pipe.

.7 Analysis must be made to ensure that there is a minimum residual pressure of 280 kPa (40 psi) under Peak Hour Demand conditions.

.8 Separate analysis must be made to ensure that there is a minimum residual pressure of 140 kPa (20 psi) under Maximum Day Demand plus Fire Flow Conditions.

D.5 WATERMAIN ALIGNMENT AND LOCATION

.1 Watermains must be located within the road right-of-way and outside the carriageway in accordance with the typical roadway cross section.

.2 Watermains must be located a minimum of 2.5m o/c from any sewer line, 1.5m from any catch basin and 1.8m o/c from any gas line or as required by the utility company. Where power cables, telephone cables, television cables, or duct lines cross a watermain, they must maintain a minimum distance of 1.0m from any valve, hydrant or curb stop.

.3 Public Utility Lot widths must be at least 4.0m for a single utility and 6.0m for two utilities.

.4 Water distribution and transmission systems in new subdivisions must be looped wherever possible. Dead ends will be allowed in residential cul-de-sacs provided that the line is no longer than 120m. Hydrant or flush point to be located near or at a dead end.

D.6 REQUIRED DEPTH FOR WATERMAINS

.1 The watermain must be installed to provide a minimum cover of 3.0m from top of curb grade to the top of the pipe, or in lanes, 2.75m from centerline of the lane to top of the pipe.

.2 The watermain must have sufficient depth of cover to provide complete frost protection.

.3 The bottom of hydrant flanges must be located 50mm above finished grade. Invert depths at hydrant locations must be 2.55 m below the top of the curb.

.4 Under normal conditions, watermains must cross above the sewer with sufficient clearance to allow for proper bedding and structural support of the pipes. Pipe clearance when passing over any sewer must be a minimum of 300mm separation between the top of the sewer pipe and the bottom of the watermain.

.5 Pipe clearance when passing under any sewer must be a minimum of 500mm separation between the bottom of the sewer pipe and the top of the watermain. Efforts must be made to pass over the sewer when possible.

D.7 VALVE LOCATION AND SPACING

.1 The location and spacing of valves should be such that when the system is in operation:

.1 No more than two hydrants will be put out of service by a watermain shutdown

.2 No more than four valves are required to affect a shutdown

.3 No more than 30 lots are out of service due to a watermain shutdown

.2 Valves should be no greater than 800m apart on lines 450mm and larger.

.3 Valves must be located on the projection of the property lines or at the BC of curb returns at intersections.

.4 Valves must be located at both ends of a main passing through a utility lot or easement and must be placed 500mm from the property line.

.5 Flush point valves (min. 50mm) must be installed at the end of all dead-end lines.

.6 Valves must be the same size as the corresponding main.

D.8 HYDRANT LOCATION AND SPACING

.1 The maximum spacing between hydrants must be 150 m for single-family residential areas, 120 m in multiple-family residential and school areas, and 90 m in industrial / commercial areas.

.2 Hydrants must be located at the projection of the property lines or at the BC of curb returns at intersections.

.3 For cul-de-sacs, less than 75m in length, the hydrant must be located at or near the intersection.

.4 Hydrants must be located 1.5m from the curb face when there is no walkway and 2.7m from the curb face when monolithic curb and gutter sidewalk exists.

.5 Each hydrant must be connected to the main with a 150mm PVC branch controlled by an independent 150mm gate valve located at least 1.0m from the hydrant.

.6 Hydrants within commercial or industrial developments must be protected by steel bollards. The County may require bollards to protect hydrants within residential subdivisions that may be at risk of damage from vehicles.

.7 Hydrants must be located at the beginning of the curve of the curb return at the corner of an intersection.

.8 In cul-de-sacs which are 90m or less in length, the fire hydrant shall be installed on the intersection street at or near the intersection with the cul-de-sac.

.9 Hydrants to be shown on site plans, submitted with a subdivision application.

D.9 WATER SERVICES

.1 Separate water service connections must be provided for each separately titled lot.

.2 The minimum size of a residential water service must be 25mm. Non-residential service connections must be sized according to anticipated demand.

.3 Connections for all water services must be installed at the time of initial subdivision development.

.4 Curb stops must be located such that they do not conflict with driveway locations and must not be placed within concrete sidewalks or driveways.

.1 A separate service line with metering chamber 1.5m inside the property line may be required for each lot at the County's discretion. Refer to D.16.2

.2 A 3.5m utility easement is required to be registered on all lots.

.5 The water services must be installed to the property line. In areas where natural gas distribution facilities require an easement along the front of the property, the service connections must be extended to the edge of the easement furthest from the roadway.

.1 Residential water services must be installed in common trench with sanitary sewer and sump pump discharge collection services as depicted on the detailed drawings. Class B bedding must be used. Common trench installation is only permitted for sizes up to 50mm.

.6 The minimum allowable distance between main stops must be 600mm, and the minimum allowable distance between main stops and an adjacent collar or coupling must be 300mm. Each residential service connection must incorporate a horizontal gooseneck and utilize a corporation main stop. Connections must be staggered radially as required by PVC pipe manufacturers.

.7 For residential services, the symbol CC must be stamped in the sidewalk opposite the location of the curb cock.

.8 Parks may require a water service. The size, type and requirement will be determined by the County.

D.10 WATER PIPE MATERIALS

.1 General

.1 Approved piping material includes:

.1 AWWA C900 PVC DR 25, DR 18 or DR 14 (100mm to 1500mm diameter)

.2 AWWA C906 HDPE DR 11

.2 The Developer must supply and install only new materials. All materials found to be defective or damaged must be replaced at the cost of the Developer. The pipe must not be more than two years old at the time of installation.

.3 Records of quality control testing performed by the manufacturer must be made available upon request.

.4 Joint lubricants must be certified for potable water use in accordance with National Sanitation Foundation Standards.

.2 PVC

.1 All pipe materials and fabrication must conform to AWWA C900.

.2 PVC watermain from 100mm through 300mm diameter must be DR18, Class 235 (1620kPa), cast iron outside diameters with bell and spigot ends. PVC watermain from 450mm through 900mm diameter must be DR25, Class 165 (1138kPa).

.3 PVC pipe must be certified under CSA B137.3 and B137.0.

.4 The pipe must be supplied with integral wall thickened bell ends and jointless elastomeric gaskets conforming to ASTM F477.

.3 Polyethylene

.1 The use of polyethylene pipe requires prior approval by the County.

.2 All pipe materials and fabrication must conform to AWWA C901 or C906, as applicable.

.3 Polyethylene pipe must conform to CSA B137.1 and ASTM F714, D3035, D3350

.4 Watermain must be HDPE DR11 (Series 160).

.5 Moulded fittings must conform to ASTM D2683 or D3261

.6 Fabricated fittings must be manufactured from a pipe of the same series as that used in the piping system.

.7 Pipe must be joined by thermal butt-fusion, flange assemblies, compression type fittings or electro-fused fittings.

.8 Brass compression couplings must be used with stainless steel inserts.

.9 Couplers must be Victaulic Type 995 for use with HDPE piping or approved equal.

.10 Valves must be cast iron gates valves with flanged connections.

.11 Each pipe length must be marked for use with potable water, the manufacturer's name, nominal pipe size, dimension ratio, material grade, manufacturing standard, and a code indicating the date and place of manufacture.

.4 Steel

.1 The use of steel pipe requires prior approval by the County and must be used only under special circumstances.

.2 Steel watermain materials and fabrication must conform to AWWA C200 and ASTM A53. Compliance certificates must be made available upon request.

.3 The minimum yield strength must be 207 MPa.

.4 Pipe thickness must not be less than 6.35 mm.

.5 Pipes must have bevelled ends for field butt welding.

.6 Fittings must be standard weight seamless or welded with bevelled ends for butt welding.

.7 Flanges must be 150lb. forged ASA type.

.8 Each length of pipe must be hydrostatically tested by the manufacturer conforming to AWWA C200 and to a test pressure of not less than the determined by the following formula:

.1 $P = 2 \times S \times t/D$

Where

P = minimum hydrostatic pressure (kPa)
S = stress in pipe wall during a hydrostatic test (kPa), which must be 0.75 times the specified yield point of the steel used, unless otherwise specified.
t = wall thickness (mm)
D = outside diameter (mm)

.9 Each pipe must be marked with the manufacturer's name and the shipment number.

.5 Concrete, Steel Cylinder Type

.1 The use of concrete pressure pipe requires prior approval by the County and must be used only under special circumstances.

.2 Concrete water pipe must conform to AWWA C301 or C303.

.3 The minimum operating pressure must be 1035 kPa.

.4 The pipe must be supplied with bell and spigot ends complete with rubber gaskets.

.5 Steel connections must be lined and coated with cement mortar.

.6 Pipe must be manufactured using sulphate resistant Type 50 cement.

D.11 LININGS AND COATINGS

.1 The application of lining (pipe interior) and coatings (pipe exterior) applies to steel and ductile iron pipe.

.2 Cement mortar lining for use with ductile iron pipe must conform to AWWA C104.

.3 Epoxy coating and lining for use with steel and ductile iron pipes and fittings must conform to AWWA C210 or C213 for coatings or C210 for linings.

.4 Polyethylene coating for use with steel and ductile iron pipes and fittings must be Yellow Jacket No.1 extruded polyethylene as supplied by Shaw Pipe Protection Ltd. or approved equal. Provide Shaw Pipe Protection Ltd.'s Canusa polyethylene heat shrink sleeves for joints or approved equal.

.5 Cold applied tape coating for steel and ductile irons specials, joints and repairs must conform to AWWA C209, C217 or C214 as applicable.

.6 Polyethylene Encasement as per AWWA (8 mil High Density) is an acceptable form of corrosion protection for all Ductile Iron pipe and cast-iron fittings including thrust restraint devices. The acceptance of polyethylene encasement for corrosion protection has made the requirement for Hyprotec pipe obsolete. Ductile Iron pipe can now be used in sizes ranging from 150mm to 900mm design in accordance with AWWA C-150.

.7 Heat shrinkable coatings must conform to AWWA C216.

D.12 FITTINGS

.1 PVC Fittings

.1 Injection moulded fittings must conform to AWWA C907 and CSA B137.2.

.2 Extruded fittings must conform to AWWA C900 and CSA B137.3

.3 Fittings must be “push-on” type with elastomeric gaskets of pressure actuated seal design and must be used with PVC or ductile iron pipe.

.2 Steel Fittings

.1 Fittings for PVC, steel and concrete pressure pipe must conform to AWWA C200 and C208 with a minimum working pressure of 1035 kPa and a yield point strength of 207 MPa.

.2 Slip-on flanges of forged steel must conform to AWWA C207, Class D and flat faced or weld-neck flanges must conform to ANSI B16.1, Class 125.

.3 Use stainless steel double threaded studs with two nuts, ASTM A307, Grade B.

.4 Full-faced rubber gaskets must be used with 1035 kPa working pressure.

.5 Weldolets and threadolets of forged steel must comply with ASTM A105.

.6 Welding of shop-fabricated fittings must conform to CSA Z662.

.7 The exterior of all fittings must be factory coated with an epoxy coating conforming to AWWA C213.

.8 All fittings must require installation of a zinc sacrificial anode.

.3 Concrete, Steel Cylinder Type Fittings

.1 Fittings must conform to AWWA C301 or C303 as applicable.

.2 Push-on joints with vulcanized synthetic rubber gasket must be used.

.3 Cement must be sulphate-resistant Type 50.

.4 Steel connection must be coated and lined with cement mortar.

D.13 COUPLINGS AND ADAPTORS

.1 PVC couplings must conform to AWWA C900 or C907 as applicable.

.2 Bolted sleeve couplings must conform to AWWA C219 with ductile iron or carbon steel bodies with epoxy coating conforming to AWWA C213 or AWWA C550 as applicable. Couplings must have a minimum operating pressure of 1035 kPa. Linings must be in accordance with AWWA C210, C213 or C550 and be suitable for use with potable water.

.3 Flange adaptors must conform to AWWA C219 with ductile iron or carbon steel bodies with epoxy coating conforming to AWWA C210, C213 or C550 as applicable. The minimum operating pressure must be 1035 kPa. Flanges must conform to AWWA C207, Class D. Linings must be in accordance with AWWA C210, C213 or C550 and be suitable for use with potable water.

.4 Couplings for grooved and shouldered joints must conform to AWWA C606 and must have operating pressures, coatings and linings as above.

D.14 TAPPING SLEEVES

.1 Tapping sleeves must conform to AWWA C207, Class D with carbon steel body with a fusion bonded epoxy coating or Type 304 stainless steel.

.2 Tapping sleeves for concrete cylinder pipe must conform to AWWA Manual M-9, body and tapping gland to be fusion epoxy coated to AWWA C213, outlet flange to AWWA C207, Class D.

D.15 PIPE CASING

.1 Steel pipe casings to conform to AWWA C200, a minimum tensile strength of 207 MPa.

.2 Inside diameter of casing must be at least 50mm larger than the outside diameter of the carrier pipe bell and insulator runners.

.3 Use plastic / polyethylene carrier pipe insulators.

D.16 METERS

.1 The County utilizes Sensus meters. All water meters must conform to AWWA C700, C701 and C710.

.2 Meter chambers may be required at the property line for all properties with a building setback of 150 metres or greater at the County's discretion.

.3 The meter box must be Mueller/McCullough Thermal-Coil or approved equal.

.4 Chamber must be 380mm diameter PVC SDR 35 with a 3-metre bury.

.5 Chamber must be insulated on the sides with 50mm polyethylene insulation complete with 1.27 mm thick, high-density black polyethylene jacket. The jacket must be factory installed using the "U.I.P." system furnished by Urecon Ltd. or approved equal. The top must be insulated with 100mm factory supplied insulation.

D.17 VALVES

.1 Valves - General

.1 All water valves must be certified to National Sanitation Foundation (NSF) Standard 61 – Drinking Water System Components: Health Effects and Standard 14 – Plastics Piping System Components and Related Materials.

.2 All valves must be provided with stainless steel bolts.

.3 Provide operating nuts located between 1.0 and 3.0m below ground surface with rock shields on all valves.

.2 Gate Valves for Buried Service (100mm – 300mm)

.1 Gate valves must conform to AWWA C500 for bronze mounted solid wedge valves or C509 for resilient seated valves.

.2 Valves must be an iron body; bronze mounted gate valve with non-rising stem, bell ends, single ring gasket and push-on joints for connecting to pipe with cast iron outside diameter.

.3 Provide “O” ring seal for the valve stem.

.4 Provide 50mm square operating nut turning clockwise to close.

.5 Interior to be factory epoxy coated conforming to AWWA C550. Corrosion protection to be provided by the installation of a zinc sacrificial anode.

.6 Cast iron valve casing conforming to ASTM A48, Class 25, screw or sliding type with epoxy coating conforming to AWWA C213. Valve casings located within roadways or sidewalks must be screw type only.

.7 For blow offs, valves to be flanged to AWWA C207, Class D.

.3 Gate Valves in Chambers (450mm – 1500mm)

.1 Must conform to same standards as above, in addition, provide 50mm square operating nut with hand wheel, horizontal setting, bevel gears, position indicator. Provide by-pass with gate valve to equalize pressure on opening and closing the main valve.

.4 Butterfly Valves in Chambers (450mm and larger)

.1 All butterfly valves must conform to AWWA C504, Class 150B, short body, flanged, wafer or fully lugged, cast iron body, rubber seat, bronze disk.

.2 Provide removable “O” ring shaft seals.

.3 Provide manual geared buried service actuator conforming to AWWA C504.

.4 Provide screw type valve casing.

.5 Exterior and interior factor applied epoxy coating conforming to AWWA C550. Corrosion protection to be provided by the installation of a zinc sacrificial anode.

.5 Check Valves

.1 Swing check valves must only be used for sizes 300mm and smaller conforming to AWWA C508, cast iron body, bronze trimmed cast iron disk, flanged end to ANSI B16.1, bronze seat rings. Minimum 1035 kPa working pressure.

.2 Slanting disc check valves must be used for sizes 300mm and greater, cast iron body ASTM A126, Grade B, flanged ends to ANSI B16.1, ductile iron disk to ASTM A536, bronze seat and disc rings, stainless steel pivot pins and bushing to ASTM T304, valve position indicator. Minimum 1035 kPa working pressure.

.3 Double door check valves must have a cast iron body to ASTM A126, aluminum bronze gates to ASTM B148, Grade B, stainless steel spring 316SS, stainless steel stop pin, ANSI 125# flanges, wafer or threaded lug type, Buna N valve seat. Minimum 1035 kPa working pressure.

.4 Silent check valves must be wafer style or globe type, cast iron body to ASTM A126, Grade B, bronze trim, stainless steel spring 316 SS, Buna N valve seat, ANSI 125# flanges. Minimum 1035 kPa working pressure.

.5 Rubber flapper check valves must have a cast iron body, rubber lined Buna N replaceable flapper, “O” ring seating. Minimum 1035 kPa working pressure.

.6 Pressure Reducing Valves

.1 Valves 200mm and smaller must be of single diaphragm type. Valves 250mm and larger must be double diaphragm type.

.2 Valves must be globe style, hydraulically operated; pilot controlled with flanged cast iron body to ANSI B16.1, Class 125. Valves must have type 304 stainless steel seat and stem.

.7 Flow Control Valves

.1 Valves must be diaphragm type, globe or angle style with cast iron body and bronze trim.

.2 Provide an “O” ring seat seal on main valve and strainer and needle valve on pilot inlet lines.

.8 Air Valves

.1 All air valves must conform to AWWA C512 with cast iron body and stainless-steel float. Minimum working pressure must be 1035 kPa.

D.18 HYDRANTS

.1 All hydrants must be either Canada Valve or McAvity model hydrants unless otherwise approved by the County.

.2 All hydrants must be certified to NSF Standard 61 – Drinking Water System Components: Health Effects and Standard 14 – Plastics Piping System Components and Related Materials.

.3 Compression type hydrants must be supplied conforming to AWWA C502 for dry barrel fire hydrants.

.4 Hydrant must be designed for 1035 kPa working pressure.

.5 Hydrants must be self-draining, and a gravel drainage pit must be provided on each hydrant lead. Where the hydrant lead is located below the water table, the hydrant drain port must be plugged. The County must be notified of any hydrants with plugged drain ports prior to construction. The record drawings must clearly indicate each plugged hydrant.

.6 Hydrants must have one pumper connection, 146mm outside diameter, and two hose connections (63.5mm) with Alberta Mutual Aid thread at least 415mm above the ground flange. Nipples must be provided with caps without chains or cables. The hose and pumper caps and hydrant valve must open counter-clockwise.

.7 Hydrants must consist of a minimum 2.45 m barrel with 300mm extension.

.8 Hydrants must have a 150mm cast iron outside diameter inlet elbow with bell end and harnessing lugs. Elbow must be flanged to the barrel.

.9 Valve stem in hydrant head to have “O” ring seals.

.10 Operating nut must be three-sided, each side being a 36.5 mm long arc.

.11 Hydrants must have stainless steel bolt assemblies throughout.

.12 A 150mm gate valve must be provided on each hydrant lead.

.13 External paint must conform to AWWA C502 – corrosion resistant – lime green/yellow as approved by the County.

D.19 SERVICE CONNECTIONS

.1 Water service pipe must be Type K Copper conforming to AWWA C800, Series 200 Municipal Tubing conforming to CSA B137.1 or Series 160 Polyethylene tubing conforming to AWWA C901 and CSA B137.1

.2 Minimum service size must be 25mm for main stops, piping and curb cocks where the service length is 30m or less. Where service lengths exceed 30m, the minimum service size must be 38mm.

.3 For water services 100mm and larger, match pipe, fittings and valves to main pipe materials.

.4 Provide corporation main stops, service saddles, curb cocks, service boxes and couplings according to the materials approved by the City of Edmonton. Compression connections with stainless steel inserts are required for all materials.

.5 All fittings must be designed for an operating pressure of 1035 kPa.

.6 Water service saddles must be stainless steel type 304, bronze or a combination. Bronze components must conform to ASTM B62. Single or double band design.

.7 Service saddles for use on polyethylene pipe must be Romac type 101, 202, 305 or 306 series, Robar 2706 or approved equal for use on polyethylene pipe.

.8 Operating rods must be Type 304 stainless steel with brass cotter pins.

.9 Water service lines may be laid in the same trench as sewer service lines.

.10 Curb cocks must be marked with a red 50mm by 50mm by 1.50m marker projecting 0.60m above finished ground elevation. Curb cock boxes must be installed in collapsed position unless directed otherwise by the County. Curb stops must be placed 0.3m (1 foot) from the property line within the public right of way.

D.20 CATHODIC PROTECTION

.1 Cathodic protection must be provided for all steel and ductile iron pipe, cast iron fittings, valves and hydrants.

.2 Magnesium and zinc anodes must conform to the standards of the City of Edmonton.

D.21 TRENCHING, BEDDING AND BACKFILLING

.1 All trenching and backfilling must be completed in strict accordance with the Occupational Health and Safety Code.

.2 If unsuitable soil conditions are encountered, proper measures for dealing with the conditions must be identified either on the design drawings or as a brief report to the County prior to construction.

.3 Class “B” pipe bedding must be utilized in suitable soil conditions. Washed rock must be used if the water table is above the pipe zone. Bedding sand must have a minimum depth of 150mm below the pipe, must extend up both sides to the trench wall and provide a minimum cover of

300mm above the pipe. The Developer must identify special pipe foundation measures for areas where unsuitable pipe foundation conditions exist.

.4 The minimum trench width measured at the pipe springline must be the pipe outside diameter plus 450mm. The maximum trench measured at the pipe springline must be the pipe outside diameter plus 600mm. The County must be notified if the trench must be excavated deeper or wider than specified.

.5 Excavated material must be stockpiled at a safe distance from the edge of the trench.

.6 The Developer must identify areas where the trench excavation requires sheathing, shoring or bracing in order to protect workers, property or adjacent structures.

.7 Trench excavations must be kept free of water.

.8 It must be the Developer's responsibility to ensure that the utility trenches are adequately compacted.

.1 Native backfill under existing or proposed roads or laneways must be compacted throughout the entire right-of-way width to:

.1 98% standard proctor density from subgrade to 1.5m below subgrade or original ground, whichever is lower;

.2 95% standard proctor density greater than 1.5m from the subgrade or original ground, whichever is lower;

.2 Granular backfill under existing or proposed roads or laneways must be compacted to 95% of standard proctor density throughout the entire trench depth below subgrade and the entire right-of-way width.

.3 Backfill in all other areas must be compacted to 95% standard proctor density.

.4 Subgrade and base course compaction for roadway construction must meet the geotechnical requirements of the roadway.

.5 If the above standards cannot be achieved due to a large variation in soil types throughout the development, the County may at its sole discretion, establish a more appropriate standard on an individual case basis. One-mould proctor density testing may be permitted if the Developer submits an acceptable proposal, justifying the required changes to the compaction standards.

.9 If the minimum compaction standards cannot be met due to abnormal weather or wet ground conditions, the County may establish a more suitable standard on a site-specific basis provided adequate justification is presented by the Developer. One-mould proctor density testing will not be permitted as an alternate testing procedure due to wet soil conditions. The Developer will be required to suggest appropriate measures such as drying in-situ material or importing suitable material to meet the required Standard Proctor Densities.

.10 All landscaping, pavement structures, sidewalks, curb and gutter damaged or removed during trenching must be restored or replaced unless otherwise directed by the County.

.11 All debris, surplus fill and unused materials must be removed from the site.

D.22 WATERMAIN INSTALLATION

.1 The pipe and gasket installation must be conducted in compliance with the pipe manufacturer's specifications.

.2 Installation of PVC pipe and fittings must conform to AWWA M23 and AWWA C605.

.3 Installation of ductile iron pipe and cast-iron fittings must conform to AWWA C600.

.4 Installation of concrete steel cylinder pipe must conform to AWWA M9.

.5 Field welding procedures must be in accordance with CSA Z662. Welders must be qualified as B pressure welders.

.6 Align pipes carefully when joining. Keep joints free of mud, gravel and foreign material and ensure that the joint is complete as outlined in the manufacturer's specifications. Complete each joint before laying the next length of pipe. Deflections must not exceed those permitted by the manufacturer.

.7 The pipe must be thoroughly flushed of all dirt, stones and pipe lubricant when complete.

.8 The alignment of pipes less than 900mm in diameter must not be more than 150mm off the designated alignment. The alignment for pipes larger than 900mm must not deviate by more than 50mm per 300mm of diameter.

.9 The invert of the pipe must not deviate from the design grade by more than 40mm.

D.23 OPERATION OF BOUNDARY VALVES & EXISTING HYDRANTS

.1 County representatives must be notified at least 48 hours (two full business days) in advance of valve operation requirements. County personnel must operate the boundary valves.

.2 The Developer must obtain permission for using a hydrant as a water source for construction. Arrangements for payment for water used may be required. County representatives may outline conditions of use depending on the circumstances.

D.24 VALVE INSTALLATION

.1 Valves, valve casings and fittings must be installed in accordance with the manufacturer's specifications.

.2 All valves must be installed with a concrete thrust block.

.3 Valve casings must be between 5 – 15 mm below grade for unpaved areas and at grade for paved surfaces and sidewalks.

.4 Upon completion, all valve casings must be checked to ensure that they are plumb and that the operating nut can be turned properly.

D.25 HYDRANT INSTALLATION

.1 Hydrants must be installed in accordance with the manufacturer's specifications and AWWA M17.

.2 All hydrants must be installed with a concrete thrust block.

.3 A gravel drain must be provided at the base of the hydrant barrel consisting of a minimum of 1.0 m3 of washed rock.

.4 Hydrant drain ports must be left open except where the water table is above the hydrant drain. The County must be notified of hydrants with plugged drain ports.

.5 Upon completion, all hydrants must be checked to ensure that they are plumb and that the operating nut is functioning properly.

D.26 SERVICE INSTALLATION

.1 Residential water services must be installed in common trench with the sanitary and storm sewer services. Double services may be in a common trench to the property line.

.2 Tapping for residential service connections must be done with full operating pressure in the main. The tap must be made within 30° of the pipe crown and goose-necked to service trench level. The service line must be supported by sandbags until it reaches the trench level.

.3 A tapping valve and sleeve must be used for services 100mm and larger.

.4 Curb stops must be installed 300mm from the property line.

.5 Services crossing existing roadways and/or sidewalks must be augered, bored or tunnelled unless otherwise approved by the County.

.6 When placing the water service, it will always be on the right of the sanitary service.

D.27 INSPECTION AND TESTING

.1 Inspections

.1 All water installations must be subject to inspections by the County prior to issuance of the Construction Completion Certificate (CCC) and Final Acceptance Certificate (FAC).

.2 Compaction Testing

.1 The Developer is required to submit all compaction test results to the County for review prior to the issuance of the Construction Completion Certificate (CCC).

.3 Pressure Testing

.1 The entire system must be subjected to a hydrostatic pressure test in the presence of the County. The Developer is responsible for the supply of all necessary labour, materials and equipment to complete the testing. The Developer must notify the County at least 48 hours (two full business days) in advance of the testing.

.2 Select acceptable test sections in consultation with the County. The maximum length of distribution main test sections must be 450m. The maximum length of transmission main sections must be 800m.

.3 The test section must be filled with water 24 hours prior to the test. All thrust blocks must be cured and backfill partially or completely done.

.4 Ensure that all main valves and hydrant isolation valves in the test section are open and that the hydrants are closed.

.5 Ensure that all air is expelled from the section using hydrants and service taps at high points and dead-ends and raise the watermain pressure to the test pressure. The test pressure must be 150% of the working pressure measured at the lowest elevation or 1035 kPa whichever is greater.

.6 Note the pressure and water level at the beginning of the test. The test duration must be 2 hours. The pressure must be maintained within 20 kPa of the specified test pressure throughout the test.

.7 Measure the water level at the end of the test and calculate the observed leakage. Compare against the allowable leakage calculated as follows:

$$L = \frac{NDP^{\frac{1}{2}}}{128225}$$ for PVC pipe

$$L = \frac{NDP^{\frac{1}{2}}}{32046}$$ for Ductile Iron Pipe

where L = allowable leakage, L/hr

N = total number of joints

D = nominal pipe diameter, mm

P = test pressure, kPa

.4 HDPE Pressure Testing

.1 Before acceptance of any high-density polyethylene pipe water system, the entire system must be subjected to a hydrostatic pressure test in the presence of the County. The Developer must provide all the necessary labour, materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connectors, plugs, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure and expansion-leakage loss.

.2 Expel air from the collection system by slowly filling the main with water. High points must have automatic air/vacuum relief valves to vent air when filling and be closed when pressure is applied.

.3 A hydrostatic test pressure of 1.5 times the rated pressure of the pipe at the lowest point in the system main must be applied.

.4 Pressurized pipe to require test pressure over a 3-hour period and hold required test pressure for an additional hour to allow for pipe expansion and stretching prior to the leakage test.

.5 Test period must be for a 2-hour duration. Amount of water (leakage) required to return the pipe to required test pressure must not exceed the allowance given in the following table:

Field Testing of HDPE Waterline Systems

Nominal Pipe Size (mm)	Allowance for Expansion (L/100m)
50	1.6
75	1.9
100	3.1
150	7.5
200	12.5
250	16.2
300	28.7
350	33.7
400	41.1
450	53.6

.6 Total time under test pressure must not exceed 8 hours. If the test is not accepted due to leakage or equipment failure, the test section must be permitted to "relax" for an 8-hour period prior to the next testing sequence.

.7 Prior to the start of pressure and leakage, chlorination and bacteria testing, the Developer will be required to provide a plan outlining how the testing is to be accomplished. The plan must include the sequence of the valve turning, sections of water main to undergo pressure and leakage testing, how chlorination is being accomplished, and location when chlorine residual and bacteria tests are to be taken. Testing will not be allowed to proceed until the above is approved by the County.

.5 Disinfection

.1 Water mains are to be flushed and disinfected by the Developer in accordance with AWWA C651 continuous feed method.

.2 Chlorine residual tests must be performed at the beginning and end of the disinfection and again after flushing the lines.

.3 Approximately 16 hours after flushing the chlorine, one bacteriological sample for every 90 metres of main must be taken and submitted for analysis unless otherwise approved by the County. Where dead ends exist, samples must be taken at the end of the line. Approved bacteriological sample bottles from the Provincial Laboratory for Public Health or the local health unit must be used.

.4 The mains must not be commissioned and put into use until the bacteriological sample results are approved by the County.

.5 Under Provincial Government standards and guidelines, super chlorinated water used for disinfection of the system cannot be directed into a storm sewer, ditch drainage system or open water body. De-chlorination will be required before being discharged into the environment.

D.28 HYDRANTS

.1 At least one hydrant flow test must be conducted by the Developer in order to ensure that the flows and pressures identified in the design calculations are being provided in the field. If discrepancies are found, all hydrants in the development must be tested, and the Developer must indicate the corrective action that the Developer must undertake to remedy the deficiency.

D.29 SUMMARY OF WATER DISTRIBUTION SYSTEM STANDARDS

.1 The following is a list of standards applicable to water distribution system materials and construction. In all cases, it is intended that the latest version apply.

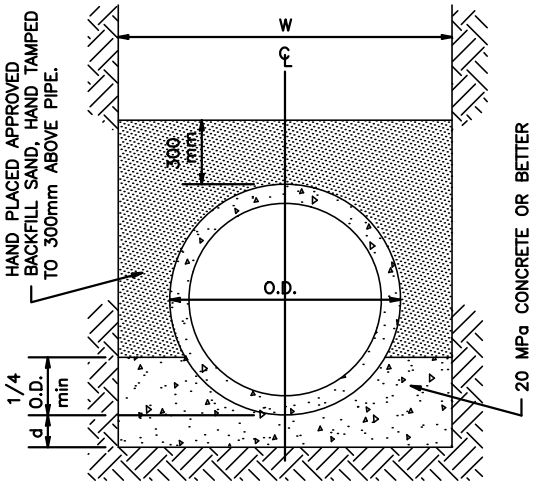
Standard	Title
CSA B137.0	Definitions, general requirements and methods of testing for thermoplastic pressure piping
CSA B137.1	Polyethylene Pipe, Tubing, and Fittings for Cold Water Pressure Services
CSA B137.2	PVC Injection-Moulded Gasketed Fittings for Pressure Applications
CSA B137.3	Rigid Polyvinyl Chloride (PVC) Pipe and Fittings for Pressure Applications
CSA A23.1 & A23.2	Concrete Specifications
CSA Z662	Oil and gas pipeline systems
AWWA C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C150	Thickness Design of Ductile-Iron Pipe
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast for Water
AWWA C200	Steel Water Pipe – 6 In. (150mm) and Larger
AWWA C205	Cement-Mortar Protective Lining and Coating for Steel Water Pipe – 4 In. (100mm) and Larger – Shop Applied
AWWA C207	Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In (100mm Through 3600mm)
AWWA C208	Dimensions for Fabricated Steel Water Pipe Fittings
AWWA C209	Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
AWWA C210	Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings
AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines
AWWA C214	Tape Coating Systems for Steel Water Pipe
AWWA C216	Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines

AWWA C217	Microcrystalline Wax and Petrolatum Tape Coating Systems for Steel Water Pipe and Fittings
AWWA C219	Bolted Sleeve-Type Couplings for Plain-End Pipe
AWWA C301	Prestressed Concrete Pressure Pipe, Steel-Cylinder Type
AWWA C303	Concrete Pipe, Bar-Wrapped, Steel-Cylinder Type
AWWA C500	Metal-Seated Gate Valves for Water Supply Services
AWWA C502	Dry-Barrel Fire Hydrants
AWWA C504	Rubber-Seated Butterfly Valves
AWWA C508	Swing-Check Valves for Waterworks Service, 2 In. Through 48 in. (50mm Through 1200mm) NPS
AWWA C509	Resilient-Seated Gate Valves for Water Supply Service
AWWA C512	Air Release, Air/Vacuum, and Combination Air Valves for Waterwork and Wastewater Service
AWWA C550	Protective Epoxy Interior Coatings for Valves and Hydrants
AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C605	Underground Installation of PVC Pressure Pipe and Fittings
AWWA C606	Grooved and Shouldered Joints
AWWA C651	Disinfecting Water Mains
AWWA C700	Cold-Water Meters – Displacement Type, Metal Alloy Main Case
AWWA C701	Cold-Water Meters, Turbine Type, for Customer Service
AWWA C710	Cold-Water Meters – Displacement Type, Plastic Main Case
AWWA C800	Underground Service Line Valves and Fitting
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100mm Through 1500mm)
AWWA C901	Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm) for Water Service
AWWA C906	Polyethylene (PE) Pressure Pipe and Fittings, 4 In. thru 65 In. (100mm Through 1650mm), for Waterworks
AWWA C907	Polyvinyl Chloride (PVC) Pressure Fittings for Water – 4 In. Through 12 In. (100mm Through 300mm)
AWWA M9	Concrete Pressure Pipe
AWWA M17	Fire Hydrants: Installation, Field Testing, and Maintenance
AWWA M23	PVC Pipe – Design and Installation

ASTM A48	Gray Iron Castings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A105	Carbon Steel Forgings for Piping Applications
ASTM A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A307	Carbon Steel Bolts, Studs, and Threaded Rod
ASTM A536	Ductile Iron Castings
ASTM B62	Composition Bronze or Ounce Metal Castings
ASTM B148	Aluminum-Bronze Sand Castings
ASTM D698	Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D2683	Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
ASTM D3035	Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
. ASTM D3261	Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Polyethylene Plastics Pipe and Fittings Materials
ASTM F477	Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F714	Polyethylene Plastic Pipe (DR-PR) Based on Outside Diameter

CLASS A BEDDING

L_f = 2.8



CLASS B BEDDING

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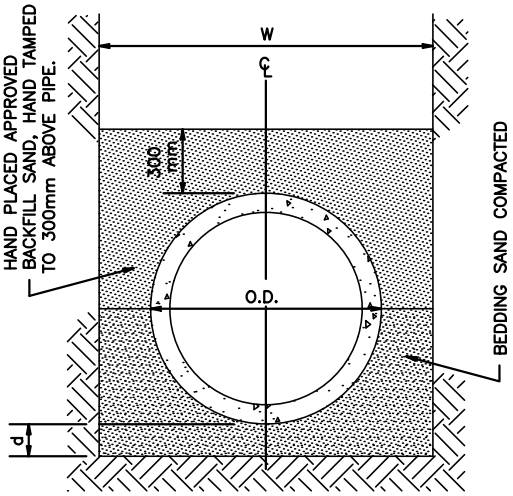

CLASS C BEDDING

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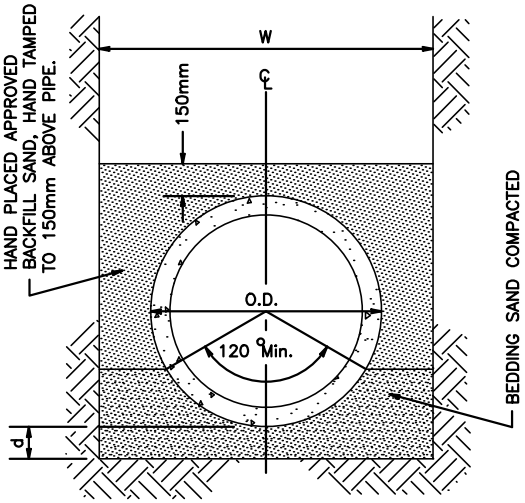
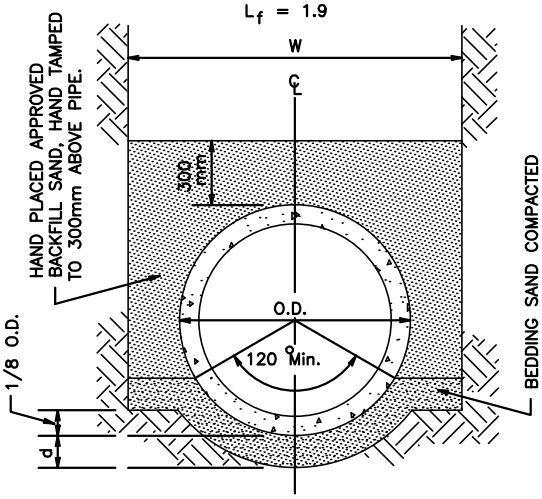


CLASS B BEDDING

ALTERNATE – 375mm I.D. & UNDER

L_f = 1.9



NOTES:

W = TRENCH WIDTH – O.D. + 450mm (MINIMUM)
– 1000mm max. FOR PIPES UP TO AND INCLUDING 400mm DIAMETER
– O.D. + 400mm max. (ON EITHER SIDE {800mm TOTAL}) FOR PIPE DIAMETERS 450mm AND ABOVE

O.D.= OUTSIDE PIPE DIAMETER
I.D. = INSIDE PIPE DIAMETER
L_f = LOAD FACTOR
d = DEPTH OF BEDDING BELOW PIPE
I.D.= 675mm OR SMALLER – d min = 150mm
I.D.= 750mm TO 1500mm – d min = 150mm
I.D.= 1650mm AND LARGER – d min = 150mm

NOTE: all dimensions in millimeters unless noted otherwise

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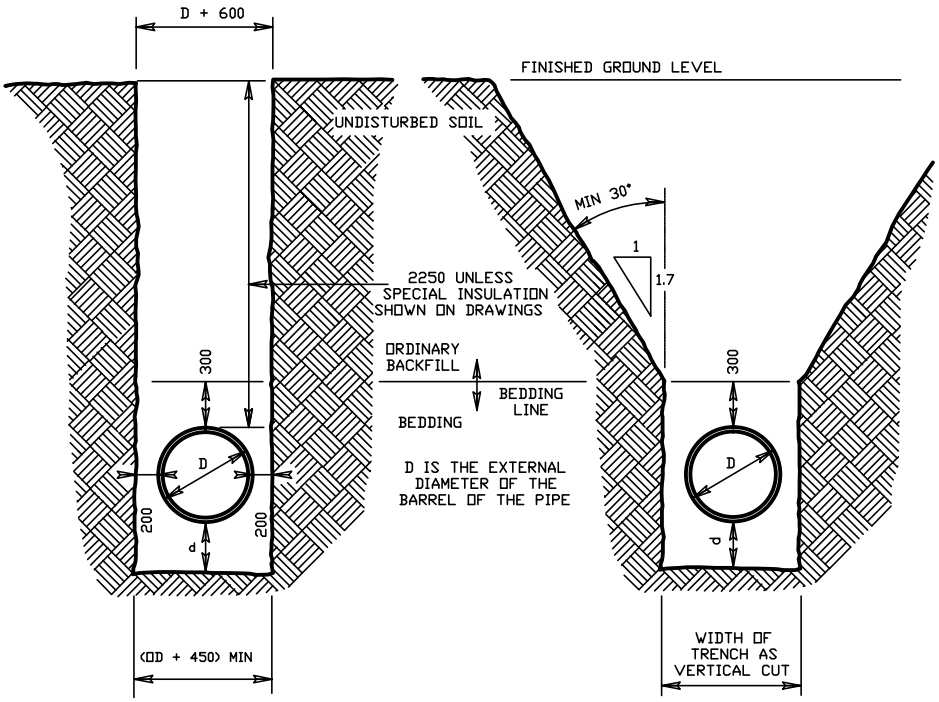
Rev.			STANDARD TRENCH BEDDING FOR CIRCULAR PIPES	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–01
Date: APRIL 2009	Drawn: TLB	Scale NTS		



STANDARD TRENCH VERTICAL CUT

(TO BE SHORED AS PER OCCUPATIONAL HEALTH AND SAFETY STANDARDS)

MAXIMUM TRENCH WIDTHS FOR SINGLE PIPES

- UP TO AND INCLUDING 400mm DIAMETER – 1000mm
- 450mm DIAMETER AND ABOVE – OD + 600mm

STANDARD TRENCH SLOPING CUT

(TO BE SLOPED AS PER OCCUPATIONAL HEALTH AND SAFETY STANDARDS)

DEPTH OF BEDDING BELOW PIPE BARREL (d)

- EXTERNAL DIAMETER OF 700mm AND BELOW :75
- EXTERNAL DIAMETER GREATER THAN 700mm :100

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

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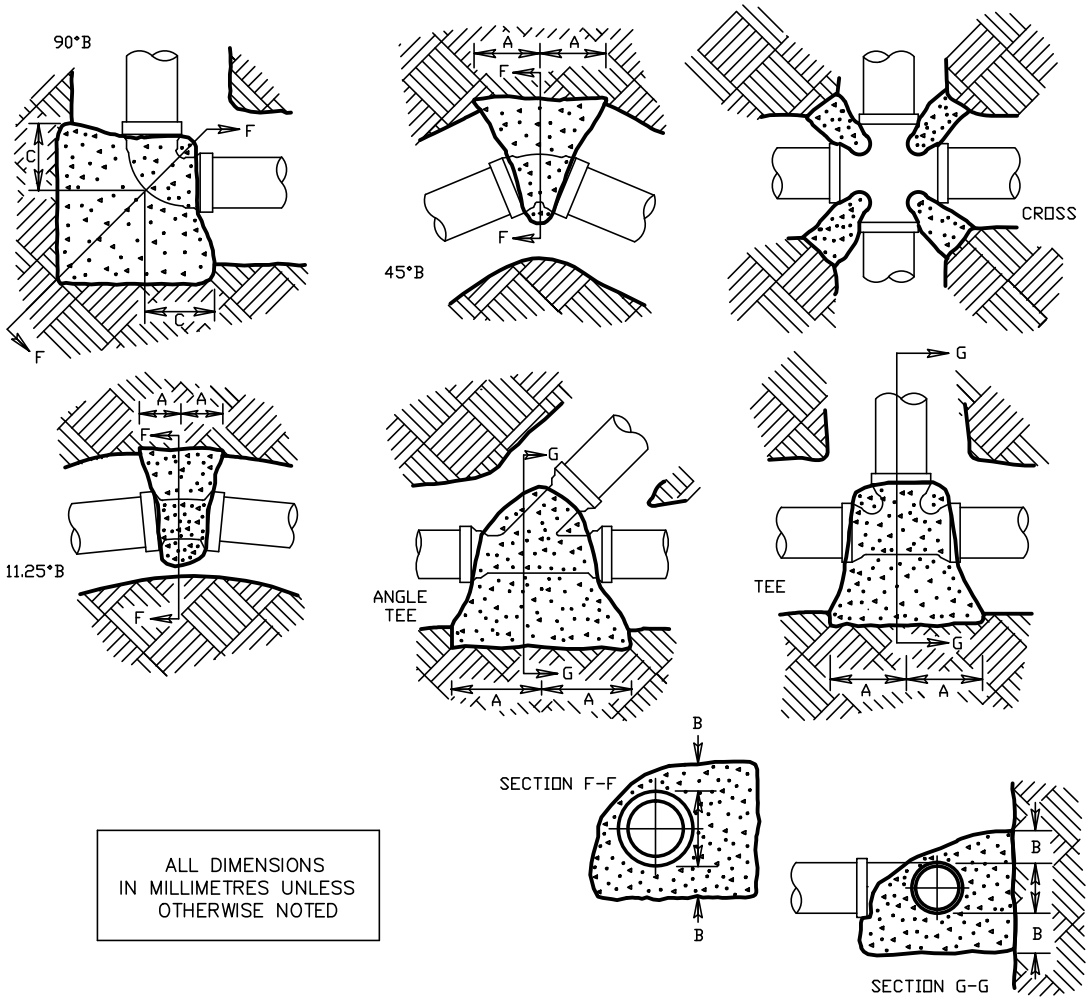
Rev.	wsp		STANDARD TRENCH DIMENSIONS FOR CIRCULAR PIPE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–02
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

REQUIRED BEARING AREA

	TEE BRANCH & DEAD END					22.5° & 11.25° BENDS					45°BENDS					90°BENDS				
DIA (mm)	300	250	200	150	100	300	250	200	150	100	300	250	200	150	100	300	250	200	150	100
A (mm)	975	775	550	375	250	300	225	200	150	100	550	450	375	300	200					
B (mm)	75	75	75	75	75	150	125	100	75	75	150	125	100	75	75	525	350	300	200	150
C (mm)																450	400	350	300	200
AREA (m^2)	1.025	0.750	0.475	0.275	0.125	0.50	0.275	0.200	0.150	0.05	0.800	0.550	0.375	0.225	0.100	1.475	1.025	0.700	0.400	0.175

NOTES:

1. DESIGN BASIS:
   a. HYDRAULIC PRESSURE 1035kPa (150 psi)
   b. SOIL BEARING CAPACITY 72kPa (1500 lb/sq.ft) (MEDIUM SOFT CLAY)
2. TEMPORARY BLOCKING MUST BE APPROVED BY THE ENGINEER
3. CONCRETE STRENGTH SHALL BE 25MPa AT 28 DAYS
4. CONCRETE TO BE CLEAR OF BELLS AND PIPE AND UNDER ALL FITTINGS

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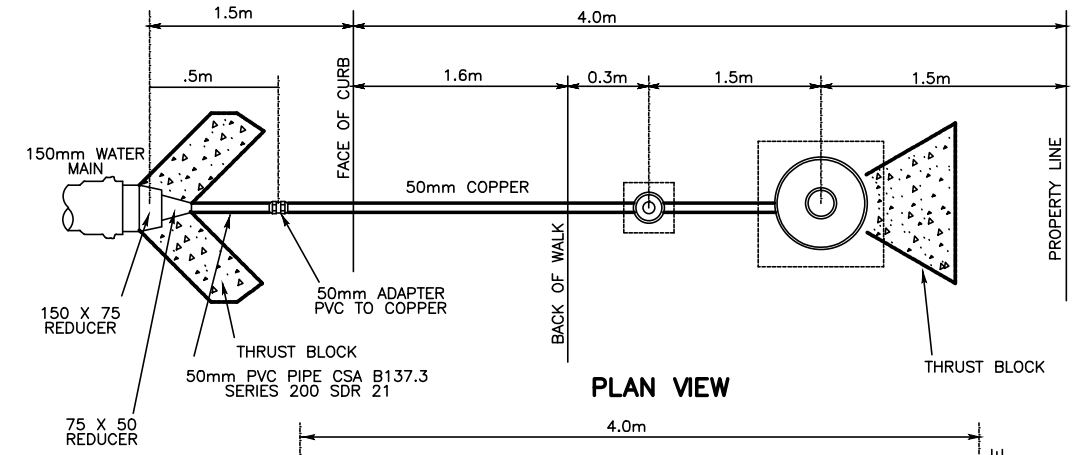
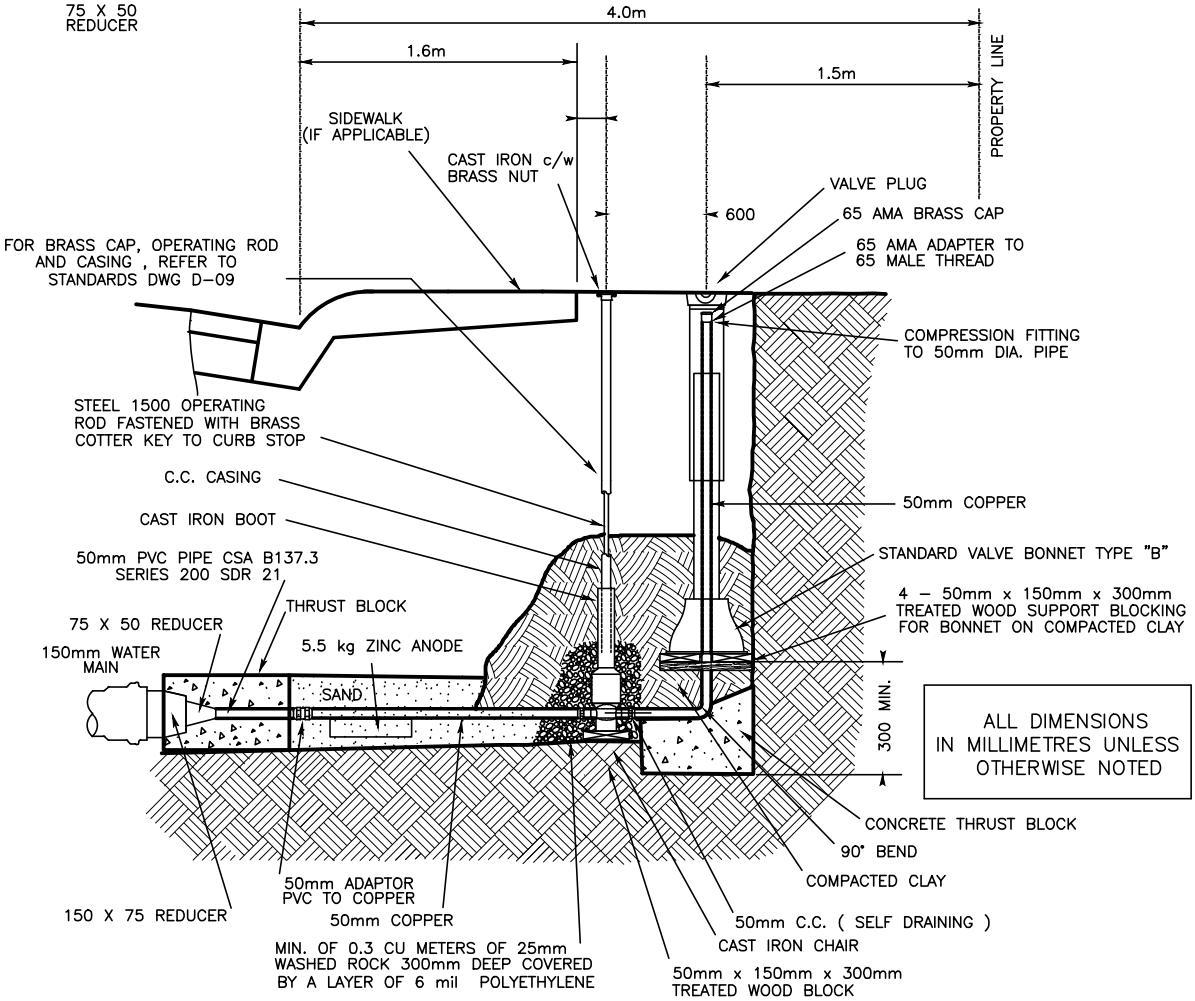
Rev.	wsp	HORIZONTAL CONCRETE THRUST BLOCK DETAILS	
Rev.			
Rev.			
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:
Date: APRIL 2009	Drawn: TLB	Scale NTS	Drawing D–03



PLAN VIEW



SECTION

LAC LA BICHE COUNTY

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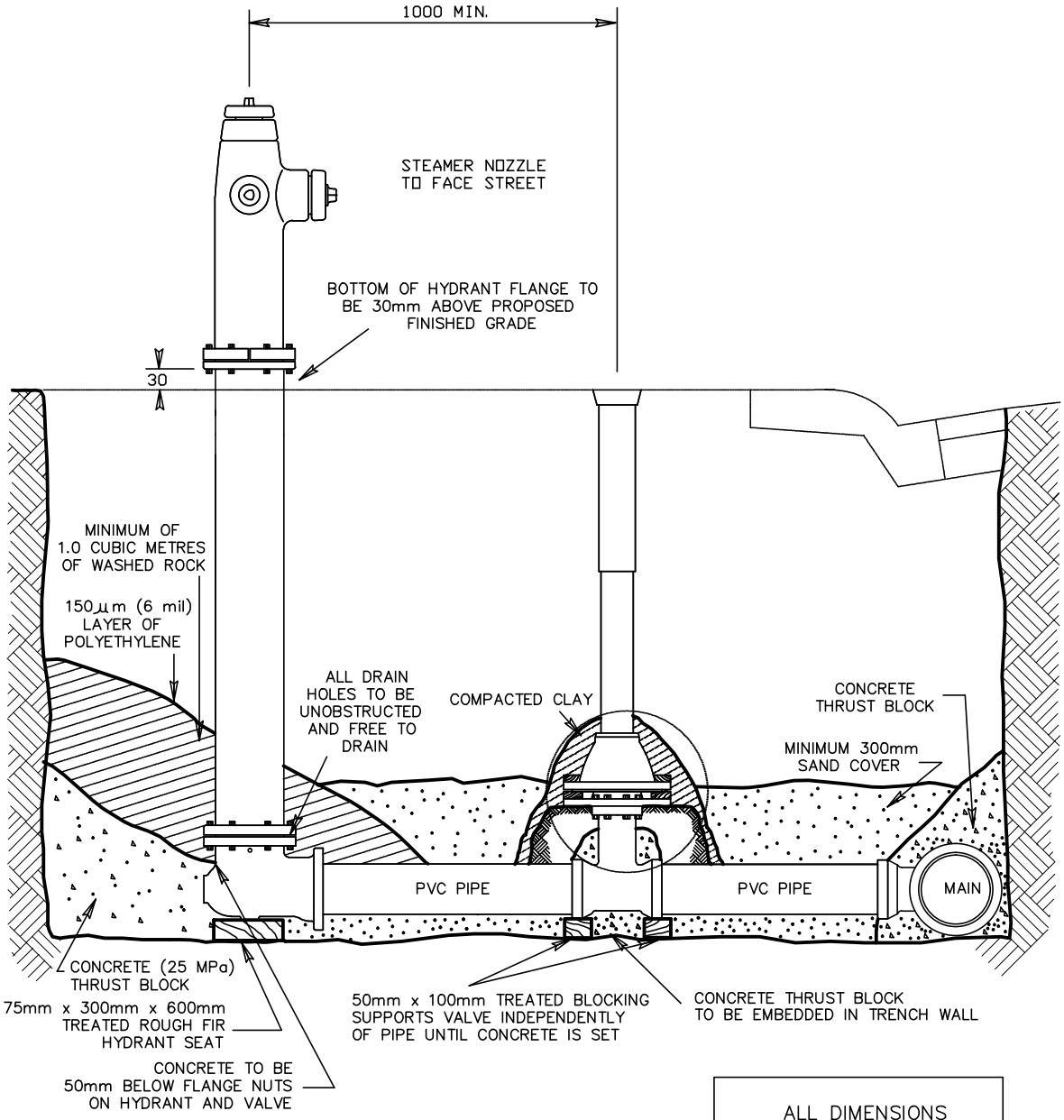
Rev.	wsp		FLUSH POINT DETAIL	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–04
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

NOTES:

1. GRADE AT BOTTOM OF HYDRANT FLANGE IS 30mm PLUS 20mm PER METRE DISTANCE FROM FACE OF CURB ABOVE ESTABLISHED (EXISTING OR PROPOSED) CURB TOP ELEVATION.

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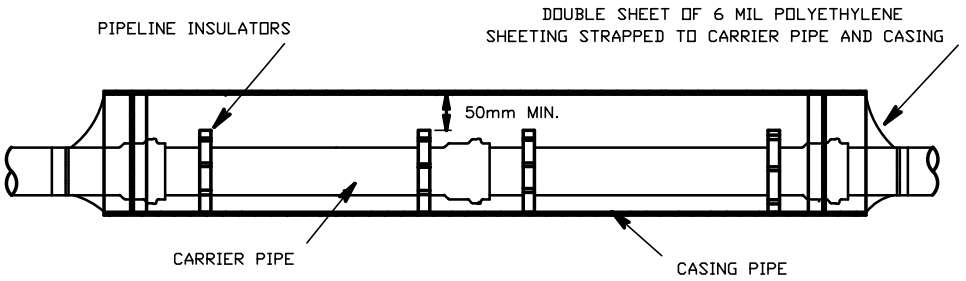
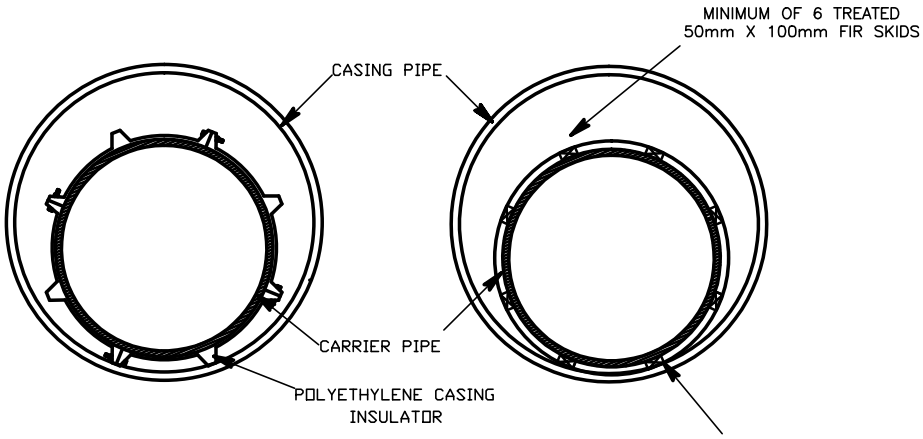
Rev.			TYPICAL HYDRANT CONNECTION	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–05
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ELEVATION



SECTION

ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

NOTES:

1. CASING MATERIAL AND THICKNESS TO BE AS SPECIFIED ON CONSTRUCTION DRAWINGS.
2. INSULATOR SPACING TO BE DETERMINED BY THE MATERIAL AND JOINT TYPE OF CARRIER PIPE BEING USED.
3. CASING COATING AND CATHODIC PROTECTION REQUIREMENTS TO BE AS SPECIFIED ON CONSTRUCTION DRAWINGS.

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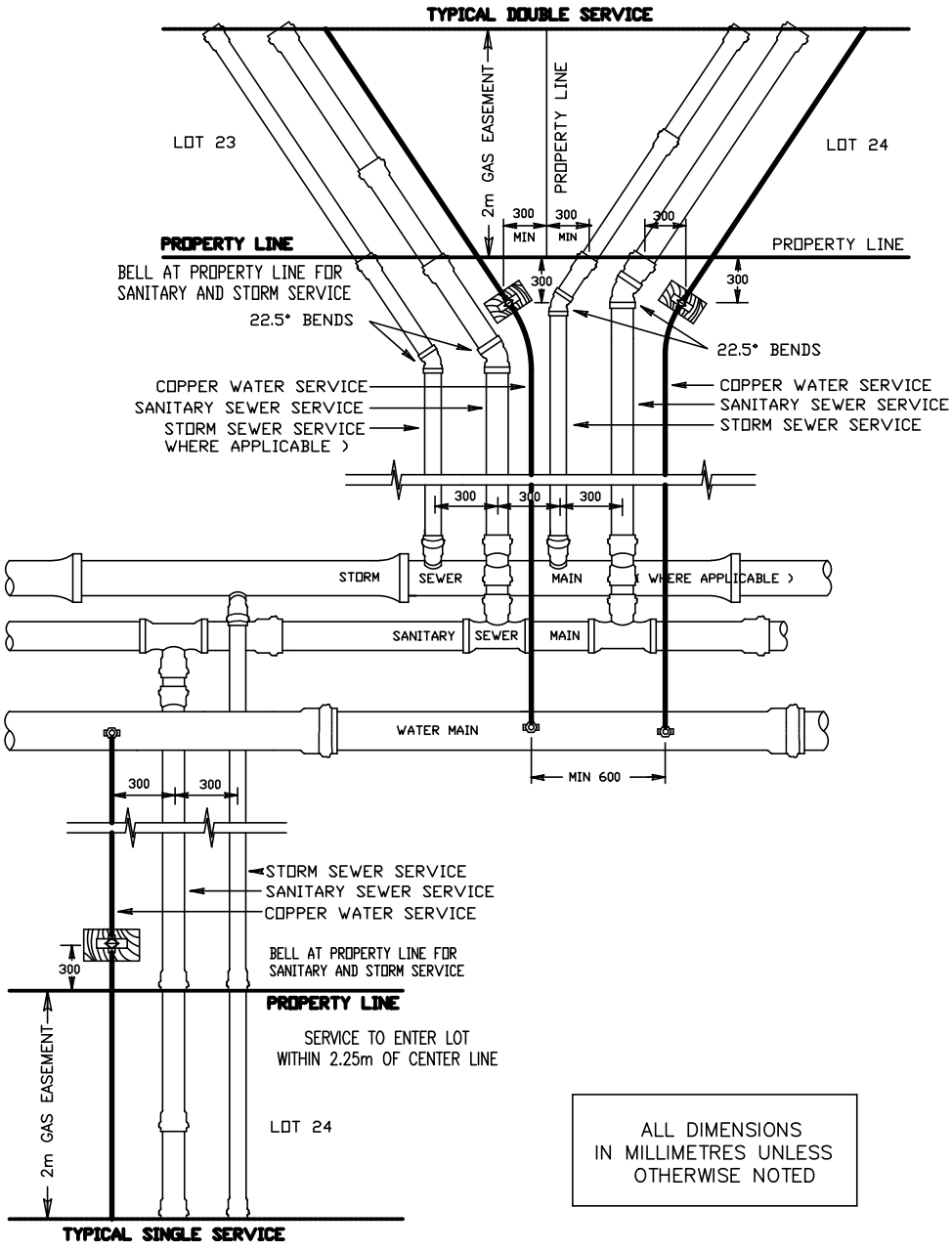
Rev.	wsp		TYPICAL CASING PIPE WITH INSULATOR	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–06
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

NOTES:

1. WATER AND SEWER SERVICES MAY BE EXTENDED TO EDGE OF 2.0m GAS EASEMENT.
2. THE CITY ACCEPTS NO RESPONSIBILITY FOR THE CONSTRUCTION OR MAINTENANCE OF SERVICES INSTALLED WITHIN THE EASEMENT.
3. MARK ENDS OF SERVICES AT EDGE OF GAS EASEMENT WITH A 50mm X 100mm X 750mm STAKE PROTRUDING 450mm ABOVE GROUND AND PAINTED BLUE. MARK THE CURB CONTROL VALVE WITH A SIMILAR STAKE PAINTED RED.
4. THE END OF COPPER WATER SERVICE PIPING SHOULD NOT BE CRIMPED CLOSED, PERMEABLE FILTER CLOTH MAY BE USED TO PREVENT INTRUSION OF DEBRIS AND TO ALLOW TESTING FLOW OF CURBSTOP.

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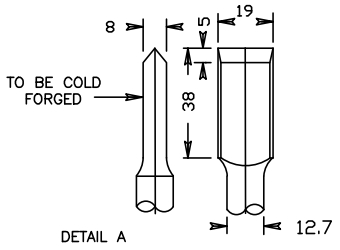
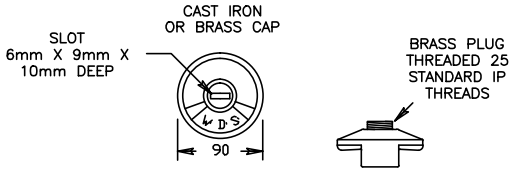
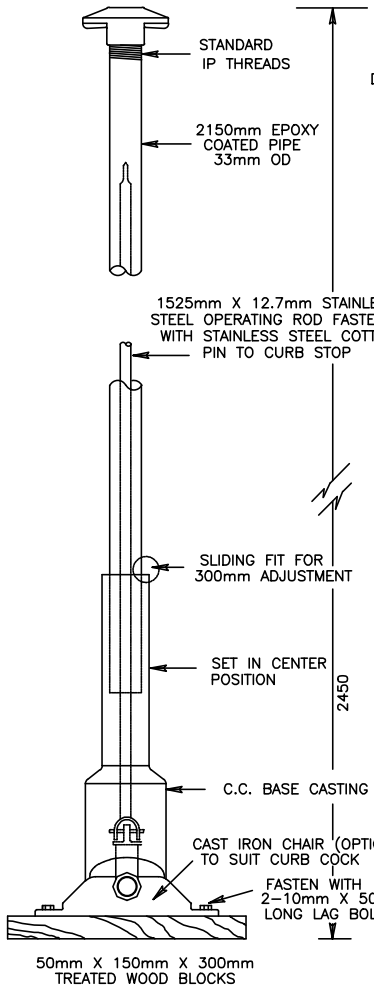
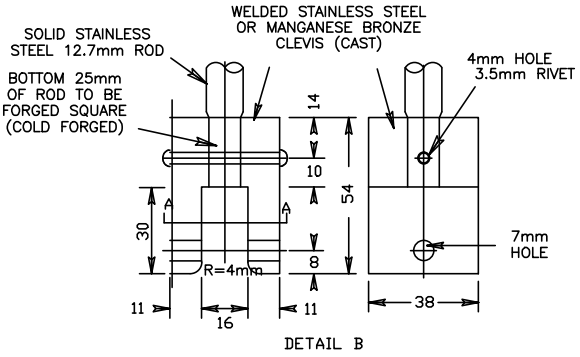
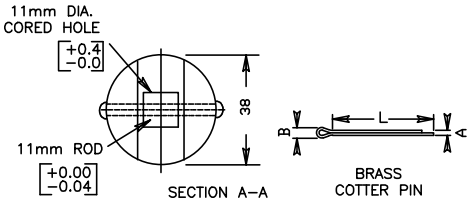
Rev.	wsp		TYPICAL SERVICES (SINGLE & DUAL)	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–07
Date: APRIL 2009	Drawn: TLB	Scale NTS		











COTTER PIN					
NOMINAL DIAMETER	DIAMETER A		OUTSIDE EYE DIAMETER B MINIMUM	HOLE SIZE RECOMMENDED	LENGTH L
	MAX.	MIN.			
6.35mm	5.7mm	5.6mm	12.7mm	6.7mm	55mm

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

NOTES:

1. OPERATING ROD SHALL BE SUPPLIED AS A SINGLE UNIT COMPRISED OF A SOLID STAINLESS STEEL ROD, ATTACHED TO A WELDED STAINLESS STEEL OR MANGANESE BRONZE CLEVIS WITH A STAINLESS STEEL RIVET.
2. THE MANUFACTURER'S NAME SHALL BE EMBOSSED ONTO THE CLEVIS.

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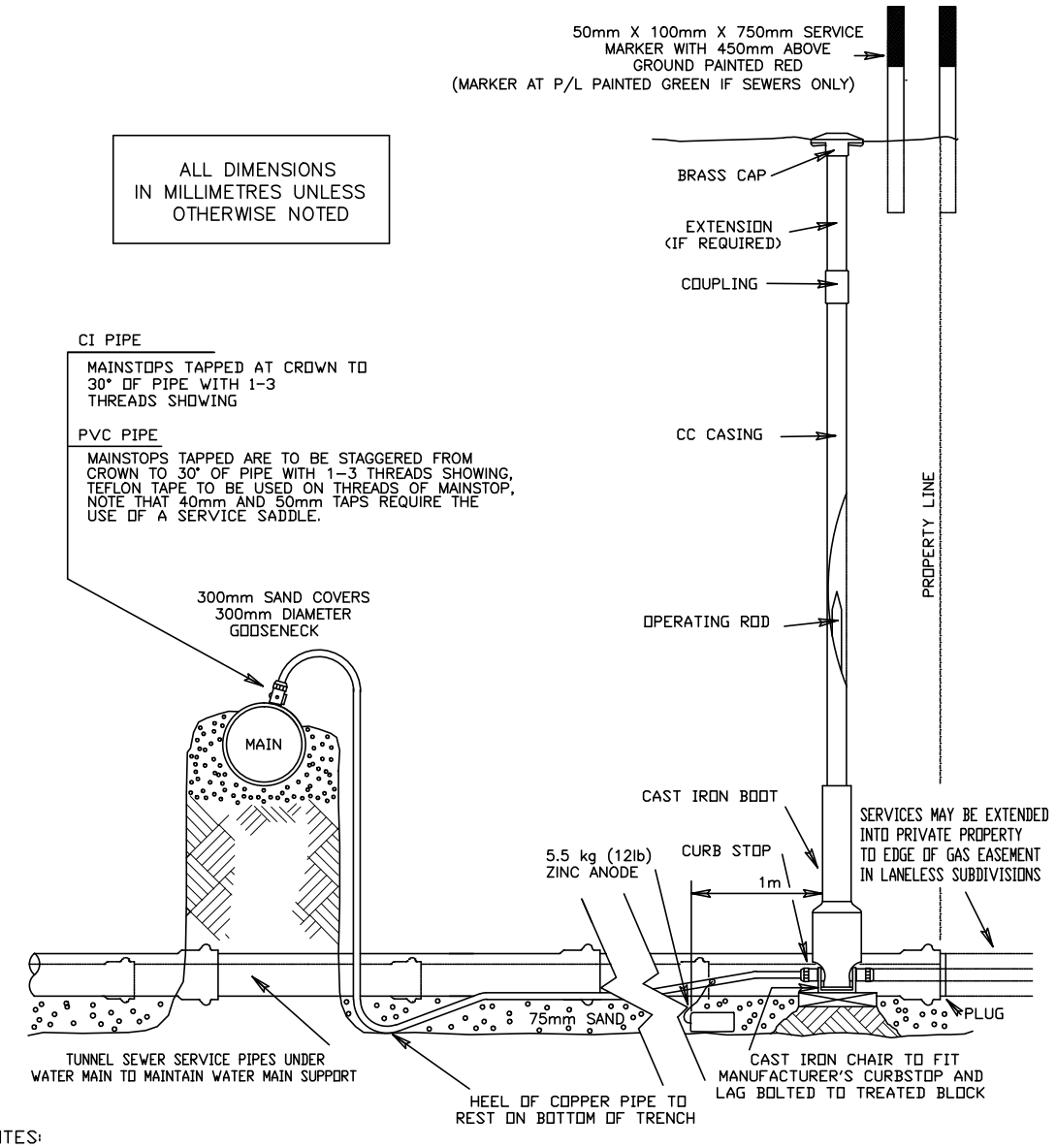
Rev.			SERVICE BOX DETAIL FOR 50mm & SMALLER WATER SERVICE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–08
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES:

1. AN ADDITIONAL GOOSENECK IS REQUIRED AT EACH SEWER CROSSING.
2. MAINSTOP TAPS SHALL BE A MINIMUM OF 600mm APART, AND NO LESS THAN 300mm FROM A COUPLING OR COLLAR.
3. COPPER SERVICE PIPE SHALL BE ONE CONTINUOUS PIECE, SHOULD LENGTH EXCEED 20m, A DOUBLE UNION WILL BE ALLOWED. SIZE OF COPPER SERVICE MUST BE 25mm MIN. IF LENGTH OF SERVICE EXCEEDS 20m.
4. INVERT ELEV. OF WATER SERVICE PIPES AT P/L SHALL BE 2.59m BELOW ESTABLISHED FINISHED GRADE.
5. WHERE ENGINEER APPROVED COVER OVER WATER SERVICE TO BE LESS THAN 2.59m SERVICE IS TO BE INSULATED.
6. ZINC ANODE SHALL BE ATTACHED TO COPPER PIPE 1.0m FROM CC WITH AN ALL BRONZE (INCLUDING NUTS AND BOLTS) CLAMP OR APPROVED EQUIVALENT.
7. ZINC ANODE TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR MIN. 50mm OF NATIVE CLAY SURROUNDING ANODE.

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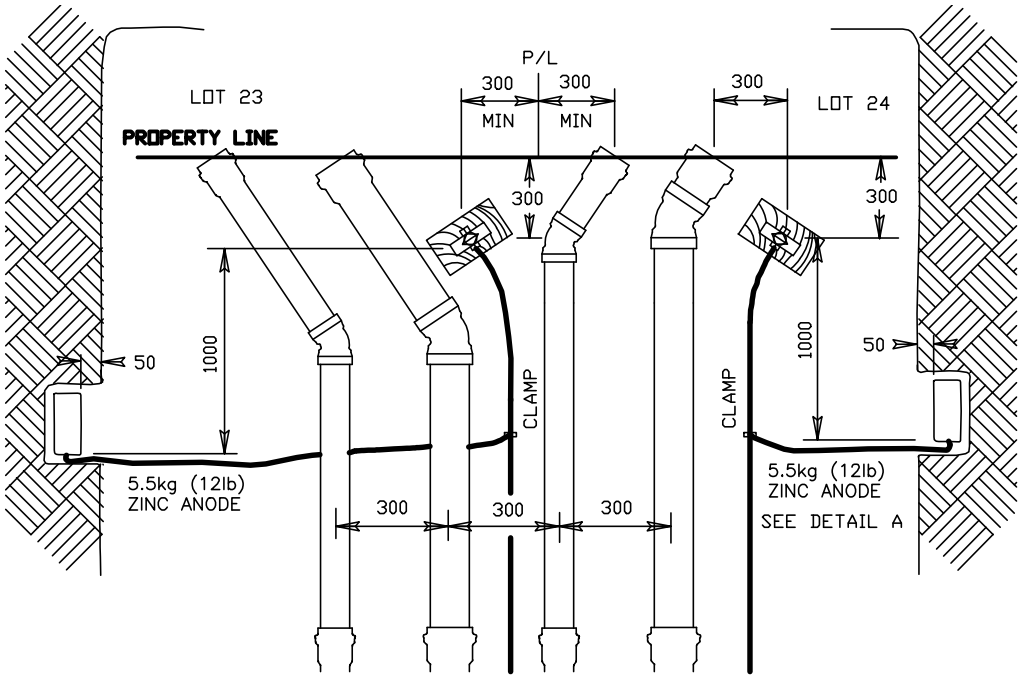
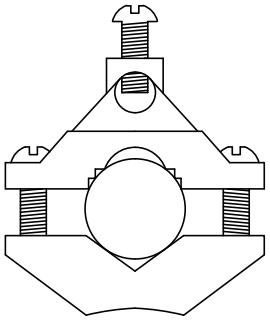
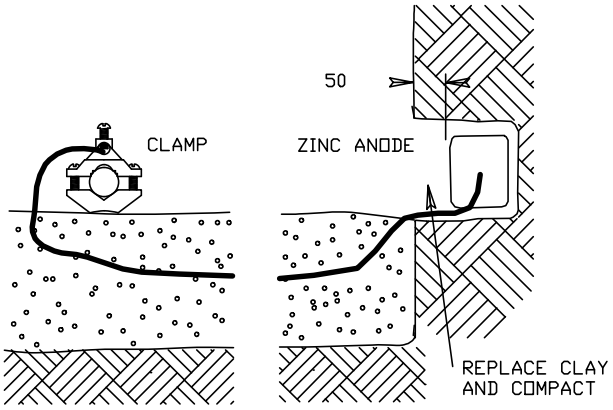
Rev.			TYPICAL 50mm & SMALLER WATER SERVICE FOR 300mm AND SMALLER WATER MAINS	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–09
Date: APRIL 2009	Drawn: TLB	Scale NTS		



PLAN VIEW



TYPICAL PIPE CLAMP



DETAIL 'A' TYPICAL

ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

NOTES:

1. PIPE CLAMP TO BE ALL BRASS OR APPROVED EQUIVALENT.
2. ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPACTED COMPLETELY AROUND ANODES.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

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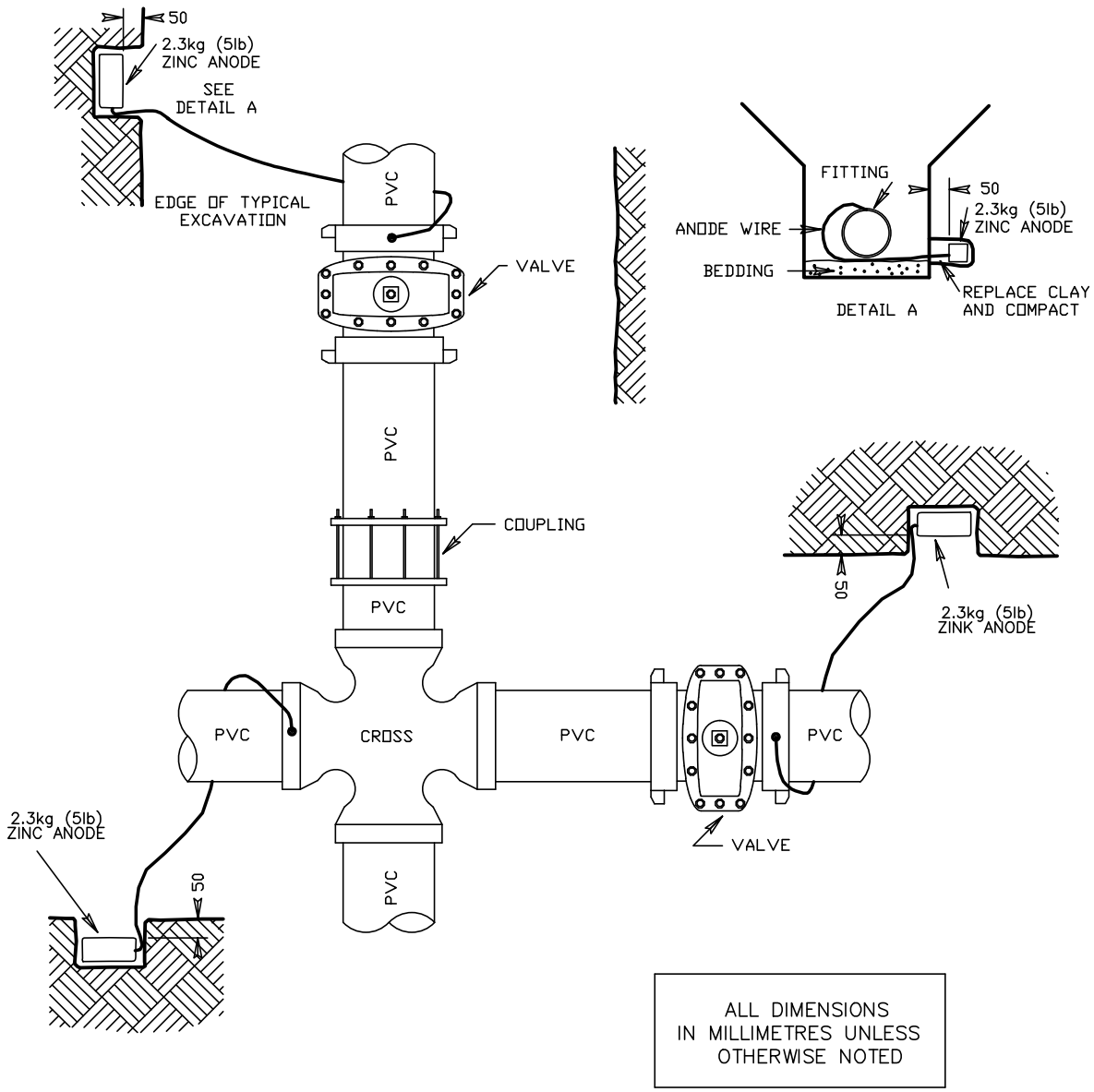
Rev.			ANODE ON 50mm & SMALLER COPPER WATER SERVICE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–10
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

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. ALL ZINC ANODES ON FITTINGS AND VALVES ARE 2.3kg (5lb).
4. ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm OF NATIVE CLAY COMPLETELY SURROUNDING THE ANODE.
5. ANODES TO BE AT LEAST 300mm CLEAR OF THRUST BLOCK

LAC LA BICHE COUNTY

General Municipal Servicing Standards

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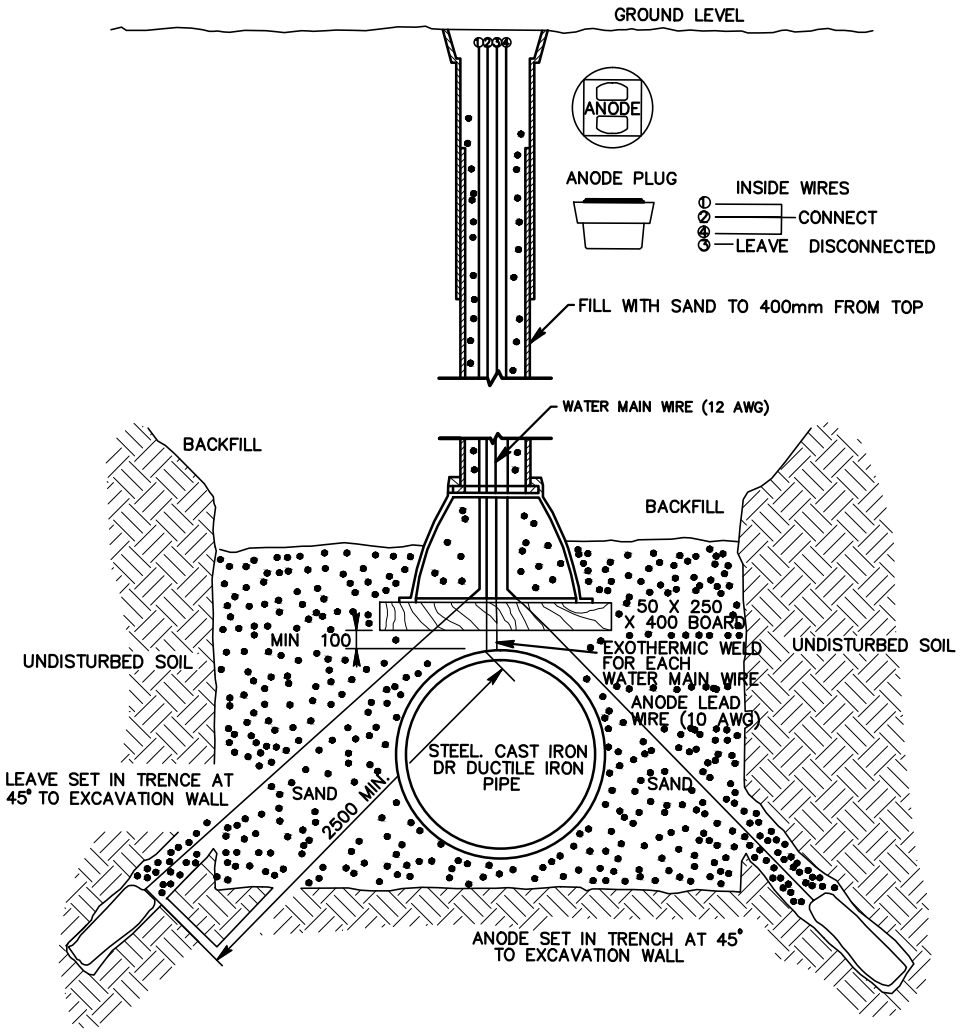
Rev.	wsp		TYPICAL ANODE INSTALLATION AT STEEL OR IRON FITTINGS USED WITH PVC WATERMAINS	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–11
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SPECIFIED.
2. NEW STEEL MAINS–INSTALLATION OF A THIRD ANODE TO BE SET IN TRENCE AT 45° EXCAVATION WALL AND A MINIMUM 3.0m CLEARANCE BETWEEN ANODES.
3. NUMBER, SPACING, TYPE AND WEIGHT OF ANODES TO BE DETERMINED BY ENGINEER

LAC LA BICHE COUNTY

General Municipal Servicing Standards

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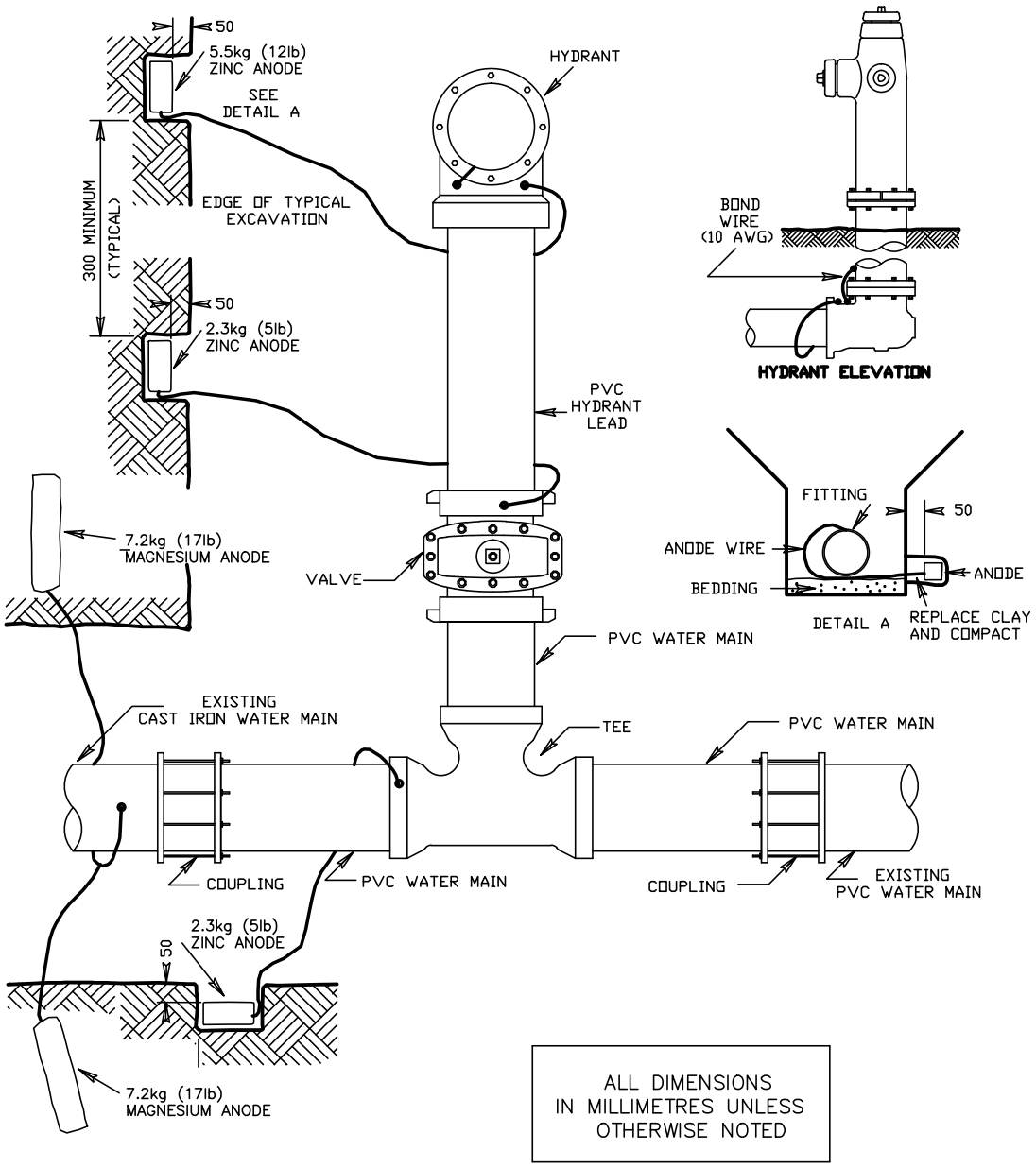
Rev.			ANODE INSTALLATION FOR STEEL AND IRON WATER MAINS	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–12
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES:

1. MIN. DISTANCE FROM ANODE TO PIPE IS 150mm.
2. INSTALL ANODE AT APPROX. PIPE DEPTH IN NATIVE SOIL.
3. ALL ZINC ANODES ON FITTINGS AND VALVES ARE 2.3kg (5lb).
4. ALL ZINC ANODES ON HYDRANTS ARE 5.5kg (12lb).
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.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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Rev.			ANODE INSTALLATION AT HYDRANT	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing D–13
Date: APRIL 2009	Drawn: TLB	Scale NTS		

SECTION E SANITARY SEWER SYSTEM

E.1 GENERAL

.1 The Developer is responsible for ensuring that the sanitary sewer system is designed and constructed according to accepted engineering practice. These guidelines are intended as a guide only and shall not be considered as a substitute for a detailed material and construction specification to be prepared by the Developer.

.2 Organizations issuing standards:

.1 ASTM – American Society for Testing and Materials

.2 CSA – Canadian Standards Association

.3 Alberta Environment Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems

E.2 FLOW GENERATION RATES

.1 The sanitary system shall be of sufficient capacity to carry peak flows plus an inflow and infiltration allowance. The flow and factors listed below shall be used as minimum requirements in the design of the sanitary sewer systems.

.1 Average Sewage Flow - 320 L/person/day for residential

- 6170 L/ha/day for non-residential, including infiltration

.2 For Preliminary Planning purposes 18.0 m^3/ha/day may be used for average sewage flow from Commercial Light Industrial development.

.3 Population Density - 3.5 persons/residence for residential

.4 Peak Sewage Flow - Average Flow x Peaking Factor

.5 Peaking Factor

.1 Residential, Harmon's Formula- $1 + 14/(4+P^{1/2})$

where P = the contributing design population in thousands.

If P<1, a peaking factor of 4.5 shall be used.

.2 Non-Residential - 3.0

Detailed analysis of the design requirements specific to each development proposal is required in cases of high non-residential flow producers. Measures to attenuate the flow into the collection system, such as on-site storage may be considered.

.6 Infiltration - 0.28 L/s/ha for residential

.7 Inflow at Sag Manholes - 0.4 L/s/manhole

For planning purposes and downstream system design, where specific requirements for an area are unknown, the designer must make a conservative estimate of the number of such

manholes which may be installed in the contributing area based on the nature of the anticipated development and include an appropriate allowance in the design.

.2 The total design peak flow rates for the sanitary sewer shall be the sum of the peak flow rates plus all extraneous flow allowances.

E.3 GRAVITY SEWER PIPE SIZING

.1 The following design factors shall be used in determining the sanitary sewer pipe sizes:

.1 Minimum pipe size - 200 mm diameter for residential

- 250 mm diameter for commercial, industrial and institutional

.2 Manning's Formula "n" - 0.013 $s/m^{1/3}$

.3 Required sewer capacity - $\frac{\text{Estimated Peak Design Flow}}{0.86}$

.4 Minimum self-cleansing velocity - 0.6 m / sec during average flow

.1 For the upstream reaches of the sanitary system, where it is not feasible to obtain a 0.6 m/s flow velocity without resulting in excessive slopes, the pipe slope shall be maximized within limits dictated by the system depth constraints. The designer is to optimize the use of the available elevation differences to provide extra slope in the reaches of the sewer system where design flows are minimal.

.5 Maximum flow velocity - 3.0 m / sec

.1 High velocity is limited to alleviate erosion and turbulence that promotes the release of odorous gas.

.6 Minimum design slopes

Sewer Diameter (mm)	Minimum Design Slope
200	0.40 %
250	0.28 %
300	0.22 %
375	0.15 %
450	0.12 %
525 and greater	0.10 %

.7 Minimum slopes shall be increased by 50% on all curved sections.

.8 The minimum gradient of the first upstream leg shall not be less than 1.0%.

.9 It is recommended that all sanitary sewers be designed with a slope of 0.4% or greater, wherever possible. No sanitary sewer may have a slope less than 0.1%.

.10 Weeping Tiles (Foundation Drains)

.1 For any residential, commercial or industrial development etc., weeping tiles, roof leaders (downspouts) and similar appurtenances that handle stormwater or groundwater are not permitted to discharge into sanitary sewers.

.2 Weeping tiles must be connected to sumps with pumped discharge into a sump pump discharged collection service which is a component of the storm drainage system. The required general arrangement of the sump pump and discharge piping to the sump discharge collection services is depicted on the Typical Sump Pump Discharge Connection Detail Drawing E-10. A minimum ½ horsepower pump is recommended for long-term reliability. The detailed arrangement must also comply with plumbing regulations.

.3 The auxiliary surface discharge piping shown on the Detail must be installed to provide an overflow if the storm drainage system cannot accommodate the flows due to capacity, freezing, or other problems. The storm sewer system shall be designed to handle weeping tile flow.

.4 The Developer will ensure that the builders install sump pumps and make the required sump pump connections.

E.4 LOW-PRESSURE SEWER SYSTEM SIZING

.1 Minimum main pipe size - 50 mm diameter

.2 Minimum service pipe size - 38 mm diameter

.3 Minimum flow velocity - 0.6 m / sec

.4 In sanitary sewers, the Hazen Williams flow coefficient, C, varies substantially with flow velocity. The following C values are recommended for estimating friction head losses in pipelines where the velocity will occur on a daily basis.

Velocity (m/s)	C
0.6	100
0.9	110

.5 The low-pressure sewer main shall be sized according to the number of services. It is the responsibility of the Developer to determine the maximum number of pumps that will be pumping simultaneously and to size the main accordingly.

.6 A two-compartment septic tank is required with a minimum total volume as per “Alberta Private Sewage System Standard of Practice 2015”.

.7 Pumps selected by the designer may be centrifugal or progressing cavity types as hydraulic conditions in the receiving system dictate, and fitted with cutters.

.8 Pumps may be either submersible sewage pumps installed in the second chamber (liquid chamber) of the septic tank or a centrifugal pump installed in the basement with a suction line to the second chamber. The use of a single chamber tank with a grinder pump is not permitted. All pump connections shall incorporate double check valves downstream of the pump discharge to prevent backflow into the septic tank.

.9 The maximum head for a low-pressure system is 24 metres (35 psi). Pumps with a higher discharge head shall only be permitted if all pumps and mains within the system have been designed to accommodate the higher pressure.

.10 All pumps within the system should typically have the same maximum discharge head to avoid shutting out smaller pumps. In larger systems or systems with large elevation differences, pumps located further away from the system outlet or at a low elevation may require a higher discharge pressure to ensure proper system operation.

.11 A single pump intended to accommodate multiple services shall not be permitted unless the Developer can demonstrate that the design will not be detrimental to the other system users.

.12 Pumps in low-pressure systems shall be provided with automatic controls and local fault indicator systems.

E.5 SANITARY SEWER ALIGNMENT AND LOCATION

.1 Sewer mains shall be located within the road right-of-way and outside the carriageway in accordance with the typical roadway cross section.

.2 Sanitary sewers shall be located a minimum of 2.5 m on centre from any watermain and 1.8m on centre from any gas line or as required by the utility company.

.3 Sanitary sewers shall be spaced at a minimum of 0.25 m between pipe walls from any adjacent storm sewer.

.4 Public Utility Lot widths shall be at least 4.0 m for a single utility and 6.0 m for two utilities.

.5 Curved sewers shall be permitted with the following restrictions:

.1 Curved sewers shall run parallel to the curb or road centreline

.2 Minimum gradient for sewers on a curve shall be 50% greater than the minimum gradient required for a straight run of sewer.

.3 Manholes shall be located at the beginning and end of each curve and intermediate locations as required.

.6 Under normal conditions, water mains shall cross above sewers with sufficient vertical separation to allow for proper bedding and structural support of the water and sewer mains.

.7 Where it is necessary for the water main to cross below the sewer, the water main shall be protected by providing:

.1 A vertical separation of at least 0.5 m from water main crown to sewer invert;

.2 Structural support of the sewer to prevent excessive joint deflection and settling; and

.3 Centring of the length of watermain at the point of crossing so that the joints are equidistant from the sewer.

E.6 REQUIRED DEPTH FOR SANITARY SEWERS

.1 Sanitary sewers shall be installed at a sufficient depth to meet the following requirements:

.1 The main shall have a minimum depth of cover of 3.0 m measured from finished grade to invert. Depth of cover above the tops of pipe shall be sufficient to provide full frost protection.

.2 The sanitary sewer shall have sufficient depth of cover to provide complete frost protection.

.3 Gravity mains shall have sufficient depth to allow all buildings to drain by gravity to the sewer. Special consideration should be taken when building floor elevations are lower than the roadway. Service lines shall have a minimum cover of 2.6m from the finished lot surface to the top of the pipe at the property line.

.4 Under normal conditions, sewer mains shall cross below water mains with sufficient clearance to allow for proper bedding and structural support of the pipes. Pipe clearance when passing under any watermain shall be a minimum of 300mm separation between the top of the sewer pipe and the bottom of the watermain.

.5 Pipe clearance when passing over any watermain shall be a minimum of 500mm separation between the bottom of the sewer pipe and the top of the watermain. Efforts shall be made to pass under the watermain when possible.

E.7 MANHOLE DESIGN AND LOCATION FOR GRAVITY SYSTEMS

.1 Manholes shall be located at the end of each line, at all changes in pipe size, gradient and alignment.

.2 The maximum distance between manholes shall not exceed 150 m.

.3 All manholes shall be 1200 mm minimum inside diameter.

.4 Manholes shall be located at the extension of property lines whenever possible to avoid conflicts with driveways.

.5 The drop across manholes should be of sufficient magnitude to account for any energy losses in the manhole.

.1 Pipe deflections of less than 45° require a drop of at least 30 mm.

.2 Pipe deflections of 45° to 90° require a drop of at least 50 mm.

.6 Invert drops for pipes larger than 600 mm or for high flow situations shall be assessed on an individual basis.

.7 The obvert elevation of a sewer entering a manhole shall not be lower than the obvert elevation of the outlet pipe.

.8 Pipe deflection in the manhole shall not be greater than 90°.

.9 Extreme changes in elevation at sanitary manholes are to be avoided, and smooth transitions in both horizontal and vertical directions are to be provided between the inverts of the incoming sewers and the outlet sewer. When this restriction is not feasible and where the elevation difference between incoming and outlet sewers is greater than 1.0 m, a specifically designed drop manhole may be required.

E.8 SANITARY SERVICES

.1 Separate sanitary sewer connections shall be provided for each separately titled lot.

.2 The minimum size of a residential gravity sanitary sewer service from the main to the property line shall be 150 mm diameter. The County may approve 100 mm diameter services under special circumstances where the total service length from main to the proposed building site is less than 30 m, and at a minimum gradient of 2.0%.

.3 The minimum size of a residential low-pressure sanitary sewer service shall be 38 mm.

.4 Non-residential service connections shall be sized according to anticipated user requirements.

.5 Low-pressure service lines shall require a curb stop at the property line. Curb stops for low-pressure services shall use caps identifying them as wastewater services. All wastewater caps shall be painted green. Curb stops shall not be stop and drain.

.6 Connections for all proposed residential lots shall be installed at the time of initial subdivision development.

.7 The minimum gradient for a gravity sanitary sewer service line shall be 2.0% for 100mm diameter lines and 1% for 150mm diameter lines and larger.

.8 Risers for service lines shall be required when sewer mains exceed 4 metres in depth.

.9 Services shall be located such that they do not conflict with driveway locations.

.10 Sanitary services shall be installed to the property line. In areas where natural gas distribution facilities require an easement along the front of the property, the service connections shall be extended to the edge of the easement furthest from the roadway.

.11 Sanitary services shall always be installed to the left of the water service when facing the property line from the roadway.

.12 Weeping tiles, roof leaders and other similar appurtenances handling storm or groundwater shall not be permitted to discharge into the sanitary sewer.

E.9 SANITARY SEWER MATERIALS

.1 The Developer shall supply only new materials. All materials found to be defective or damaged shall be replaced at the cost of the Developer.

.2 Where specific products are specified, it is intended that equals are also acceptable if approved by the County prior to installation.

.3 PVC pipe and fittings shall conform to the following:

.1 CSA B182.2, ASTM D3034, ASTM F679, NQ 3624-130 and NQ 3624-135 standards with minimum stiffness of 320 kPa. Service lines shall a minimum stiffness of 625 kPa.

.2 Standard Dimension Ratio (SDR) 35 unless otherwise indicated on the drawing.

.3 Sealing gaskets shall meet requirements of CSA B182.2 and ASTM F477.

.4 Injection moulded gasketed fittings for service connections shall conform to CSA B182.1 or CSA B182.2, and fabricated fittings shall conform to CSA B182.2 and ASTM F679.

.5 Pipe shall be tested by the manufacturer and marked in accordance with CSA B182.2. Test results shall be recorded on a certification form signed by a qualified representative of the manufacturer.

.6 Pipe and fittings shall be installed within two years from the production date indicated on the certification.

.4 Concrete pipe and fittings shall conform to the following:

.1 All concrete pipe shall be manufactured using Type 50 sulphate resistant cement CSA A3000.

.2 Non-reinforced concrete pipe shall conform to CSA A257.1, minimum Class 3 and ASTM C14.

.3 Reinforced concrete pipe shall conform to CSA A257.2 and ASTM C76.

.4 Flexible rubber gasket joints shall conform to CSA 257.3 and ASTM C443.

.5 The manufacturer of the concrete pipe shall perform quality testing and control in accordance with CSA 257.0, 257.1, 257.2 and 257.3.

.6 Each concrete pipe shall be marked with the manufacturer's name, date of casting and quality testing passing stamp.

.5 Polyethylene pipe and fittings for low-pressure systems shall conform to the following:

.1 Polyethylene pipe shall conform to CSA B137.1 and ASTM D3035, D3350

.2 A minimum pressure rating of 690kPa (Series 100)

.3 Moulded fittings shall conform to ASTM D2683 or D3261

.4 Fabricated fittings shall be manufactured from a pipe of the same series as that used in the piping system.

.5 Pipe shall be joined by thermal butt-fusion welds, proprietary electro-fusion couplings, flange assemblies or brass compression type fittings complete with stainless steel inserts. Welded joints in pipes of different wall thicknesses shall be made with electro-fusion couplings.

.6 Flanges shall be stainless steel or fusion-bonded epoxy coated ductile iron conforming to ASTM A536-80 with stainless steel nuts, bolts and washers.

.7 Compression couplings shall be used with stainless steel inserts.

.8 Service tapping saddles shall be Robar type 2706 or approved equal with a bronze body, 44mm wide stainless-steel straps with stainless steel nuts and bolts.

.9 Valves shall be cast iron gates valves with flanged connections.

.10 Each pipe length shall be marked with the manufacturer's name, nominal pipe size, dimension ratio, material grade, manufacturing standard, and a code indicating the date and place of manufacture.

E.10 MANHOLE MATERIALS

.1 Manholes shall be manufactured using sulphate resistant Type 50 cement.

.2 Manhole sections shall be pre-cast reinforced concrete conforming to ASTM C478 and CSA A257.4.

.3 All manholes shall have an inside diameter of 1200mm for pipe 900mm and less. For pipe exceeding 900mm or manhole having multiple inlets, manhole sizing shall be subject to review by the County.

.4 Manhole steps shall be standard safety type, and hot dipped galvanized iron conforming to ASTM A615 and ASTM A123 or aluminum forged from 6061-T6, 6351-T6.

.5 All pipe penetrations shall be sealed with rubber gaskets conforming to ASTM C443 and grouted with non-shrink grout.

.6 Manhole frames and covers shall be cast iron conforming to Class 20 ASTM A48 and ASTM A536. Type NF80 covers shall be used for all streets and driveways, type NF90 covers with rubber gasket shall be used for manholes located in sags and low areas and type F39 covers shall be used for all other areas. Castings shall be marked with series designation, foundry identification and date of casting. Manhole covers with Lac La Biche County identification will be encouraged. City of Edmonton or other municipal identification covers are not permitted.

.7 Pre-benched manhole bases shall be used wherever possible with pre-cored connection holes and watertight Duraseal or G-Loc joints or approved equal. Poured-in-place benching concrete shall be trowelled to a dense, smooth finish with side slopes between the channel and manhole wall for good drainage.

.8 Tee Riser manholes shall conform to CSA 257.2, ASTM C76 and CSA A257.4, ASTM C76.

.9 Safety platforms are required for all manholes greater than 7.0 m in depth.

.10 All pre-cast units shall be marked with manufacturer's identification, date of casting, type of cement and CSA standard.

E.11 TRENCHING, BEDDING AND BACKFILLING

.1 All trench excavation, shoring and backfilling shall be completed in strict accordance with the Occupational Health and Safety Code and guidelines including provisions for fall protection and safe access and egress.

.2 If unsuitable soil conditions are encountered, proper measures for dealing with the conditions shall be identified either on the design drawings or as a brief report to the County prior to construction.

.3 Class "B" pipe bedding shall be utilized in suitable soil conditions. Washed rock shall be used if the water table is above the pipe zone. Bedding sand shall have a minimum depth of 100 mm below the pipe, shall extend up both sides to the trench wall and provide a minimum cover of 300 mm above the pipe. The Developer shall identify special pipe foundation measures for areas where unsuitable pipe foundation conditions exist.

.4 The minimum trench width measured at the pipe spring-line shall be the pipe outside diameter plus 450 mm. The maximum trench measured at the pipe spring-line shall be the pipe outside diameter plus 600mm. The County must be notified if the trench must be excavated deeper or wider than specified.

.5 Excavated material shall be stockpiled at a safe distance from the edge of the trench.

.6 The Developer shall identify areas where the trench excavation requires sheathing, shoring or bracing to protect workers, property or adjacent structures.

.7 Trench excavations shall be kept free of water.

.8 It shall be the Developer's responsibility to ensure that utility trenches are adequately compacted.

.1 Native backfill under existing or proposed roads or laneways shall be compacted throughout the entire right-of-way width to:

.1 98% standard proctor density from subgrade to 1.5m below subgrade or original ground, whichever is lower;

.2 95% standard proctor density greater than 1.5m from the subgrade or original ground, whichever is lower;

.2 Granular backfill under existing or proposed roads or laneways shall be compacted to 95% of standard proctor density throughout the entire trench depth below subgrade and the entire right-of-way width.

.3 Backfill in all other areas shall be placed in layers not exceeding 150 mm thick and compacted to 95% standard proctor density.

.4 Subgrade and base course compaction for roadway construction shall be as specified in Section G.

.5 If the above standards cannot be achieved due to a large variation in soil types throughout the development, the County may at its sole discretion, establish a more appropriate standard on an individual case basis. One-mould proctor density testing may be permitted if the Developer submits an acceptable proposal, justifying the required changes to the compaction standards.

.9 If the minimum compaction standards cannot be met due to abnormal weather or wet ground conditions, the County may establish a more suitable standard on a site-specific basis provided adequate justification is presented by the Developer. One-mould proctor density testing will not be permitted as an alternate testing procedure due to wet soil conditions. The Developer will be required to suggest appropriate measures such as drying in-situ material or importing suitable material in order to meet the required Standard Proctor Densities.

.10 All landscaping, pavement structures, sidewalks, curb and gutter damaged or removed during trenching shall be restored or replaced unless otherwise directed by the County.

.11 All debris, surplus fill and unused materials must be removed from the site.

E.12 SEWER INSTALLATION

.1 The pipe and gasket installation shall be conducted in compliance with the pipe manufacturer's specifications. Installation of PVC pipe and fittings shall conform to CSA-B182.11.

.2 Pipe installation shall start at the outlet and work upstream.

.3 Align pipes carefully when joining. Keep joints free of mud, gravel and foreign material and apply sufficient pressure to ensure that the joint is complete as outlined in the manufacturer's specifications. Complete each joint before laying the next length of pipe. Deflections shall not exceed those permitted by the manufacturer.

.4 The pipe must be thoroughly flushed of all dirt, stones and pipe lubricant when complete.

.5 The horizontal alignment of pipes less than 900mm in diameter shall not be more than 150mm off the designated alignment. The alignment for pipes larger than 900mm shall not deviate by more than 50mm per 300mm of diameter.

.6 The invert of the pipe shall not deviate from the design gradient by more than 6 mm plus 20 mm per metre of the diameter of the sewer pipe.

E.13 MANHOLE INSTALLATION

.1 Manholes shall be installed as depicted on the detail drawings and in accordance with the manufacturer's recommendations.

.2 Backfill around manholes shall be placed in layers not exceeding 150 mm thick and compacted to a minimum of 98% Standard Proctor Density.

.3 Tee riser manholes shall require Class A bedding to the elevation of the spring-line.

.4 Pre-cast manhole bases shall be installed on a base of 100 mm to 300 mm washed gravel.

.5 Cast-in-place manhole bases approved by the County shall be placed directly on undisturbed ground. Where excavated surfaces are to be left exposed to wet weather, snow or any kind of disturbance before placing the manhole, they must be protected with a minimum 100 mm thick concrete mud slab.

.6 Safety steps shall be aligned on centreline perpendicular to the main flow channel. Wherever possible, the steps shall be aligned so that a person exiting the manhole would face oncoming traffic if not conflicting with the previous requirement. The distance from the top of the rim to the first step shall not be greater than 300 mm. Steps shall be evenly spaced at a maximum of 410 mm to within 600 mm of the base of the manhole. Refer to Drawing E-08 for details.

.7 The frame and cover shall be installed following the manufacturer's recommendations.

E.14 INSPECTION AND TESTING

.1 All sewer installations shall be subject to inspections by the County prior to issuance of the CCC and FAC.

.2 Video inspections by qualified personnel are required prior to CCC Two written reports including still photographs, and two (2) video recordings of the entire inspection shall be submitted to the County for review. The report shall indicate the location and severity of all leaks, cracks, breaks, collapses, deflections, sags, obstructions and any other defects affecting the performance of the line. Sections requiring repair will be subject to re-inspection when complete.

.3 Re-inspection by camera may be required on suspect areas prior to FAC at the discretion of the County. All video inspection costs shall be borne by the Developer.

.4 All material testing (backfill densities and concrete testing) shall be performed by an accredited agency and certified by an Engineer. All test results shall be submitted to the County with a report indicating any deficiencies and remediation.

.5 Infiltration and exfiltration tests may be required at the County's sole discretion for any section showing defects during the camera test.

.1 The test section shall be filled with water allowing displacement of air in the line and will be allowed to stand for 24 hours to ensure absorption in the pipe wall. Prior to the test, add enough water to ensure a head of 1 m to 3 m over the pipe crown in the upstream manhole. The test duration shall be 2 hours. The water level should be measured at the beginning and end of the test in order to calculate the infiltration/exfiltration.

.2 The allowable leakages are as follows:

.1 Infiltration Test: Performed when the groundwater is above the pipe crown for the entire test length. Allowable infiltration is 5.0 L/day/mm dia./km for PVC pipe and 20.0 L/day/mm dia./km for concrete pipe.

.2 Exfiltration Test: Performed when the groundwater is below the pipe invert for the entire test length. Allowable exfiltration is 5.0 L/day/mm dia./km and 20.0 L/day/mm dia./km for concrete pipe.

.6 The maximum acceptable long-term deflection for any PVC or another flexible pipe in 7.5% of the normal internal diameter.

.7 The County may require proving of acceptable pipe wall deflection by means of an approved mandrel test before final acceptance certification.

E.15 SANITARY WASTEWATER PUMPING SYSTEMS

.1 General

.1 Wastewater pumping systems shall only be installed where site constraints restrict the gravity collection system from tying into an existing sanitary trunk line. The requirement must be justified in an initial subdivision design report taking the development plans for the surrounding area into account.

.2 Standards and Approvals

.1 The design and construction of the pumping system must meet the requirements of other governmental authorities and regulations including Alberta Environment and Parks, Alberta Occupational Health and Safety, the Alberta Building Code and the Safety Codes Act. The Developer is responsible for all submissions and applications required for approval.

.3 Location

.1 Pumping stations shall be located in such a manner as to minimize the impact to adjacent development in terms of visibility, odour and noise.

.2 Pumping stations shall not be located in areas subject to flooding during a major rainfall event.

.3 Pumping stations shall always be accessible by road with space for parking off of the road for County maintenance vehicles.

.4 Configuration

.1 A wet well configuration with a submersible pump or above ground suction head pump is preferred.

.2 A wet well / dry well configuration may be considered for larger facilities.

.3 A building may be required for wet well / dry well pumping stations.

.4 A collection manhole shall intercept flow from all incoming sewers before discharge to the pumping station. The station shall receive flow from one inlet only.

.5 Provision shall be made to shut off flow from the collection manhole with a corrosion-proof slide gate or knife gate valve if required.

.6 Any stations without a building shall be fenced with a lockable gate to prevent unauthorized access.

.7 The Developer shall be responsible for any necessary landscaping required to enhance the appearance of the facility when located close to a residential area. Landscaping plans are subject to approval by the County.

.5 Pumping Station Design

.1 The pumps shall be sized to accommodate the maximum expected flow as determined by accepted engineering practices and according to the requirement specified in Section E.2 Flow Generation Rates.

.2 Pumping stations shall be equipped with two or more pumps sized such that if one pump is out of service, the remaining pump(s) is/are capable of pumping the design flow capacity. Pumps within a station shall generally be identical and interchangeable. Pump starts shall alternate between pumps after every cycle.

.3 Pumps shall be provided by a well-recognized manufacturer with a local repair service depot.

.4 Submersible pumps shall have a non-clog impeller design and flush valves.

.5 Pump motors shall operate on 3-phase power wherever possible. This requirement may be relaxed by the County if 3-phase power cannot be supplied at a reasonable cost. Variable frequency drives of sufficient size will be required to convert single to 3-phase power where 3-phase power is not available.

.6 Dead storage shall be minimized while meeting minimum depth requirements specified by the pump manufacturer.

.7 Wet wells shall be sized based on accepted engineering practices. Storage shall be provided to minimize the frequency of pump starts but the maximum retention time in the wet well should not exceed 30 minutes. The design shall meet the pump manufacturer's specifications for maximum start frequency.

.8 Wet wells shall be sized and equipped to accommodate operator access, maintenance and safety requirements. The Developer shall consult with the County to determine acceptable design features for safe access, fall protection and emergency rescue that suit County operating procedures and equipment legislated safety requirements.

.6 Valves and Piping

.1 The minimum diameter for all pump suction and discharge piping shall be 100 mm.

.2 Pipe sizing shall allow for minimum and maximum discharge flow velocities of 0.75 m/s to 3.5 m/s respectively within the station.

.3 Where pumps have suction pipes, suction velocities shall be limited to 0.6 to 1.8 m/s at the intake bell and 2.4 m/s in the suction pipes. The ideal velocity in suction pipes to be aimed for in the design is 1.7 m/s.

.4 Where pumps have suction pipes, conditions at the entry and in the suction pipes shall comply with the recommendations of the Hydraulic Institute for limiting net positive suction head with respect to the suction specific speed and suction specific energy to prevent cavitation.

.5 Suction pipes shall slope slightly upwards towards the pump with the straight side of any eccentric reducer on top of the pipe to prevent trapping of air.

.6 The minimum pressure rating of piping within the station shall be determined based on calculated operating pressures but shall not be less than 900 kPa.

.7 Pumps shall be connected in parallel with check valves to a common discharge header located within the station. Isolation valves shall be installed on the suction lines and discharge lines between each pump and the discharge header to allow opening pumps and check valves.

.8 A force main isolation valve shall be installed on the main discharge pipe outside the wet well.

.7 Water Supply

.1 Water supply must be provided to the facility for washing and cleaning purposes. Water service pipework is not mounted inside a building must be protected from frost damage in a proprietary enclosure and heat tracing extending to the frost line.

.2 The design shall ensure that the connection between the potable water supply and the wastewater pumping station does not cause contamination of the potable water supply. The design shall comply with the conditions stipulated in the Alberta Environment “Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems” for Water Supply and Wastewater Facilities.

.3 Where potable water supply is to be used for washing and cleaning purposes, a break tank, pressure pump and pressure tank shall be provided. In-line backflow preventers are not acceptable. The potable water shall be discharged to the break tank through an air gap at least 150mm above the maximum flood line or the spill line of the tank.

.8 Alarms and Emergency Backup

.1 The Developer shall make provisions to mitigate environmental or property damage caused by facility failure.

.2 Stations shall be equipped with or provided with the feature for future connection of remote sensing and telemetry equipment enabling operators to monitor the alarms.

.3 Power must be supplied from two independent sources. In the event of a power failure, secondary power must automatically engage through a diesel generator or direct-coupled motor. Secondary power system must not be fuelled by natural gas unless a supply tank is provided on site.

.4 Special consideration shall be made to control any possible overflow in a manner acceptable to the County and Provincial Government.

.9 Access and Maintenance

.1 Permanent hoist equipment and access hatches of sufficient size and capacity shall be provided for removal of station equipment.

.2 All access points shall have locking devices.

.3 Ladders shall be non-skid and shall comply with the Occupational Health and Safety Code.

.4 Stations shall have adequate interior and exterior lighting.

.5 The Developer is responsible for the supply of an operating and maintenance manual and as-built drawings for the facility. The content of the manual shall be arranged in the following sections.

.1 Title page

.2 Table of contents

.3 Introduction to the facility

.1 Location map and address

.2 Purpose of the facility, size and location of the serviced area and design population.

.3 Description of the pumping system.

.1 Pump make, type, rated power, model, design duty points.

.2 Principal components – valves, flow meters, emergency bypass pipework, etc

.4 Description of the backup power system. Generator make, model, rated power

Description of amenities - Wash water, security, pump lifting, vehicle access etc.

.5 Statement of control sequences and monitoring:

.6 Pump control set points. Any specialized pump control methods such as variable speed.

.7 Generator control sequence for starting, power transfer, cool down and stopping.

.8 Contact information and company logos for:

.1 Developer with company logos

.2 Consultant Engineer and sub-consultants with company logos

.3 Contractor and sub-contractors with company logos

.4 Suppliers

.9 Maintenance Division

.1 Maintenance Tasks and Schedules.

.2 Spare Parts.

.3 Tags and Directories.

.10 Construction Contract Documents Division

.1 Drawings List.

.2 Shop Drawings and Product Data.

.3 Certification – Equipment tests, Substantial performance of construction

.4 Warranties and Bonds.

.5 Maintenance Brochures.

.6 Reports – Commissioning and testing reports

.11 The Developer shall submit five (5) copies of the operation and maintenance manual and as-built drawings to the County prior to issuance of the CCC.

.10 Heating and Ventilation

.1 Forced mechanical ventilation is required for dry wells below ground level and for wet wells containing screens or mechanical equipment requiring maintenance or inspection.

.2 Equipment shall be able to provide at least six air changes per hour. Provision shall be made for ventilation of the wells with portable equipment in case of system failure. Ventilation failure alarms are required.

.3 There shall be no connection between wet well and dry well ventilation systems.

.4 Multiple air inlets and outlets are recommended for dry wells over 5 m deep. Air intakes and outlets shall be designed to function year-round, and screen openings should be sized to avoid frost build-up or clogging with air-borne debris.

.5 Air shall be forced into the dry well at a point 150 mm above the pump floor and into the wet well at a point 150 mm above the high-water level.

.6 Automatic heating and dehumidification equipment shall be provided in all dry wells.

.7 Air supply pipes in wet wells shall have a blow-by side flap mounted at head height above the lowest access platform or above the high-water level to maintain air circulation when the bottom of the pipe is submerged.

.11 Building Requirements

.1 All lift stations shall be provided with a building to house all electrical and control equipment and to provide a workspace for pump maintenance.

.2 Buildings shall be of an adequate size to allow for the required access hatches, hoist equipment, ventilation and control equipment while allowing for an appropriate workspace for pump maintenance.

.3 Access to the wet well shall not be from within the building.

.4 Building layout and access shall be designed to facilitate the removal of any equipment that may require off-site maintenance.

.5 Structural members shall be masonry, concrete or structural steel. Wood frame buildings are not permitted. Buildings shall comply with the Alberta Building Code.

.6 The design shall incorporate measures to reduce the noise and odour impact on the surrounding development.

.7 Buildings shall be designed to blend architecturally with the surrounding development.

.8 Windows shall not be permitted in lift station buildings.

.9 The combination of ventilation and hazardous rating of electrical equipment in the wet well, dry well and areas of the building must comply with the requirements of the Canadian Electrical Code.

.12 Force Mains

.1 System head curves shall be developed for each force main to be submitted to the County upon request.

.2 The minimum force main diameter shall be 100mm.

.3 The pressure rating of the pipe shall be twice the operating pressure or 690 kPa, whichever is greater unless a rigorous analysis of surge pressures demonstrates a lower pipe class is acceptable with surge protection measures if appropriate.

.4 The velocity shall be within 0.9 m/sec to 3.5 m/sec. The minimum velocity for pipes larger than 300mm shall be 1.1 m/sec. Design for force main velocities excess of 1.8 m/s should give consideration to the economics and feasibility of using standard pressure class pipes, excessive energy consumption and provisions for dealing with high turbulence at the outlet. Special design provisions for stabilizing the line shall be incorporated when design velocities exceed 3.0 m/sec.

.5 The force main design pressure shall allow for the normal static and dynamic operating pressures including water hammer effects.

.6 A series of 45° bends shall be used in lieu of 90° bends.

.7 Air release valves shall be installed in concrete access chambers at all relative high points. Force main gradients should be designed to minimize the requirement for an air release valve wherever possible.

.8 Blow-off valves shall be provided at all low points with provision for pumping the contents of the force main into tank trucks.

.9 Vacuum relief valves shall be installed wherever necessary in lines designed to drain by gravity between pumping cycles.

.10 Valve chambers on force mains shall be accessible by maintenance vehicles.

.11 Provide stainless steel bolts on all valves.

.12 Provide operating nuts located between 1.0 and 3.0m below ground surface with rock shields on all valves.

.13 The force main invert at the receiving manhole shall be a maximum of 300mm above the highest invert. The outlet invert of a lagoon inlet manhole shall always be above the high-water level.

.14 When force main length exceeds 1000 metres, cleanouts should be installed in concrete access chambers complete with isolation valves and adaptor coupling for line flushing.

.15 A 2-hour pressure test shall be conducted for all new force mains in accordance with the specifications listed under Section D.27.1 Pressure Testing for PVC and ductile iron force mains.

.16 High-density polyethylene pipelines shall be tested for leaks in accordance with Chapter 2 of the Plastics Pipe Institute Handbook of Polyethylene Pipe available online at https://plasticpipe.org/publications/pe-handbook.html.

.17 If the leakage test of a high-density polyethylene pipe fails because of leakage at a welded or electro-fused joint or because of a defect along the barrel, the defective portion must be cut out and replaced and the test repeated.

E.16 RURAL LOW-PRESSURE SANITARY SERVICING

.1 General

.1 The sanitary sewer system shall be of sufficient capacity to service the ultimate population projection of the development area. The flows and factors outlined in the following sections shall be used in the design of low-pressure sanitary sewer systems.

.2 The Developer is responsible for ensuring that the infrastructure is designed and constructed to achieve manufacturers' design life expectations consistent with good design and construction practice. System proposals must identify disposal means in accordance with the Alberta Environment Regulations and Guidelines. Plan-profile drawings, specifications and a letter report shall be prepared by an Engineer and be submitted to the County and Provincial Government for review and approval prior to construction.

.2 Estimating Average Sewage Flows

.1 A sewage generation rate of 250 L/person/day for a low-pressure sewer system with no infiltration rate shall be used, unless otherwise specified by the County. Any sewage generation rate than the above will be dependant upon the disposal system capacity.

.2 In determining residential flows, a minimum of 3.5 persons per household shall be used unless otherwise specified by the County.

.3 Recommended pump rate and head will need to be provided. This information will be included in any plumbing permit issued by the County and will endure that all residents are aware of this requirement.

.3 Pipe Sizing

.1 A report from the Developer must be prepared to ensure that pipe sizing is calculated in consideration with the topography of the serviced lands and the population projections.

.4 System Materials

.1 General

.1 The Developer shall supply and install only new materials.

.2 All such materials which are defective in manufacture, damaged in transit, or have been damaged after delivery shall be replaced by the Developer at its expense.

.3 All standards referred to mean the latest edition of that Standard.

.4 Where specific products are specified, it is intended that approved equals are also acceptable.

.5 The “approved as equal” must be obtained from the County before the equal product is used.

.2 High-Density Polyethylene (HDPE) Pipe

.1 High-Density Polyethylene pressure (HDPE) pipe shall be DR11 or DR13.5, PE 4710 iron pipe sized (IPS) and shall conform to CSA B137.1, ASTM F714 and ASTM D3350 Standards. Pipe sized from 13mm through 76mm shall conform to ANSI/AWWA C901-02 Standard. Pipe sized from 100mm through 1575mm shall conform to ANSI/AWWA C906-00 Standard.

.2 Shop only moulded pipe fittings shall be used. If unavailable other alternatives must meet County approval first.

.3 All joints are to be thermal heat fused. Mechanical service connections are not approved.

.4 All components shall be made of corrosion resistant materials.

.5 Pipe age not to exceed two years at the time of installation.

.3 Low-Pressure Sewer Mains

.1 In country-residential subdivisions, the sewer main alignments shall be as depicted on the Typical Country Residential Right-of-Way Roadway cross-section drawing E-11.

.2 Mains shall be at a depth adequate to provide a minimum of 2.75 m depth of cover from finished grade to top of the pipe.

.3 Augering or directional drilling is required under all roads.

.4 Compaction of any trenches and auger pits and repair of any settlements that occur within two years is required.

.5 A separate service line with a curb stop, marked “sewer” at the property line is required for each lot.

.6 Flushing pipes are required at the start of each collection main to facilitate removal of main line blockage.

.7 Manual air release and vacuum relief valves are required at all high points for removal of hydrogen sulphide gases from anaerobic decomposition of organics.

.8 A minimum distance of 2.5 m horizontal separation must be maintained between a sewer main and any water main.

.9 A minimum distance of 3.0 m horizontal separation must be maintained between a sewer main and any gas line.

.10 Public Utility Lot widths be a minimum of 4.0 m for a single utility and 6.0 m for one containing two utilities. A 1.0m easement is required on the lots on each side of a PUL.

.11 Tracer Wire of, polyethylene insulated, #14 AWG solid SBC (1/64”) gauge copper shall be installed simultaneously with the pipe on all mains and services. Splicing the tracer wire can be done by soldering, and mechanical connections, the following shall apply:

.1 Tracer wire shall not be connected to the steel pipe or transition couplings.

.2 Tracer wire shall be brought flush to the ground at every valve box riser, at every road crossing, at every facility location and at the end of every plastic pipe section. It shall be brought flush to the ground inside a rigid PVC conduit and looped inside a PVC junction box, within a type A valve box marked “Sewer.” An electrical continuity test shall be performed prior to acceptance.

.12 Marker posts shall be installed perpendicular to all valves, air release and flushing standpipe locations, adjacent to the property line. Warning signs and painted fence posts shall be installed at the edge of the road right-of-way where low-pressure sewers cross roadways.

.13 Posts shall be GlasForms Inc., Fiberglass Composite Markers, Dual-Flex, Part number DF66-00 (66 inches long in White) with Orange reflective stickers applied to both sides, or approved alternate.

.1 Posts shall include one composite post anchor and shall be installed 18 inches in depth, thereby leaving 4ft visible above ground.

.2 Refer to drawing E-12.

.4 Fittings

.1 High-Density Polyethylene (HDPE), DR11 conforming to ASTM FT714 and CAN B137.1, shop moulded fittings shall be used.

.2 All HDPE moulded fittings shall meet the requirements of ASTM D2683 for socket-type fittings, ASTM D3261 for butt-type fittings, or ASTM F1055 electrofusion-type fittings.

.5 Valves

.1 Gate valves for 75mm and larger shall be iron body; bronze mounted gate valves with a non-rising spindle, which open by turning in a counter-clockwise direction. All valves shall conform with AWWA C500 for bronze mounted solid wedge gate valves or AWWA C509 for resilient seated gate valves. Interior to be factory coated with epoxy coating conforming to AWWA C550. Exterior to be factory applied epoxy coated. Corrosion reduction to be provided by the installation of a zinc sacrificial anode. Valves to be flanged for polyethylene pipe.

.2 Brass inverted key-type curb stops shall be used for valves 50 mm and smaller conforming with ASTM B62 compression type. Curb stops to have adjustable bituminous or epoxy coated cast iron service base with stem to suit 3.0 m depth of bury. Top of cast iron box to be marked “SEWER.” All curb stops shall incorporate 75 mm long stainless-steel sleeves for connections to polyethylene pipe.

.3 Valve ends compatible with pipe joint type (Cast Iron Outside Diameter) to be used.

.4 Cast iron valve boxes conforming to ASTM A48, Class 25 of the screw or sliding type shall be required on all valves. Coating inside and outside shall be an asphaltic coating or fusion bonded epoxy conforming to AWWA C213. Set screw to be galvanized. Top of the box to be marked “SEWER.”

.5 Extension stem to be 25 mm square mild steel with 50 mm operating nut and flange suitable for 3.0m bury. A rock disk nut is required on all valves.

.6 Schedule 40 PVC valve boxes for the bottom boot of Norwood Foundry Type A siding type valve boxes or approved equal are permitted in areas not exposed to vehicle loading.

.6 Service Connections

.1 General

.1 Each lot must have a separate service.

.2 Curb stops marked “SEWER” shall be installed at the private property line, located within the 3.5 m utility easement.

.2 Details

.1 Sanitary sewer service pipe shall be 40 mm, DR11 polyethylene pipe, Series 110 Municipal tubing.

.2 Main connections shall be made by means of fused in-line tees or saddles. All fittings and joints must be assembled by electro-fusion or butt fusion for HDPE piping. Services to be in one piece, no mechanical connections are permitted between the main connection and curb stop.

.3 Curb Stops shall be non-draining type located adjacent to driveway locations.

.4 Minimum depth of cover shall be 2.75 m from finished grade over top of the pipe.

.3 Septic Tank/Pump

.1 Use two-compartment tank or a single-compartment tank with a pump vault, sized and constructed in accordance with Alberta plumbing codes.

.2 Extend tank access risers at least 150mm above the finished ground surface, provide watertight manhole covers and divert surface runoff away from the manhole cover.

.3 The tank must be large enough to provide:

.1 450mm for pump submergence, minimum,

.2 A full day of emergency storage capacity above the high-water alarm level, utilizing the septic tank freeboard capacity below ground and/or below building drain outlet invert,

.3 Minimum 12-hour retention time below high-water alarm level for proper treatment of the sewage flow,

.4 Storage of sludge and scum accumulation,

.5 Minimum storage requirements as per “Alberta Private Sewage System Standard of Practice 2015”.

.4 The tank must be sealed watertight tank (fibreglass), or one piece precast pump tank or special provisions for assuring watertight tank.

.5 Anti-buoyancy provisions must be adequate.

.6 All pipe and wire conduits into tank must be through hubs or fittings made during the construction of the tank and installed in a watertight and gastight fashion.

.7 No drainage or any water other than sanitary wastewater shall be allowed to enter the tank.

.8 The effluent shall enter the pump compartment or pump vault from the clear zone of the tank between the scum and sludge layers.

.9 The pump must be:

.1 Submersible,

.2 Capable of 3-minute minimum pump run time 1L/s pumping rate, and

.3 Must be a CSA approved effluent pump capable of delivering 0.3 L/s at 70 m of the total dynamic head or at a pressure established by the County. The pump must be readily removable from the ground surface.

.10 The pump discharge pipe must be of DR11 HDPE or stronger and include a check valve, disconnect union and valve within the pump tank.

.11 The pump screens shall be no larger than 3 mm in size and occupy a surface area of 1.44 square metres or equivalent product approved by the County.

.12 Pumps must be activated by either mechanical level controllers or Mercury level control switches.

.13 When any pump is located at a higher than the elevation of the terminal end a siphon-break valve must be provided for that pump.

.14 Provision for ventilation should be provided.

.4 System Installation

.1 General

.1 The system installation standards are intended to address key points only and are not to be considered as a suitable replacement for a detail construction specification to be prepared by the Developer.

.2 Trenching, Bedding and Backfilling

.1 All trenching and backfilling shall be completed in strict conformation with Occupational Health and Safety and any other applicable regulations and directions of the County Safety Officer.

.2 If unsuitable soil conditions (i.e. organics, high moisture content, rock, etc.) are encountered, the method for dealing with these conditions shall be assessed by the qualified Professional Engineer commissioned by the Developer, and a letter report submitted to County.

.3 For open trench construction Class “B’ bedding as depicted on the Detail Drawing shall be used for all sewer mains in suitable soil conditions. If unsuitable pipe foundations exist, the design for a special pipe foundation and bedding shall be prepared by a qualified Professional Engineer and to the County.

.4 In all new subdivisions, it shall be the Developer's responsibility to ensure that utility trenches are adequately compacted. In the road ditch or ditch slope, the road right-of-way 95% on Standard Proctor Density shall be required. 98% shall be required if in the slope of the road.

.5 A two-year warranty on trench settlement shall be required in all areas of work performed by trencher machine excavation.

.6 If the above compaction standards cannot be achieved because of abnormal weather or wet ground conditions the County may at its sole discretion establish a more appropriate standard for the individual case on receipt of an acceptable proposal from the Developer.

.3 Augering of All Services Connection

.1 All service connections shall be installed by augering under proposed or existing streets except where augering is not feasible due to adverse soil conditions. Open trenching may be permitted subject to the County's acceptance of the need and acceptance of the backfill material.

.2 All auger pit excavations shall be backfilled with granular bedding material and mechanically compacted, in lifts not to exceed 150 mm in depth, to a minimum of 98% Standard Proctor Density to 300 mm above the pipe.

.3 Backfill of auger pit excavation over 300 mm above the pipe shall be compacted in lifts not to exceed 150mm in depth, to a minimum of 95% in the road ditch or ditch slope or a minimum of 98% if in the side slope of the road.

.5 Inspection and Testing

.1 Before acceptance of the work, the entire system shall be subjected to a hydrostatic pressure test in the presence of the County representative. The Developer shall provide all necessary labour. Materials and equipment for the test including a suitable pump, measuring tank, pressure hoses, connections, plug, caps, gauges and all other apparatus necessary for filling the main, pumping to the required test pressure and recording the pressure and expansion-leakage losses. The Developer shall provide evidence that the gauges used are accurate.

.2 Expel air from collection system, slowly filling main with water. High points must have automatic air/vacuum relief valves to vent air when filling and be closed when pressure is applied.

.3 The hydrostatic test pressure of 1.5 times the pipe at the lowest point in the system main shall be applied.

.4 Pressurized pipe to require test pressure over a 3-hour period and hold requires test pressure for an additional hour to allow for pipe expansion and stretching prior to the leakage test.

.5 Test period shall be 2 hours. Amount of make-up water (leakage) required to return the pipe to required test pressure shall not exceed the allowance given in the following table.

Field Testing of Low-Pressure Sewer Systems

	Nominal Pipe Size (mm)	Allowance for Expansion (Leakage) (litres/100m of pipe)
.1	50	1.6
.2	75	1.9
.3	100	3.1
.4	150	7.5
.5	200	12.5

.6 Total time under test pressure must not exceed 8-hours. If test is not accepted due to leakage or equipment failure, test sections must be permitted to "relax" for 8 hours prior to the next testing sequence.

E.17 SUMMARY OF SANITARY SEWER SYSTEM STANDARDS

.1 The following is a summary of the standards applicable to the sanitary sewer systems materials and construction. In all cases, it is intended that the latest apply.

.2 ASTM

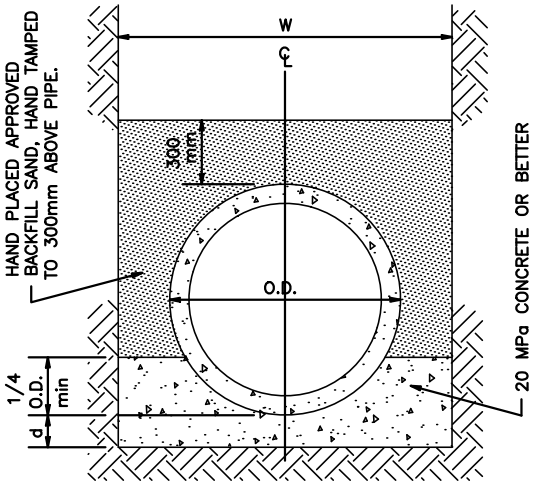
- .1 A48 Grey Iron Castings
- .2 C14 Concrete Sewer, Storm and Drain, and Culvert Pipe
- .3 C76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- .4 C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
- .5 C478 Precast Reinforced Concrete Manhole Sections
- .6 D698 Moisture-Density Relations of Soils and
- .7 D3281 Soil-Aggregate Mixtures
- .8 D3034 Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

.3 CSA

- .1 A5 Portland Cements
- .2 A23.1 Concrete Materials and Methods of Concrete Construction
- .3 A257 Series Standards for Concrete Pipe
- .4 B182.1 Sewer Pipe Fittings
- .5 B182.2 PVC Sewer Pipe and Fittings (PSM Type)
- .6 B182.11 Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings
- .7 G30.12 Billet Steel Bars for Concrete Reinforcement

CLASS A BEDDING

L_f = 2.8



CLASS B BEDDING

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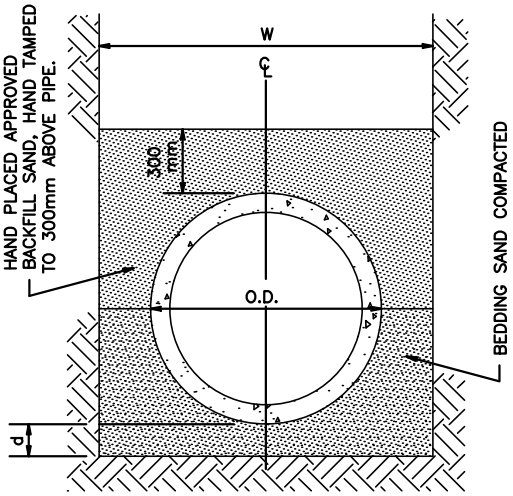

CLASS C BEDDING

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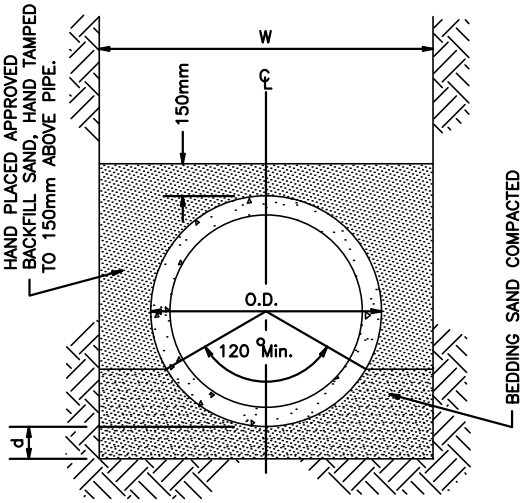

CLASS B BEDDING

ALTERNATE – 375mm I.D. & UNDER

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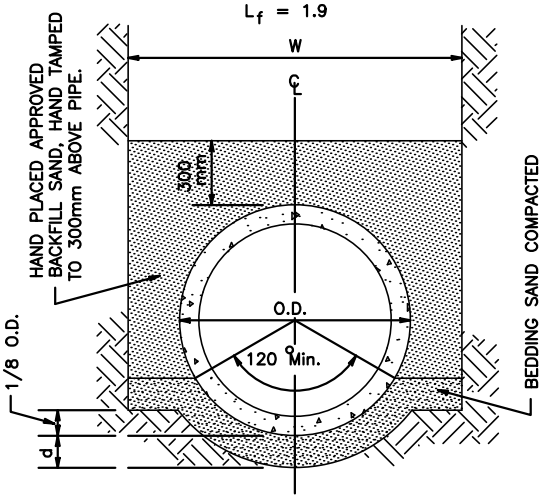


NOTES:

W = TRENCH WIDTH – O.D. + 450mm (MINIMUM)
– 1000mm max. FOR PIPES UP TO AND INCLUDING 400mm DIAMETER
– O.D. + 400mm max. (ON EITHER SIDE {800mm TOTAL}) FOR PIPE DIAMETERS 450mm AND ABOVE

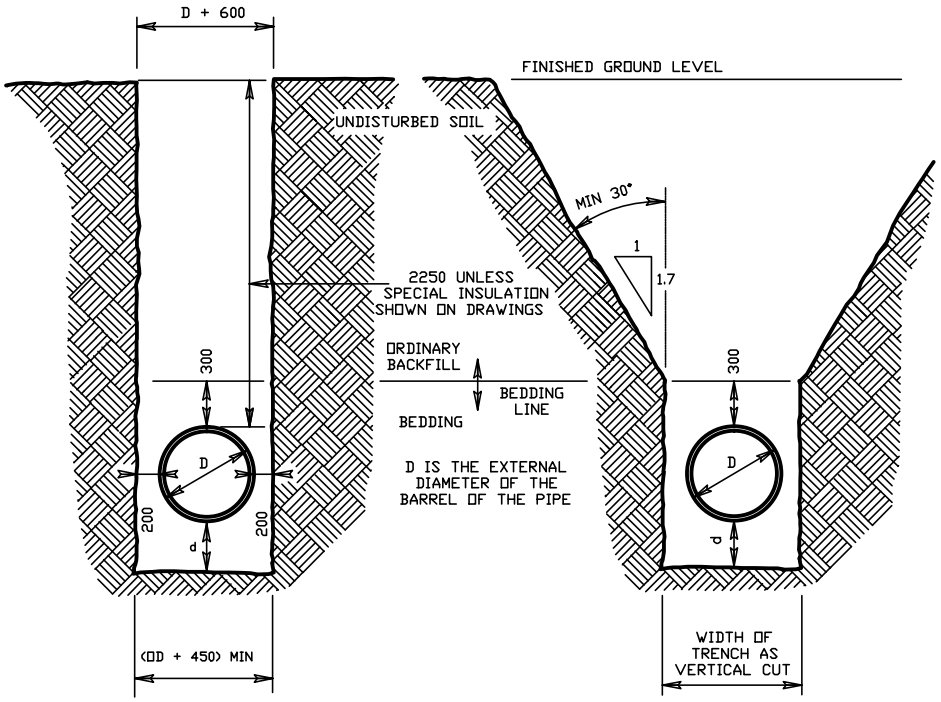
O.D.= OUTSIDE PIPE DIAMETER
I.D. = INSIDE PIPE DIAMETER
L_f = LOAD FACTOR
d = DEPTH OF BEDDING BELOW PIPE
I.D.= 675mm OR SMALLER – d min = 150mm
I.D.= 750mm TO 1500mm – d min = 150mm
I.D.= 1650mm AND LARGER – d min = 150mm

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.			STANDARD TRENCH BEDDING FOR CIRCULAR PIPES	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E–01
Date: APRIL 2009	Drawn: TLB	Scale NTS		



STANDARD TRENCH VERTICAL CUT

(TO BE SHORED AS PER OCCUPATIONAL HEALTH AND SAFETY STANDARDS)

MAXIMUM TRENCH WIDTHS FOR SINGLE PIPES

–UP TO AND INCLUDING 400mm DIAMETER – 1000mm
–450mm DIAMETER AND ABOVE – OD + 600mm

STANDARD TRENCH SLOPING CUT

(TO BE SLOPED AS PER OCCUPATIONAL HEALTH AND SAFETY STANDARDS)

DEPTH OF BEDDING BELOW PIPE BARREL (d)

–EXTERNAL DIAMETER OF 700mm AND BELOW :75
–EXTERNAL DIAMETER GREATER THAN 700mm :100

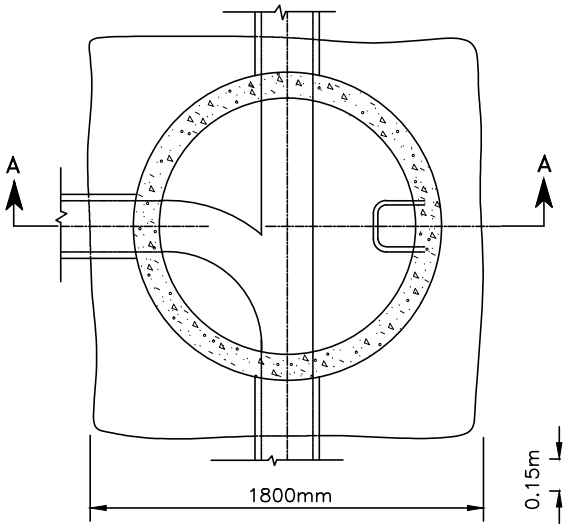
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

LAC LA BICHE COUNTY

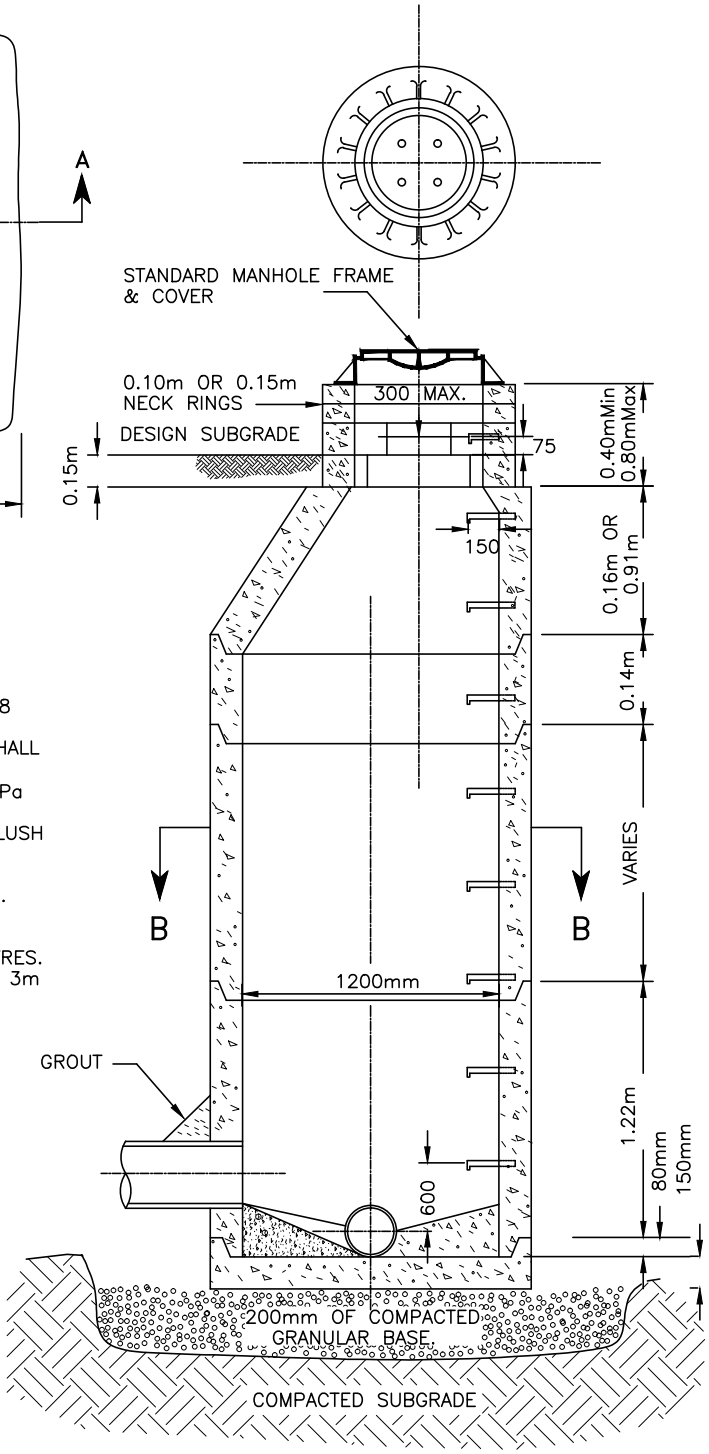
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		STANDARD TRENCH DIMENSIONS FOR CIRCULAR PIPE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E–02
Date: APRIL 2009	Drawn: TLB	Scale NTS		



SECTION B – B



SECTION A – A

NOTES

1. STANDARD M.H. FRAME & COVER.
2. MANHOLE BARRELS TO MEET A.S.T.M. C478
3. FORMANHOLES OVER 5.00m IN DEPTH, PRECAST OR POURED IN PLACE BASES SHALL BE REINFORCED WITH BARS.
4. POURED IN PLACE CONCRETE TO BE 30MPa AT 28 DAYS.
5. INLET & OUTLET PIPE TO BE GROUTED FLUSH WITH WALL.
6. GALVANIZED STEEL SAFETY STEPS AT 0.41m MAXIMUM TO FULL HEIGHT OF M.H.
7. RUBBER GASKET JOINT.
8. SAFETY GRATING TO BE USED WHEN THE DEPTH OF THE MANHOLE EXCEEDS 5 METRES. THE SAFETY GRATING WILL BE PLACED AT 3m BELOW THE MANHOLE TOP.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

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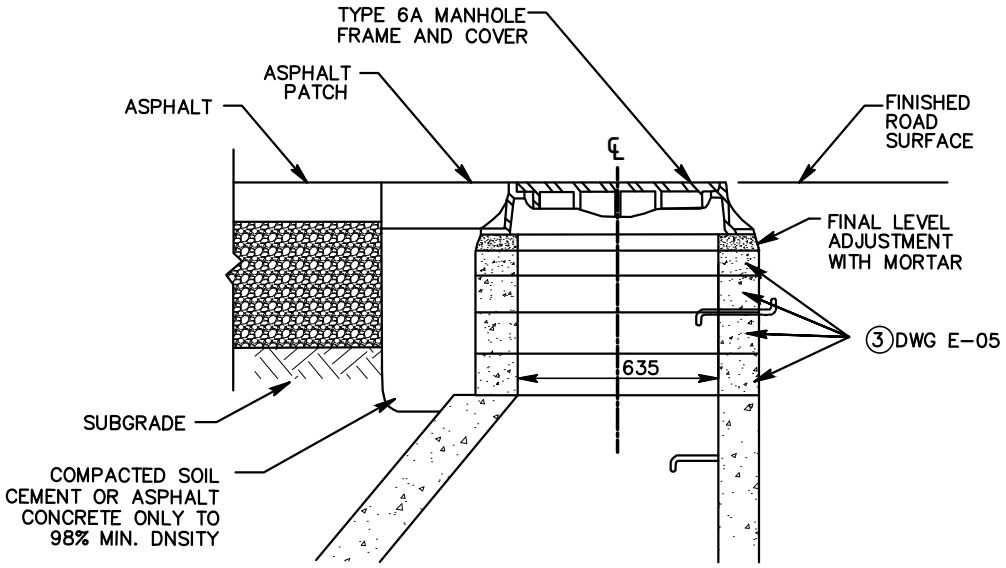
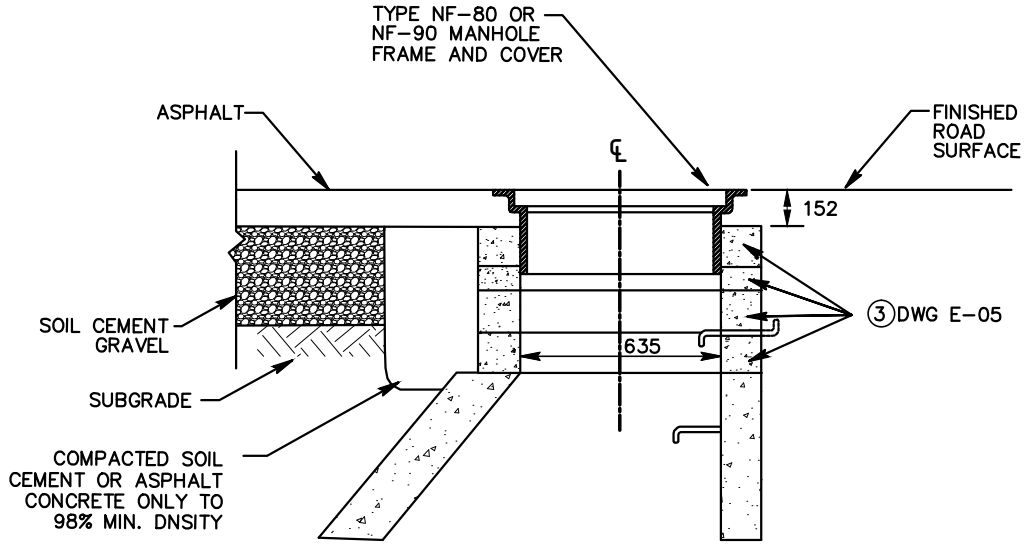
Rev.			STANDARD 1200mm MANHOLE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E–03
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS ARE IN mm
UNLESS OTHERWISE NOTED



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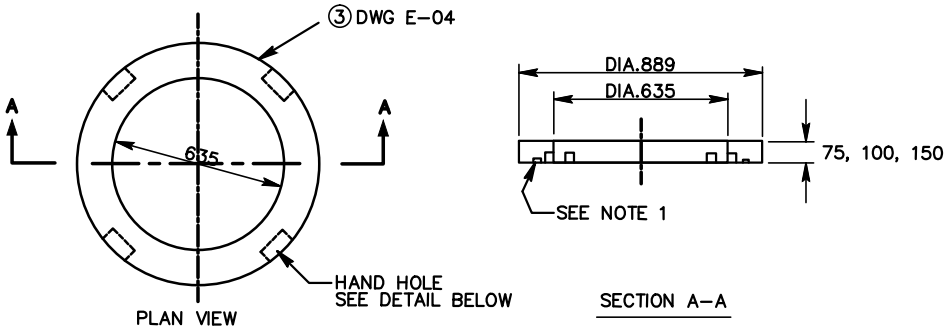
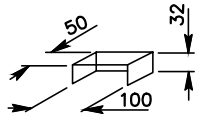
Rev.	wsp		NECK SECTION DETAILS FOR STANDARD 1200 MANHOLE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E-04
Date: APRIL 2009	Drawn: TLB	Scale NTS		



635 RING

(NECK RING FOR USE WITH TYPES 4A, 6, 6A, 8, NF-80, NF-90 FRAMES AND COVERS/GRATINGS)



HAND HOLE DETAIL

NOTES:

1. A CONCENTRIC GROOVE LOCATED AT MID CROSS SECTION, SUITABLE FOR SEALANT IS REQUIRED FOR NECK RINGS AND EXTENSION RINGS.
2. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE NOTED

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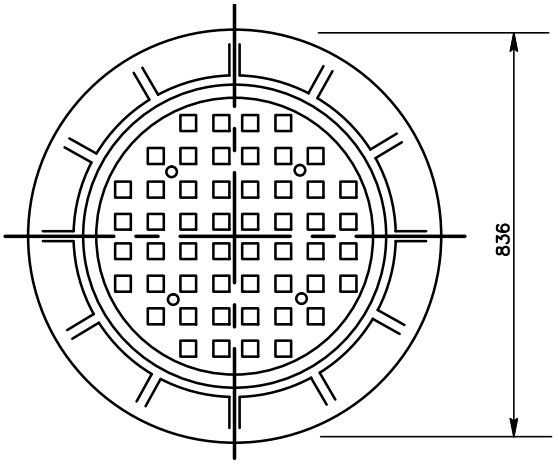
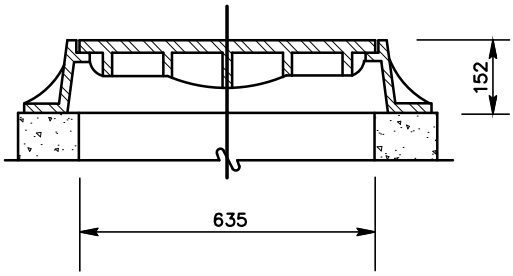
Rev.			635 NECK RING	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E-05
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS ARE IN mm
UNLESS OTHERWISE NOTED



MATERIAL;
FRAME: GRAY IRON CLASS 20B
COVER: GRAY CLASS 20B

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General Municipal Servicing Standards

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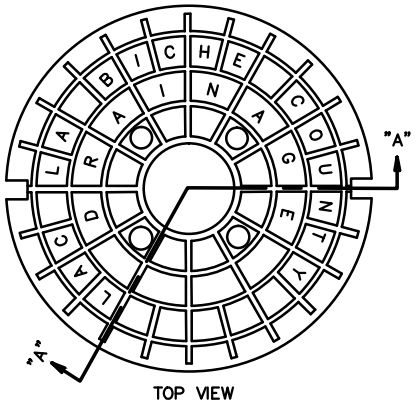
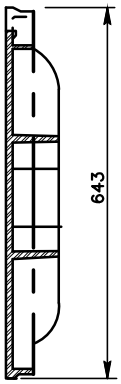
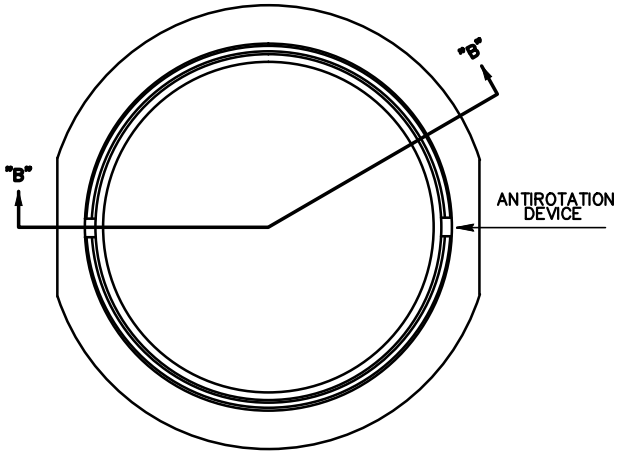
Rev.	wsp		TYPE 6A COVER AND FRAME	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E–06
Date: APRIL 2009	Drawn: TLB	Scale NTS		



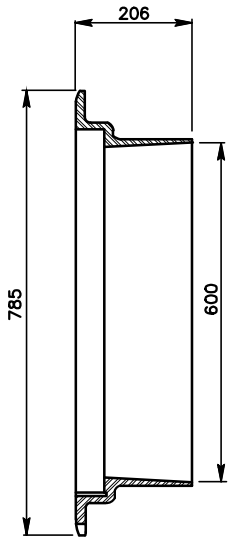
TOP VIEW
MANHOLE COVER
WITH 4 VENTHOLES



SECTION "A–A"



PLAN



SECTION "B–B"

NOTES:

1. MATERIAL SPECIFICATION:
   CUCTILE IRON TO CONFORM TO A.S.T.M. A536 (LATEST EDITION) GRADE 80–60–03
2. NF–90 FRAME AND COVER IS WATERTIGHT VARIATION OF NF–80.
   THERE ARE NO VENTING HOLES IN NF–90 COVER AND A GASKET IS
   PLACED BETWEEN THE FRAME AND COVER
3. ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED

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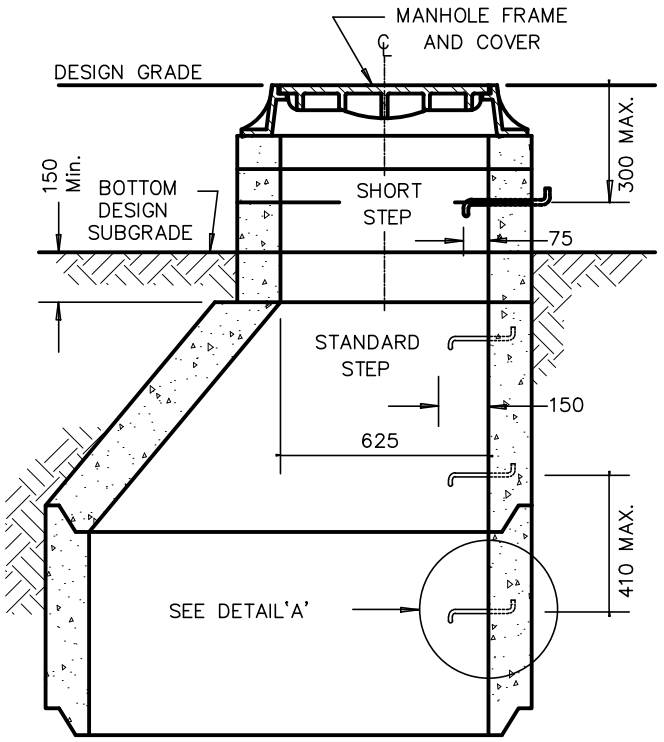
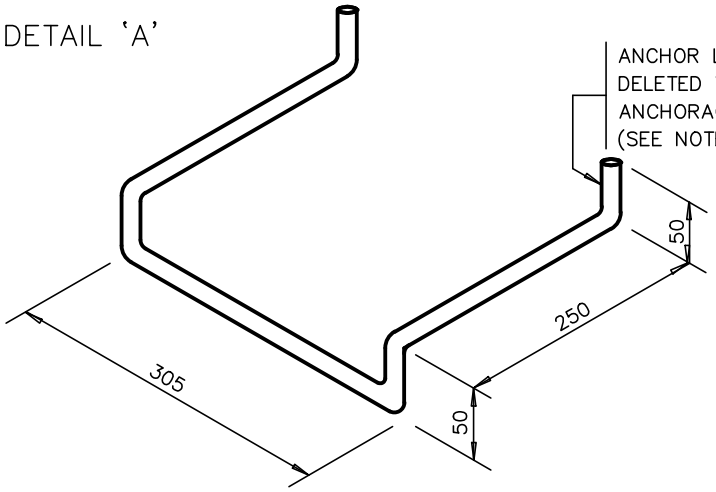
Rev.			FLOATING MANHOLE FRAME AND COVER TYPE NF-80 AND NF-90	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E–07
Date: APRIL 2009	Drawn: TLB	Scale NTS		

PLACEMENT:

1. EXCEPT WHERE SPECIFIED OTHERWISE, SAFETY STEPS SHALL BE INSTALLED IN ALL PRECAST MANHOLE SECTIONS & CONES, IN THE GRADE ADJUSTMENT SECTIONS AND IN CAST IN PLACE SECTIONS SO THAT WHEN THE VARIOUS SECTIONS ARE ASSEMBLED IN ANY COMBINATION THEY WILL FORM A CONTINUOUS VERTICAL LADDER WITH RUNGS EQUALLY SPACED AT A MAXIMUM OF 410mm TO WITHIN 300mm BELOW THE COVER AND TO WITHIN 600mm OF THE BASE OR BENCHING.
2. STEPS SHALL BE CAST FIRMLY IN PLACE OR SECURED WITH A SUITABLE MECHANICAL ANCHORAGE TO PREVENT PULLOUT, AND MAINTAIN WATER TIGHTNESS.
3. "STANDARD STEPS" SHALL PROJECT A DISTANCE OF 150mm MEASURED AT THE POINT OF EMBEDMENT.
4. A "SHORT STEP" WITH A PROJECTION OF 75mm SHALL BE INSTALLED WITHIN THE GRADE ADJUSTMENT SECTION, CAST INTO THE NECK OR FIRMLY MORTARED IN PLACE BETWEEN THE NECK RINGS, WITH THE ANCHOR LEGS OUTSIDE OF THE NECK RING.
5. EXCEPT AS SPECIFIED ABOVE, DESIGN AND INSTALLATION OF SAFETY STEPS SHALL CONFORM TO A.S.T.M. C478.



TYPICAL MANHOLE SECTION



ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

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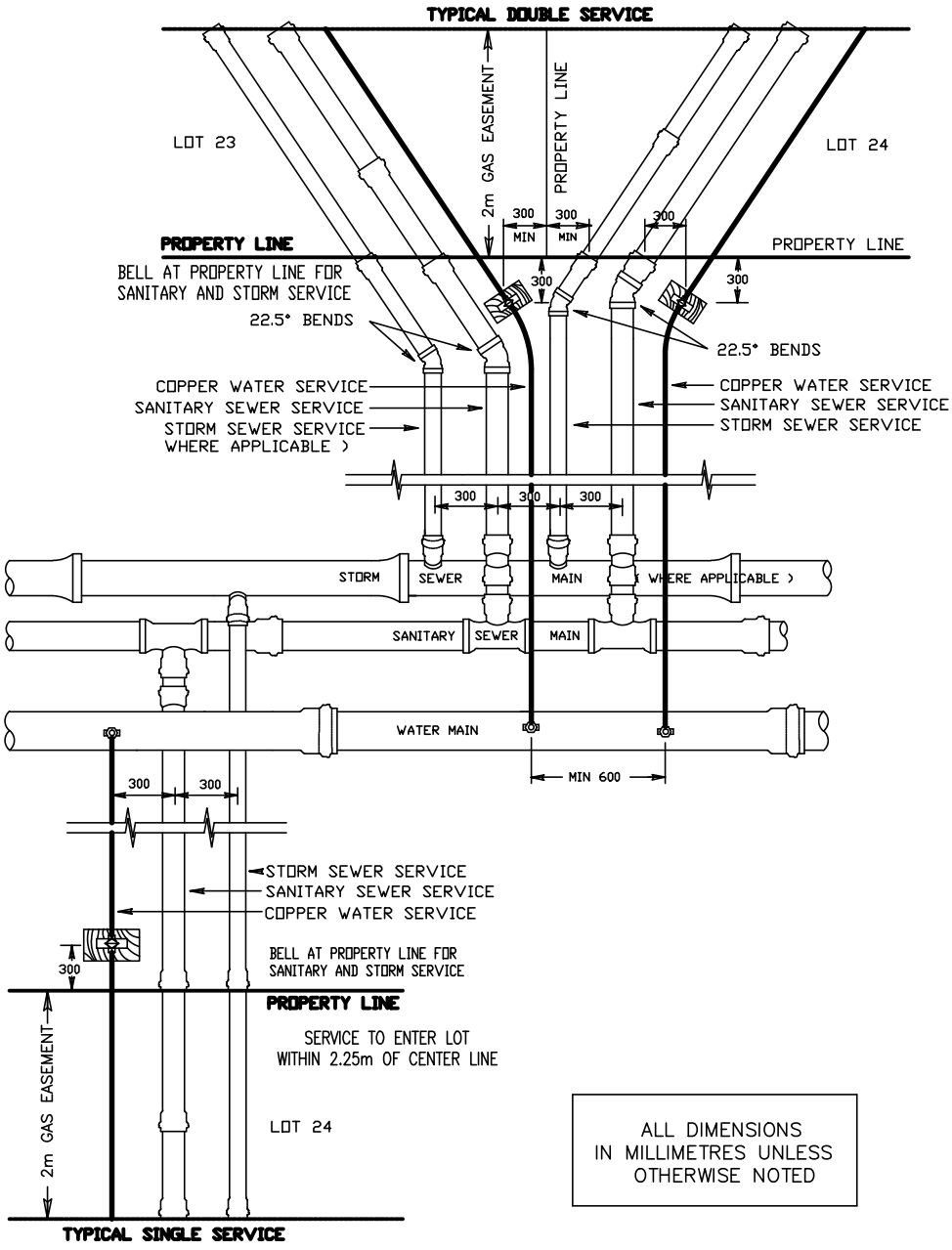
Rev.	wsp		SAFETY STEPS FOR MANHOLES	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E–08
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

NOTES:

1. WATER AND SEWER SERVICES MAY BE EXTENDED TO EDGE OF 2.0m GAS EASEMENT.
2. THE CITY ACCEPTS NO RESPONSIBILITY FOR THE CONSTRUCTION OR MAINTENANCE OF SERVICES INSTALLED WITHIN THE EASEMENT.
3. MARK ENDS OF SERVICES AT EDGE OF GAS EASEMENT WITH A 50mm X 100mm X 750mm STAKE PROTRUDING 450mm ABOVE GROUND AND PAINTED BLUE. MARK THE CURB CONTROL VALVE WITH A SIMILAR STAKE PAINTED RED.
4. THE END OF COPPER WATER SERVICE PIPING SHOULD NOT BE CRIMPED CLOSED, PERMEABLE FILTER CLOTH MAY BE USED TO PREVENT INTRUSION OF DEBRIS AND TO ALLOW TESTING FLOW OF CURBSTOP.

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General Municipal Servicing Standards

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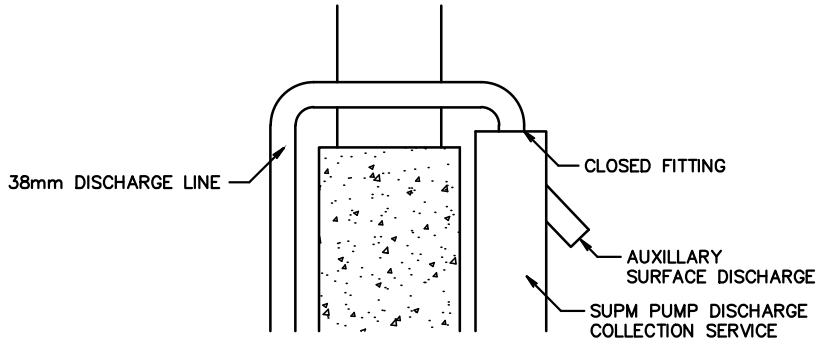
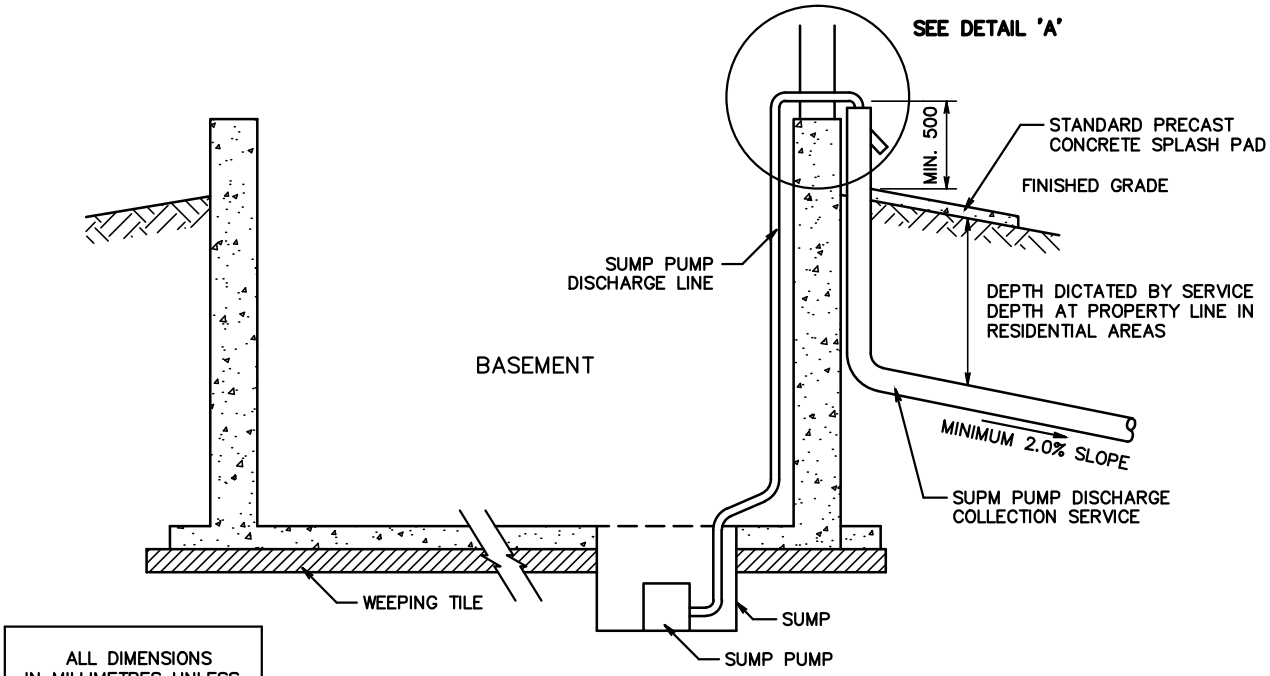
Rev.	wsp		TYPICAL SERVICES (SINGLE & DUAL)	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E–09
Date: APRIL 2009	Drawn: TLB	Scale NTS		



DETAIL A



ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

NOTES:
1. ROOF LEADERS (DOWNSPOUTS) OR ANY OTHER STORM WATER SOURCE MUST NOT BE CONNECTED TO THE SUMP DISCHARGE COLLECTION SERVICE LINE.
2. 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.

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General Municipal Servicing Standards

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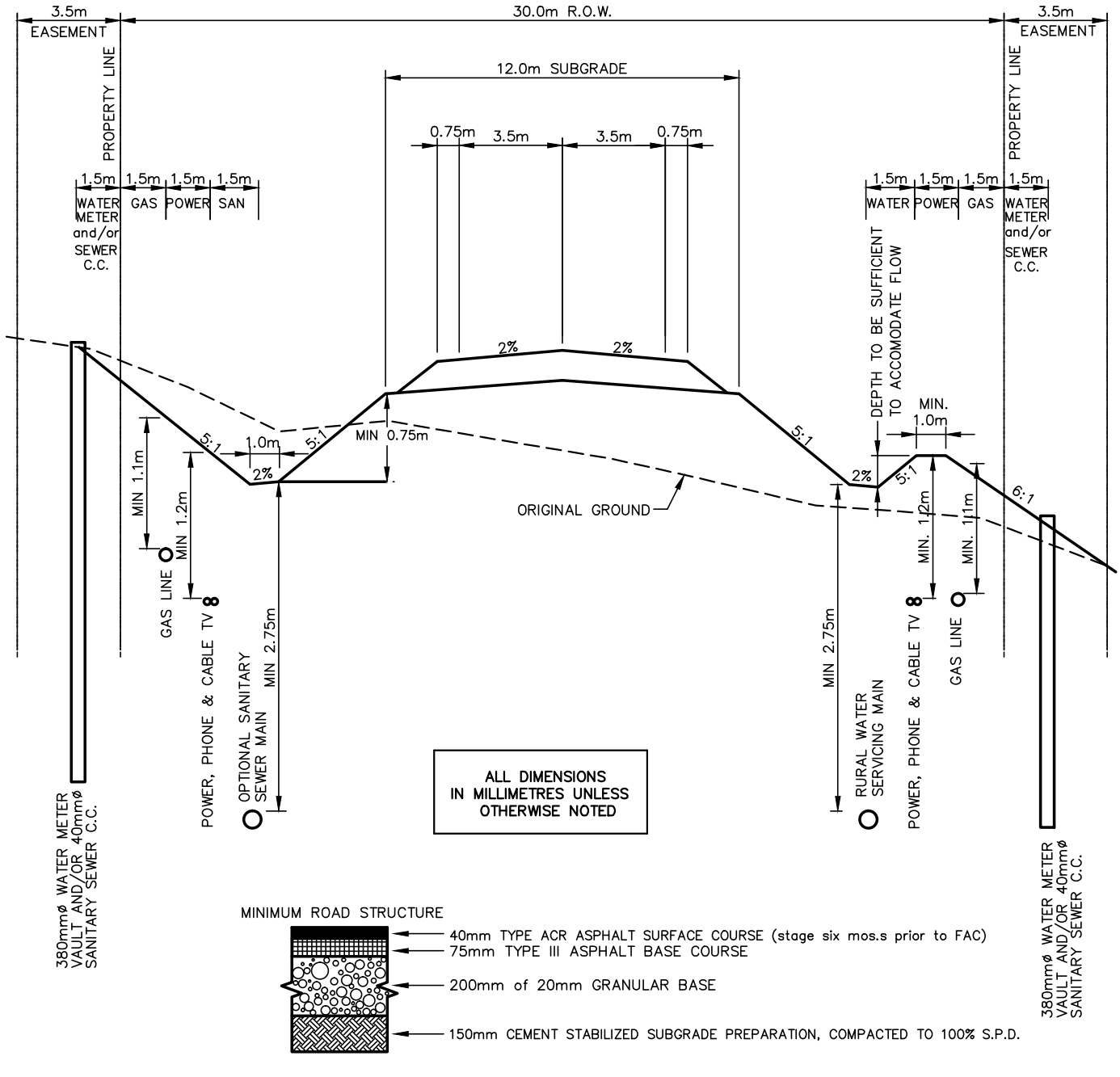
Rev.			TYPICAL SUMP PUMP DISCHARGE CONNECTION	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E–10
Date: 2008	Drawn: OM	Scale: NTS		



NOTES:

1. PROVISION FOR 7.5m FINISHED TOP AND 11.0m SUBGRADE ON CUL-DE-SAC ROADS PER LOT NUMBER AND SECOND ACCESS REQUIREMENTS.
2. MINIMUM LONGITUDINAL GRADE FOR ROAD AND DITCH TO BE 0.6%.
3. POSITIVE DRANAGE IS TO BE MAINTAINED AT ALL LOCATIONS.
4. DITCH DEPTH TO BE CONFIRMED BY GEOTECHNICAL REPORT.
5. MINIMUM ROAD STRUCTURE SUBJECT TO REVISION BY GEOTECHNICAL REPORT RECOMMENDATIONS.
6. ALL TRENCHES IN ROADS OR SIDESLOPE REQUIRE COMPACTION TO 98% STANDARD PROCTOR DENSITY.
7. ALL TRENCHES IN DITCH BOTTOM OR BACKSLOPE TO 95% STANDARD PROCTOR DENSITY.

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General Municipal Servicing Standards

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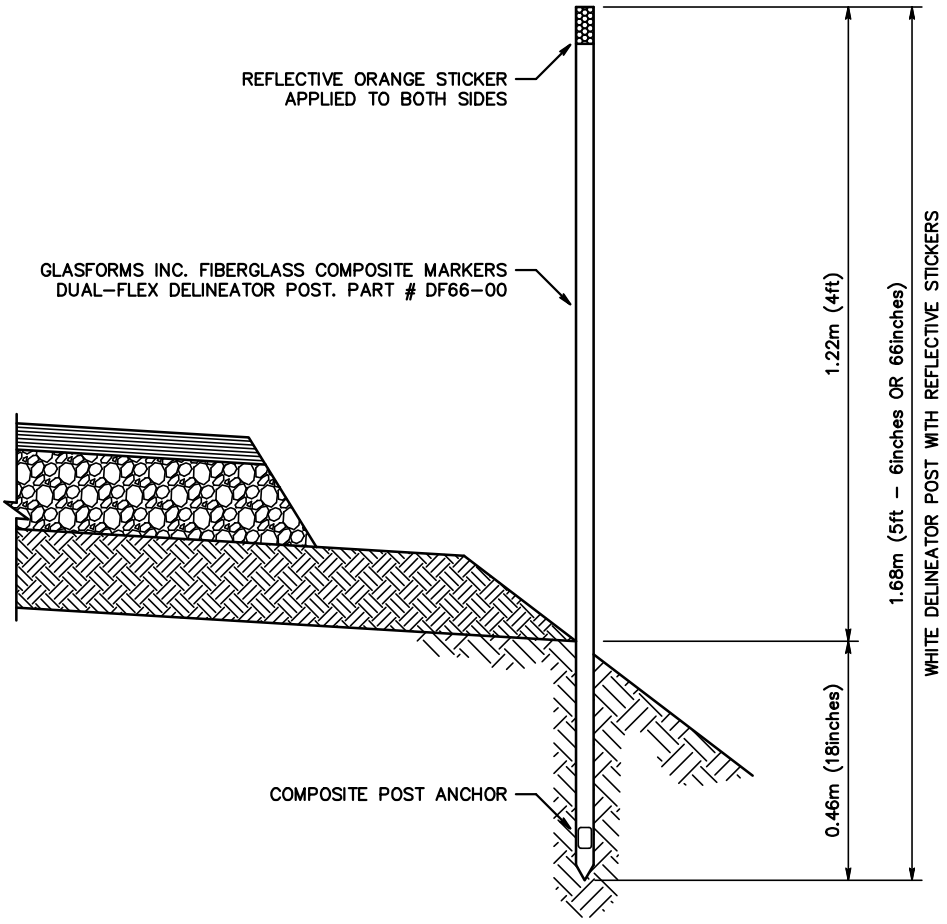
Rev.	wsp		RESIDENTIAL SUBDIVISION ROAD 8.5m FINISHED TOP ON 12.0m SUBGRADE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E-11
Date: APRIL 2009	Drawn: EPL	Scale NTS		



NOTES:
1. POSTS TO BE INSTALLED AT EDGE OF SUBGRADE PREPARATION.
2. EACH POST TO INCLUDE ONE POST ANCHOR.
3. SIX POSTS REQUIRED PER SUBDIVISION ACCESS (EXCEPT ON CLASS I GRID ROADS).
4. TWO POST REQUIRED PER RESIDENTIAL ACCESS.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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Rev.			FLEXIBLE DELINEATOR POSTS	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing E-12
Date: 2008	Drawn: OM	Scale: NTS		

SECTION F STORMWATER MANAGEMENT SYSTEM

F.1 GENERAL

.1 The Developer is responsible for ensuring that the storm sewer system is designed and constructed according to accepted engineering practice. These guidelines are intended as a guide only and must not be considered as a substitute for a detailed material and construction specification to be prepared by the Developer'.

.2 The stormwater management system should be designed with major and minor drainage systems. In general, a minor system consists of piping, manholes, catch basins and outfall structures that have been designed in order to avoid property damage and flooding due to runoff generated by a 1in 5-year rainfall event. A major system consists of the roads, gutters, lot drainage and detention facilities designed to avoid significant property damage and control flooding caused by a 1 in 100-year rainfall event. When the capacity of the minor system is exceeded, the major system must provide a continuous overland flow route allowing the excess runoff to reach the designated ponding areas or water body.

.3 The design of both the major and minor systems must address the guidelines presented in the latest edition of the publication "Stormwater Management Guidelines for the Province of Alberta."

.4 Organizations issuing standards:

.1 ASTM – American Society for Testing and Materials

.2 CSA – Canadian Standards Association

.3 Alberta Environment "Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems"

F.2 MINOR SYSTEM

.1 Flow Rates

.1 The storm sewers must be designed as a separate sewer system. Effluent from sanitary sewers or any potentially contaminated drainage must not be discharged in the storm sewers.

.2 The Minor System must be designed to accommodate the runoff generated from a 1:5 year or more frequent rainfall event without surcharge of sewer pipes or ponding at catch basins. An allowance should be made for sump pump discharge or individual service lines from weeping tiles where required.

.3 Roof leaders should be discharged to the ground and drain away from the building, water supply well, and septic bed. Provisions must be made to prevent soil erosion. The County may approve the discharge of roof leaders to the storm sewer when conditions prevention of erosion and/or property damage.

.4 Dry wells must be permitted only where the groundwater table is below the bottom of the dry well. Dry wells must be not less than five metres from the building foundation and located to ensure that drainage flows away from the building.

.5 The Rational Method must be used in estimating flows for the design of storm sewers for areas less than 65 hectares.

.1 $Q = CIA/360$

where

Q = the design peak flow rate in cubic metres per second

I = the intensity of rainfall in millimetres per hour

A = the contributing area in hectares

C = the runoff coefficient

.6 The five-year rainfall intensity must be taken from an officially recognized regional station.

.7 Minimum runoff coefficients must be according to the following table:

Land Use / Surface Characteristics	Runoff Coefficient, C
Country Residential	0.3
Urban	0.4
Grassed Areas (Parks, playgrounds)	0.15
Undeveloped Land (Farmland)	0.1
Industrial	0.6
Commercial	0.7

.8 Due to the large variation in lot sizes for rural residential developments and in impervious areas for commercial and industrial areas, a weighted runoff coefficient for these types of developments can be calculated using the following formula:

.1 $$C = \frac{(0.9 \text{ x Impervious Area}) + (0.15 \text{ x Pervious Area})}{\text{Total Area}}$$

.9 The intensity for the rational formula is to be sought from Atmospheric Environment Services, Environment Canada. T_c is the sum of the inlet time and travel time. The inlet time is the time for the overland flow to reach the curb. The maximum inlet time for residential areas must be 10 minutes. Inlet times for commercial or industrial areas must be calculated on a site-specific basis. The travel time, defined as the time it takes for the runoff to reach the design point from the moment it reaches the curb, is calculated based on gutter and pipe velocity.

.10 For areas larger than 65 hectares, the Developer must submit acceptable computer modelling of the area for review.

.11 Weeping tile flows must be presented in a detailed Geotechnical Hydrogeological Investigation prepared by a qualified geotechnical engineer or hydrogeologist. The report should outline expected weeping tile flows and any design and construction procedures required for foundation installation.

.2 Pipe Sizing

.1 The following design factors must be used in determining the storm sewer pipe sizes:

Minimum pipe size for storm sewer main	-	300mm
Minimum pipe size for foundation drains main accommodating flow from weeping tiles ONLY	-	150mm
Minimum pipe size for catch basin leads	-	250mm
Manning's Formula "n"	-	0.013
Minimum flow velocity when flowing full	-	0.6m/sec
Maximum flow velocity	-	3.0 m/sec

.1 Minimum design slopes

Sewer Diameter (mm)	Minimum Design Slope
300	0.194 %
375	0.145 %
450	0.114 %
525	0.092 %
600	0.077 %
675	0.065 %
750	0.057 %
900	0.045 %
1050	0.036 %
1200	0.031 %
1350	0.027 %
1500	0.023 %
1650	0.020 %
1800	0.018 %
1950	0.016 %
2100	0.015 %
2250	0.013 %
2400	0.012 %
2550	0.011 %
2820	0.010 %

.2 Minimum slope on curved sections

Sewer Diameter (mm)	Minimum Design Slope
300	0.25 %
375	0.18 %
450	0.15 %
525	0.13 %
600 and greater	0.10 %

.3 Minimum grade for catch basin leads - 1.0%

.4 The minimum grade of the first upstream leg must not be less than 0.5%

.3 Storm Sewer Alignment and Location

.1 Sewer mains must be located within the road right-of-way and outside the carriageway in accordance with the typical roadway cross section.

.2 Storm sewers must be located a minimum of 3.0 m o/c from any watermain and 1.8m o/c from any gas line or as required by the utility company.

.3 Storm sewers must be spaced at a minimum of 0.25m between pipe walls from any adjacent sanitary sewer.

.4 Public Utility Lot (PUL) widths must be at least 4.0m for a single utility and 6.0m for two utilities.

.5 Curved sewers must run parallel to the curb or road centreline.

.4 Required Depth for Storm Sewers and Catch Basin Leads

.1 Storm sewers must be installed at a sufficient depth to meet the following requirements:

.1 The main must have a minimum depth of cover of 2.2 m measured from finished grade to the invert.

.2 The storm sewer must have sufficient depth of cover to provide complete frost protection.

.3 The main must have sufficient depth to allow all required building foundations to drain by gravity to the sewer. Special consideration should be taken when building floor elevations are lower than the roadway. Service lines must have a minimum cover of 2.0m from the finished lot surface to the top of the pipe at the property line.

.4 The catch basin leads must have a minimum of 1.5 metres of cover measured to the top of the pipe.

.5 Under normal conditions, storm sewer mains must cross below water mains with sufficient clearance to allow for proper bedding and structural support of the pipes. Pipe clearance when passing under any watermain must be a minimum of 300mm separation between the top of the sewer pipe and the bottom of the watermain.

.6 Pipe clearance when passing over any watermain must be a minimum of 500mm separation between the bottom of the sewer pipe and the top of the watermain. Efforts must be made to pass under the watermain when possible.

.5 Manhole Design and Location

.1 Manholes must be located at the end of each line, at all changes in pipe size, grade and alignment.

.2 The maximum distance between manholes must not exceed 150m.

.3 All manholes must be a minimum 1200mm inside diameter.

.4 Manholes must be located at the extension of property lines whenever possible in order to avoid conflicts with driveways.

.5 The drop across manholes should be of sufficient magnitude to account for any energy losses in the manhole.

.1 Pipe deflections of less than 45° require a drop of at least 30mm

.2 Pipe deflections of 45° to 90° require a drop of at least 50mm

.6 Invert drops for pipes larger than 600mm or for high flow situations must be assessed on an individual basis.

.7 The obvert elevation of a sewer entering a manhole must not be lower than the obvert elevation of the outlet pipe.

.8 Pipe deflections in manholes must not be greater than 90°.

.6 Storm Services and Foundation Drains

.1 Foundation drain service connections will be required for weeping tile flow in areas where the water table is higher than the basement foundations. Sizing of foundation drain service lines must be based on expected flows as determined by the geotechnical investigation. Sump pump discharge collection systems with surface discharge must not be permitted in areas with urban road cross sections.

.2 Storm sewer connections for the connection of roof drains will only be required where geotechnical conditions dictate such as areas where slope stability is an issue

.3 When required, separate storm sewer or foundation drain service connections must be provided for each separately titled lot.

.4 The minimum size of a residential storm sewer or foundation drain service must be 100mm. Non-residential service connections must be sized according to anticipated flow.

.5 Connections for all proposed residential lots requiring storm sewer or foundation drain services must be installed at the time of initial subdivision development.

.6 The minimum grade for a storm sewer or foundation drain service line must be 2.0%.

.7 Services must be located such that they do not conflict with driveway locations.

.8 The storm sewer or foundation drain services must be installed to the property line. In areas where natural gas distribution facilities require an easement along the front of the property, the service connections must be extended to the edge of the easement furthest from the roadway.

.7 Catch Basins and Leads

.1 The maximum surface/gutter flow distance must be 150m.

.2 The catch basin grates, leads and spacing must be designed such that there will be no ponding during a 1:5-year rainfall event.

.3 At sag locations, the determination of the required capacity must account for flow that may bypass inlets at upstream gutter locations.

.4 The minimum inside diameter for a pre-cast catch basin must be 610 mm.

.5 The minimum sump depth in catch basins must be 600mm.

.6 The gutter flow must be intercepted by a catch basin prior to crossing a walkway wherever possible.

.7 The depth of flow in gutters should not exceed the top of the curb at any point.

.8 Catch basins must be located at the BC or EC of any curb return.

.9 The maximum length of a catch basin lead must be 30 metres. If the length must exceed 30 metres, a catch basin manhole must be installed on the upstream end.

.10 All leads must be connected to a manhole or catch basin manhole at the downstream end.

.11 Catch basins and leads must not be placed beyond the public right-of-way. Lots must be filled and graded to ensure that all runoff drains to a public right-of-way.

.12 The minimum grade on a catch basin lead must be 1.00%.

.13 Minimum depth of cover must be 1.5 metres to the top of the pipe.

.8 Storm Sewer Materials

.1 The Developer must supply only new materials. All materials found to be defective or damaged must be replaced at the cost of the Developer.

.2 Where specific products are specified, it is intended that approved equals are also acceptable. Approval must be obtained by the County prior to installation.

.3 PVC pipe and fittings must conform to the following:

.1 CSA B182.2, ASTM D3034, ASTM F679, NQ 3624-130 and NQ 3624-135 standards with minimum stiffness of 320 kPa. Service lines must have a minimum stiffness of 625 kPa.

.2 Ultra-Rib PVC or approved equal is acceptable from 250 to 600mm. The pipe must conform to CSA B182.4 and ASTM F794 with a minimum stiffness of 320 kPa.

.3 Standard Dimension Ratio (SDR) 35 unless otherwise indicated on the drawing.

.4 Sealing gaskets must meet requirements of CSA B182.2 and ASTM F477.

.5 Injection moulded gasketed fittings for service connections must conform to CSA B182.1 or CSA B182.2, and fabricated fittings must conform to CSA B182.2 and ASTM F679.

.6 The pipe must be tested by the manufacturer and marked in accordance with CSA B182.2. Test results must be recorded on a certification form signed by a qualified representative of the manufacturer.

.7 Pipe and fittings must be installed within two years from the production date indicated on the certification.

.4 Concrete pipe and fittings must conform to the following:

.1 All concrete pipe must be manufactured using Type 50 sulphate resistant cement CSA A3000.

.2 Non-reinforced concrete pipe must conform to CSA A257.1, minimum Class 3 and ASTM C14.

.3 Reinforced concrete pipe must conform to CSA A257.2 and ASTM C76.

.4 Flexible rubber gasket joints must conform to CSA 257.3 and ASTM C443.

.5 The manufacturer of the concrete pipe must perform quality testing and control in accordance with CSA 257.0, 257.1, 257.2 and 257.3.

.6 Each concrete pipe must be marked with the manufacturer's name, date of casting and quality testing passing stamp.

.9 Manhole Materials

.1 Manholes must be manufactured using sulphate resistant Type 50 cement.

.2 Manhole sections must be pre-cast reinforced concrete conforming to ASTM C478 and CSA A257.4.

.3 All manholes must have a minimum 1200 mm inside diameter. Oversize manholes are permitted, at the discretion of the County, to accommodate large pipe diameters.

.4 Manhole steps must be standard safety type, with hot dipped galvanized iron that conforms to ASTM A615 and ASTM A123 or aluminum forged from 6061-T6, 6351-T6.

.5 All joints must be sealed with rubber gaskets conforming to ASTM C443 and grouted with non-shrink grout.

.6 Manhole frames and covers must be cast iron conforming to Class 20 ASTM A48 and ASTM A536. Type NF80 covers must be used for all streets and driveways, type NF90 covers with rubber gasket must be used for manholes located in sags and low areas, and type F39 covers must be used for all other areas. Castings must be marked with series designation, foundry identification and date of casting. Manhole covers with Lac La Biche County identification will be encouraged. Manhole covers with names of other municipality names are not permitted.

.7 Pre-benched manhole bases must be used wherever possible with pre-cored connection holes and watertight Duraseal or G-Loc joints or approved equal.

.8 Tee Riser manholes must conform to CSA 257.2, ASTM C76 and CSA A257.4, ASTM C478.

.9 Safety platforms are required for all manholes greater than 7.0m in depth.

.10 All pre-cast units must be marked with manufacturer's identification, date of casting, type of cement and CSA standard.

.10 Catch Basin Materials

.1 Catch basin barrels must be manufactured using sulphate resistant Type 50 cement.

.2 Catch basin frames and grates must be cast iron conforming to Class 20 ASTM A48 and ASTM A536. Type F38 or F39 grates must be used for all round top inlet catch basins, type F51 or F36A grates must be used for straight face curbs and type F33, K7 or DK7 must be used for rolled face curb. Any other types must obtain approval by the County. Castings must be marked with series designation, foundry identification and date of casting.

.3 If required, catch basin steps must be standard safety type, hot dipped galvanized iron conforming to ASTM A615 and ASTM A123 or aluminum forged from 6061-T6, 6351-T6.

.4 All pre-cast units must be marked with manufacturer's identification, date of casting, type of cement and CSA standard.

.11 Trenching, Bedding and Backfilling

.1 All trenching and backfilling must be completed in strict accordance with the Occupational Health and Safety Code.

.2 If unsuitable soil conditions are encountered, proper measures for dealing with the conditions must be identified either on the design drawings or as a brief report to the County prior to construction.

.3 Class “B” pipe bedding must be utilized in suitable soil conditions. Washed rock must be used if the water table is above the pipe zone. Bedding sand must have a minimum depth of 100mm below the pipe, must extend up both sides to the trench wall and provide a minimum cover of 300mm above the pipe. The Developer must identify special pipe foundation measures for areas where unsuitable pipe foundation conditions exist.

.4 The minimum trench width measured at the pipe springline must be the pipe outside diameter plus 450mm. The maximum trench measured at the pipe springline must be the pipe outside diameter plus 600mm. The County must be notified if the trench must be excavated deeper or wider than specified.

.5 Excavated material must be stockpiled at a safe distance from the edge of the trench.

.6 The Developer must identify areas where the trench excavation requires sheathing, shoring or bracing in order to protect workers, property or adjacent structures.

.7 Trench excavations must be kept free of water.

.8 It must be the Developer’s responsibility to ensure that the utility trenches are adequately compacted.

.1 Native backfill under existing or proposed roads or laneways must be compacted throughout the entire right-of-way width to:

.1 98% standard proctor density from subgrade to 1.5m below subgrade or original ground, whichever is lower;

.2 95% standard proctor density greater than 1.5m from the subgrade or original ground, whichever is lower.

.2 Granular backfill under existing or proposed roads or laneways must be compacted to 95% of standard proctor density throughout the entire trench depth below subgrade and the entire right-of-way width.

.3 Backfill in all other areas must be compacted to 95% standard proctor density.

.4 Subgrade and base course compaction for roadway construction must be as specified in Section G.

.5 If the above standards cannot be achieved due to a large variation in soil types throughout the development, the County, at its sole discretion, may establish a more appropriate standard on an individual case basis. One-mould proctor density testing may be permitted if the Developer submits an acceptable proposal prepared by the Developer, justifying the required changes to the compaction standards.

.9 If the minimum compaction standards cannot be met due to abnormal weather or wet ground conditions, the County may establish a more suitable standard on a site-specific basis provided adequate justification is presented by the Developer. One-mould proctor density testing will not be permitted as an alternate testing procedure due to wet soil conditions. The Developer will be required to suggest appropriate measures such as drying in-situ material or importing suitable material in order to meet the required Standard Proctor Densities.

.10 All landscaping, pavement structures, sidewalks, curb and gutter damaged or removed during trenching must be restored or replaced unless otherwise directed by the County.

.11 All debris, surplus fill and unused materials must be removed from the site.

.12 Storm Sewer Installation

.1 The pipe and gasket installation must be conducted in compliance with the pipe manufacturer's specifications. Installation of PVC pipe and fittings must conform to CSA-B182.11.

.2 Pipe installation must start at the outlet and work upstream.

.3 Align pipes carefully when joining. Keep joints free of mud, gravel and foreign material and apply sufficient pressure to ensure that the joint is complete as outlined in the manufacturer's specifications. Complete each joint before laying the next length of pipe. Deflections must not exceed those permitted by the manufacturer.

.4 The pipe must be thoroughly flushed of all dirt, stones and pipe lubricant when complete.

.5 The alignment of pipes less than 900mm in diameter must not be more than 150mm off the designated alignment. The alignment for pipes larger than 900mm must not deviate by more than 50mm per 300mm of diameter.

.6 The invert of the pipe must not deviate from the design grade by more than 6mm plus 20mm per metre of the diameter of the sewer pipe.

.13 Manhole Installation

.1 Manholes must be installed as depicted on the detail drawings and in accordance with the manufacturer's recommendations.

.2 Backfill around manholes must be compacted to a minimum of 98% Standard Proctor Density.

.3 Tee Riser manholes must require Class A bedding to the elevation of the springline.

.4 Pre-cast manhole bases must be installed on a base of 100mm to 300mm washed gravel.

.5 Cast in place manhole bases approved by the County must be placed directly on undisturbed ground.

.6 Safety steps must be aligned on centreline perpendicular to the main flow channel. Wherever possible, the steps must be aligned so that a person exiting the manhole would face oncoming traffic if not conflicting with the previous requirement. The distance from the top of the rim to the first step must not be greater than 300mm. Steps must be evenly spaced at a maximum of 410mm to within 600mm of the base of the manhole. Refer to Drawing E-08 for details.

.7 The frame and cover must be installed following the manufacturer's recommendations.

.14 Inspection and Testing

.1 All sewer installations must be subject to inspections by the County prior to issuance of the Construction Completion Certificate (CCC) and Final Acceptance Certificate (FAC).

.2 Video inspections by qualified personnel are required prior to CCC for all sewers less than 1200mm in diameter. A walk-through inspection is permitted for any sewer 1200mm and larger. A written report including still photographs and a video recording of the entire inspection must be submitted to the County for review. The report must indicate the location and severity of all leaks, cracks, breaks, collapses, deflections, sags, obstructions and any other defects affecting the performance of the line. Sections requiring repair will be subject to re-inspection when complete.

.3 Re-inspection by camera may be required on suspect areas prior to FAC at the discretion of the County. All video inspection costs must be the responsibility of the Developer.

.4 All material testing (backfill densities) must be performed by an accredited agency. All test results must be submitted to the County with a report indicating any deficiencies and remediation.

.5 An infiltration and/or exfiltration test may be required at the County's sole discretion for any section showing deficiencies during the camera test.

.1 The test section must be filled with water allowing displacement of air in the line and will be allowed to stand for 24 hours to ensure absorption in the pipe wall. Prior to the test, add enough water to ensure a head of 1m to 3m over the pipe crown in the upstream manhole. The test duration must be 2 hours. The water level should be measured at the beginning and end of the test in order to calculate the infiltration/exfiltration.

.2 The allowable leakages are as follows:

.1 Infiltration Test: Performed when the groundwater is above the pipe crown for the entire test length. Allowable infiltration is 5.0 L/day/mm dia./km for PVC pipe and 20.0 L/day/mm dia./km for concrete pipe.

.2 Exfiltration Test: Performed when the groundwater is below the pipe invert for the entire test length. Allowable exfiltration is 5.0 L/day/mm dia./km and 20.0 L/day/mm dia./km for concrete pipe.

F.3 MAJOR SYSTEM

.1 General

.1 The overall major drainage system for the Urban Services Areas must be designed to provide continuous overland flow routes with minimum depths of ponding in roadway sags and to provide overflow routes at all stormwater management facilities. The development of the major drainage system framework must be a key component of the Master Drainage Plan to be developed by the Developer for new drainage basins (watersheds).

.2 The major system must accommodate a 1:100-year storm condition with maximum surcharging in the roadway gutter of 180mm. If downstream constraints require a gutter flow in excess of 180mm, special modelling and design calculations must be submitted to the County for review. The County must determine the extent, if any, of a relaxation of the

maximum 180mm gutter flow standard on an individual basis. The major drainage system must be fully contained within the boundary of Public Property.

.3 Arterial roads must not be apart of the major overland flow system. Where the slope of the terrain makes it particularly difficult to prevent the major drainage from accessing an arterial right-of-way, the County may grant the Developer permission to discharge primary drainage flow on to the arterial right-of-way subject to:

.1 no adverse impact on the drainage on the arterial road, or

.2 the opportunity for the provision of a depressed swale or pathway with sufficient flow and/or storage capacity to accommodate a 1:100-year storm event and carry the flow to the point of discharge into an off arterial overland flow route, and

.3 the Developer's agreement to pay for the cost of such additional works or charges needed to accommodate the increased discharge.

.4 Provisions must be taken to employ control/abatement measures to that construction material, and debris does not enter any stormwater management facility at any point during subdivision construction.

.5 Grading

.1 Carefully designed and controlled lot grading is an important component of the Major System. Lots must be designed to drain from back to front except under extreme cases where the Developer can satisfy the County that back to front drainage is not technically feasible. If an alternate system is required, it must be designed so that surface water crosses the fewest lots possible in its path to the street. No more than 2 lots must be crossed. In extreme cases, the County may permit more than 2 lots to be crossed provided a concrete drainage swale and easements are established. The potential problem areas must be identified in the Design Brief.

.2 Lot Grading

.1 Proper lot grading is the first step towards a well planned major drainage system. The goal of the lot grading must be to ensure that water flows away from the building, water supply well, and septic bed, and in no case, must ponding levels come within 150mm from the finished ground elevation at the building during a 1:100-year rainfall event. Flow from lots must always have an escape route to a public right-of-way. The lot-grading plan must develop a proper balance between the road and gutter elevations, proposed building elevations, surrounding development and existing topography.

.2 Generally, the lots must be designed to drain from back to front. Drainage towards the back of lot will be permitted where laneways or public right-of-ways are in place to accommodate drainage directly from the lot without crossing adjacent lots. An overall drainage plan will be required for all subdivisions.

.3 An initial grade of 10% sloping away from the building for a distance of 3m must be required on all sides. The slope must continue at a minimum grade of 2.0% to the property boundary. Larger slopes are desirable if topography allows to a maximum of 10%.

.4 Reserves and public lands must be graded to drain towards developed streets, lanes, and/or the storm drainage system.

.3 Swales

.1 Drainage swales on municipal or private property must be constructed prior to any development of subdivision lots. Complete swale construction must be a prerequisite to the issuance of the Construction Completion Certificate.

.2 Drainage swales located on private property must be covered by an easement in favour of the County. A minimum clearance of 200mm should be provided between the edge of the swale and the property line. Major rainfall event flows must be contained within the easement.

.3 Drainage swales crossing several properties for the collection of runoff must not be permitted unless special circumstances warrant.

.4 Concrete swales must be required when accommodating flow from more than three adjacent lots.

.5 Earthen swales must be protected from erosion by grass cover, appropriate ground cover or geotextile fabric.

.6 The minimum design slope for concrete swales on private property is 0.75%.

.7 The minimum design slope for concrete swales on public property is 0.5% or as required to provide adequate hydraulic capacity.

.8 The minimum design slope for swales without a concrete gutter is 1.5%.

.4 Roadways

.1 Grading of streets comprising the major drainage system must follow the guidelines listed below:

.1 Continuity of overland flow routes between adjacent developments must be maintained.

.2 Collector roads must have at least one lane that is not inundated.

.3 Local roads should not have a depth of water more than 50mm above the crown of the road.

.4 The depth of water at the curb must be less than 500mm for all roadways.

.5 Stormwater Storage Facilities

.1 General

.1 This section identifies the general design parameters for the planning and design of stormwater storage facilities.

.2 A drainage master plan must be prepared by the Developer providing a detailed description of the development area including overland flow, catchment areas, natural storage and planned storage.

.3 Several different storage methods may be employed for a stormwater storage facility such as:

.1 Retention Storage (wet ponds) – collects and stores runoff for a period of time and releases it after the inflow has ceased. Retention storage also includes constructed wetlands.

.2 Detention storage (dry ponds) – provides a controlled outlet to the area restricting flow. When the inflow exceeds the allowed outflow, water is detained in the designated storage area until flows diminish. Low flows are not usually detained.

.3 Channel Storage – channels constructed with wide bottoms and small grades will provide a type of storage as the channel fills with water.

.4 The design of the storage facility must be based on a 1:100-year rainfall event. The Developer must include detailed calculations for a range of storm durations to determine the critical volume as well as an analysis of the capacity and characteristics of the downstream receiving drainage course. Measures must be taken in order to avoid flooding, erosion or sedimentation in the downstream receiving drainage course.

.5 These minimum standards are not intended to restrict Developers from formulating innovative stormwater management processes intended to protect the environment and improve the stormwater quality prior to release. All stormwater management plans must be submitted to the County for review and approval.

.6 The Developer must address the guidelines presented in the latest edition of the publication “Stormwater Management Guidelines for the Province of Alberta” prepared by Alberta Environment Protection.

.7 Stormwater quality best management practices must be an objective in the design of stormwater management facilities.

.2 Design Standards for Lakes and Wet Ponds

.1 Lands covered by the facility including areas covered by water at the normal water level (NWL), inlets, outlets, control structures and access routes must be designated as Public Utility Lot (P.U.L.).

.2 Private property subject to potential flooding must be covered by an easement in favour of the County.

.3 A restrictive covenant must be placed on the lots abutting the facility as required to control development that will restrict the capacity.

.4 The design must incorporate a semi-annual turnover at average annual precipitation.

.5 The high-water level must be at least 600mm below the lowest building opening on adjacent lots. Freeboard requirements are to be determined as part of the storage facility design and may vary in consideration of the facility design basis.

.6 The minimum surface area at normal water level must be 2 ha in order to discourage a large number of small facilities.

.7 The lake must have maximum side slopes of 3H:1V from the lake bottom to 1m below the NWL. Slopes above this level must have a maximum slope of 7H:1V. These slopes may be revised in confined spaces or areas with extreme topography at the discretion of the County.

.8 The minimum depth from the NWL to the lake bottom must be 2.5m in order to discourage the growth of vegetation.

.9 Where the ground water level is below the NWL, the lake bottom must be of impervious material. Where the ground water level is near or above the NWL, the lake bottom may be made of a pervious material based on the geotechnical investigation.

.10 Inlets and outlets are to be placed in order to maximize detention time and water circulation thereby avoiding dead storage areas.

.11 Inlet and outlet pipes are to be fully submerged and at least 200mm above the lake bottom and 1.0m below the NWL.

.12 The inlet manhole invert must be at or above the NWL in order to avoid sedimentation.

.13 Provision must be made in order to drain the lake completely by gravity or portable pump system.

.14 An overflow channel and overland drainage route must be provided with the high-water level.

.15 Edge treatment is required for erosion protection due to wave action from 0.3m below the NWL to 0.3m above the NWL.

.16 All weather vehicle access must be provided to all control works. Access to the lake for launching boats must also be available.

.17 Approved fencing and signage must be installed where necessary for safety purposes.

.18 The shoreline treatment between the high water level and the normal water level must be chosen to ensure that erosion does not occur and natural wetland vegetation develops.

.3 Design Standards for Dry Ponds

.1 Lands covered by the facility including areas covered by water at the 1:5-year level, inlets, outlets, control structures and access routes must be designated as Public Utility Lot (P.U.L.).

.2 Private property subject to potential flooding must be covered by an easement in favour of the County.

.3 A restrictive covenant must be placed on the lots abutting the facility as required to control development that will restrict the capacity.

.4 All dry ponds must be designated as off-line storage areas designed to temporarily detain excess flow and control downstream flow to acceptable limits. Low flow conditions must not be diverted to the dry pond.

.5 The maximum storage depth must be 1.5m measured from the invert of the outlet pipe.

.6 The pond must be designed to drain completely after the excess flow has dissipated. The pond bottom must have a minimum slope of 1.0% towards the outlet. French drains may be required.

.7 Side slopes must have a maximum slope of 7H:1V within private property and 5H : 1V within public property.

.8 Grass cover must be established after completion of construction.

.9 All inlets and outlets must have grates with a maximum bar spacing of 150mm over their openings in order to prevent access. The possibility of plugging must be considered in the sizing of the outlet pipe. The maximum flow through the grating must be 1.0 m/sec.

.4 Inlets, Outlets and Outfall Structures

.1 Obverts of outfall pipes must be above the 1:5-year flood level of the receiving drainage course.

.2 Inverts must be above the winter ice or completely submerged with obverts 1.0m below NWL.

.3 Drop structures, energy dissipaters, riprap and filter fabric, must be used where necessary to prevent erosion.

.4 Removable grates must be installed on openings to discourage unauthorized access.

.5 All piped inlets and outlets for stormwater storage facilities must be capped with compacted clay or other impervious material at the pond inverts in order to prevent water from washing out the granular bedding material.

.6 A silt trap must be provided at the inlets of each pond. A defined path via publicly owned land or established drainage courses must be identified and designed to carry flows when the design storage is exceeded.

.7 The lake and perimeter area design must allow for vehicle access to inlets, outlets, and other facilities requiring maintenance.

F.4 SUMMARY OF SANITARY SEWER SYSTEM STANDARDS

.1 The following is a summary of the standards applicable to the sanitary sewer systems materials and construction. In all cases, it is intended that the latest apply.

.2 <u>ASTM</u>

A48	Grey Iron Castings
C14	Concrete Sewer, Storm and Drain, and Culvert Pipe
C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C478	Precast Reinforced Concrete Manhole Sections
D698	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures
D3034	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

<u>CSA</u>

A5	Portland Cements
A23.1	Concrete Materials and Methods of Concrete Construction
A257 Series	Standards for Concrete Pipe
B182.1	Sewer Pipe Fittings
B182.2	PVC Sewer Pipe and Fittings (PSM Type)
B182.4	Profile PVC Sewer Pipe and Fittings
B182.11	Recommended Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings
G30.12	Billet Steel Bars for Concrete Reinforcement

CLASS A BEDDING

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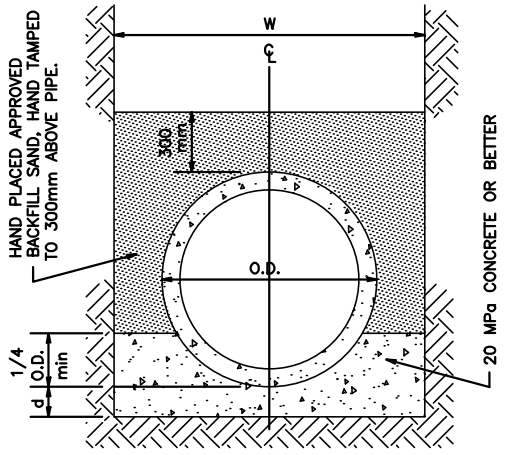

CLASS B BEDDING

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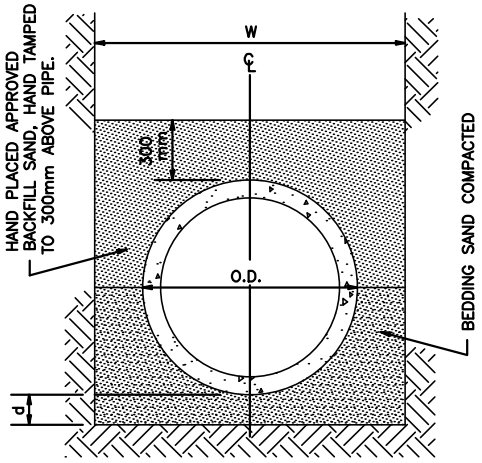

CLASS C BEDDING

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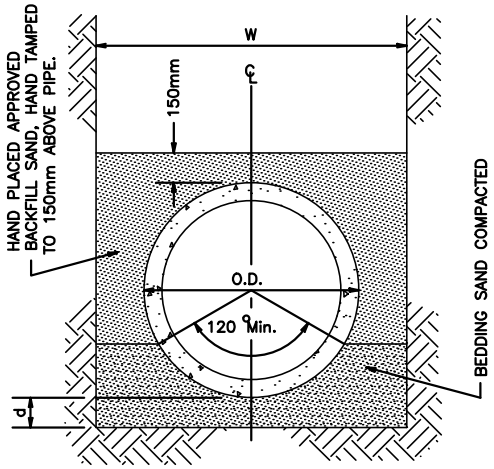

CLASS B BEDDING

ALTERNATE – 375mm I.D. & UNDER

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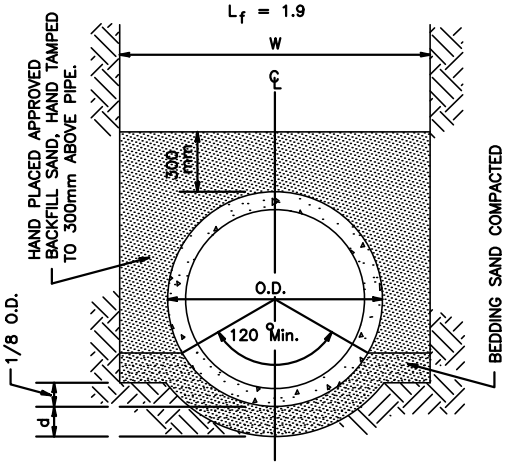


NOTES:

W = TRENCH WIDTH – O.D. + 450mm (MINIMUM)
– 1000mm max. FOR PIPES UP TO AND INCLUDING 400mm DIAMETER
– O.D. + 400mm max. (ON EITHER SIDE {800mm TOTAL}) FOR PIPE DIAMETERS 450mm AND ABOVE

O.D.= OUTSIDE PIPE DIAMETER
I.D. = INSIDE PIPE DIAMETER
L_f = LOAD FACTOR
d = DEPTH OF BEDDING BELOW PIPE
I.D.= 675mm OR SMALLER – d min = 150mm
I.D.= 750mm TO 1500mm – d min = 150mm
I.D.= 1650mm AND LARGER – d min = 150mm

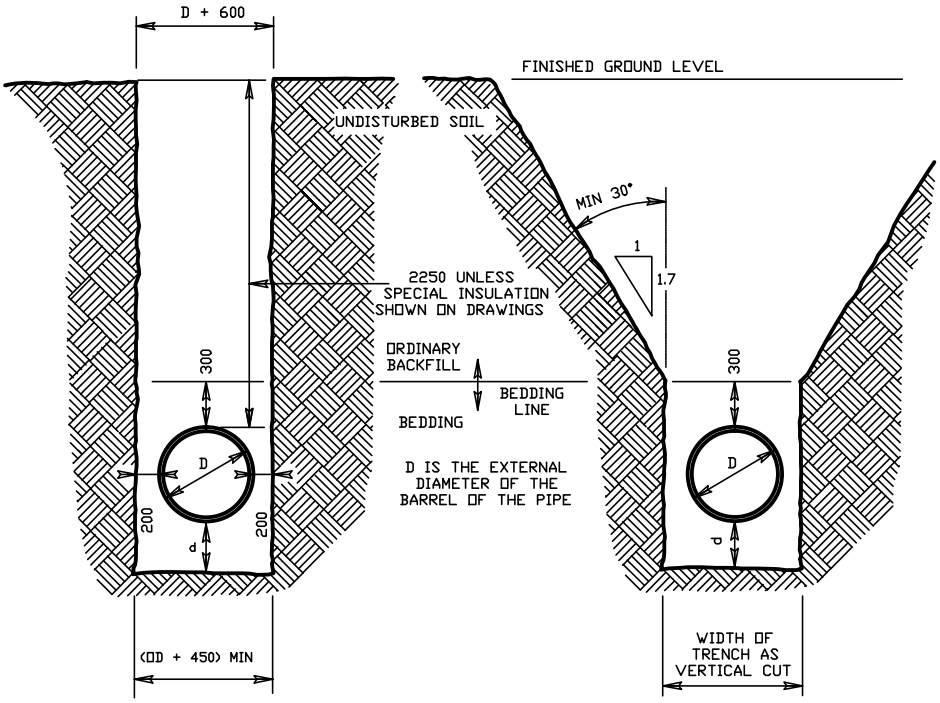
STANDARD TRENCH BEDDING FOR CIRCULAR PIPES

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.			STANDARD TRENCH BEDDING FOR CIRCULAR PIPES	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–01
Date: APRIL 2009	Drawn: TLB	Scale NTS		



STANDARD TRENCH VERTICAL CUT

(TO BE SHORED AS PER OCCUPATIONAL HEALTH AND SAFETY STANDARDS)

MAXIMUM TRENCH WIDTHS FOR SINGLE PIPES

- UP TO AND INCLUDING 400mm DIAMETER – 1000mm
- 450mm DIAMETER AND ABOVE – OD + 600mm

STANDARD TRENCH SLOPING CUT

(TO BE SLOPED AS PER OCCUPATIONAL HEALTH AND SAFETY STANDARDS)

DEPTH OF BEDDING BELOW PIPE BARREL (d)

- EXTERNAL DIAMETER OF 700mm AND BELOW :75
- EXTERNAL DIAMETER GREATER THAN 700mm :100

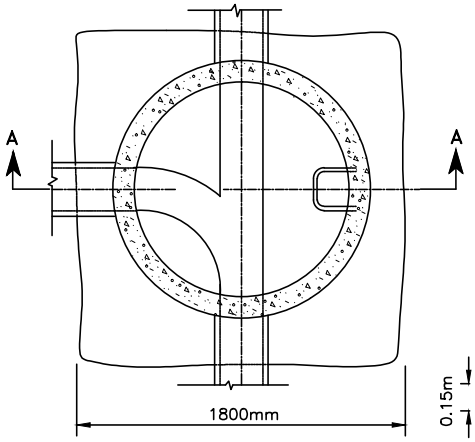
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

LAC LA BICHE COUNTY

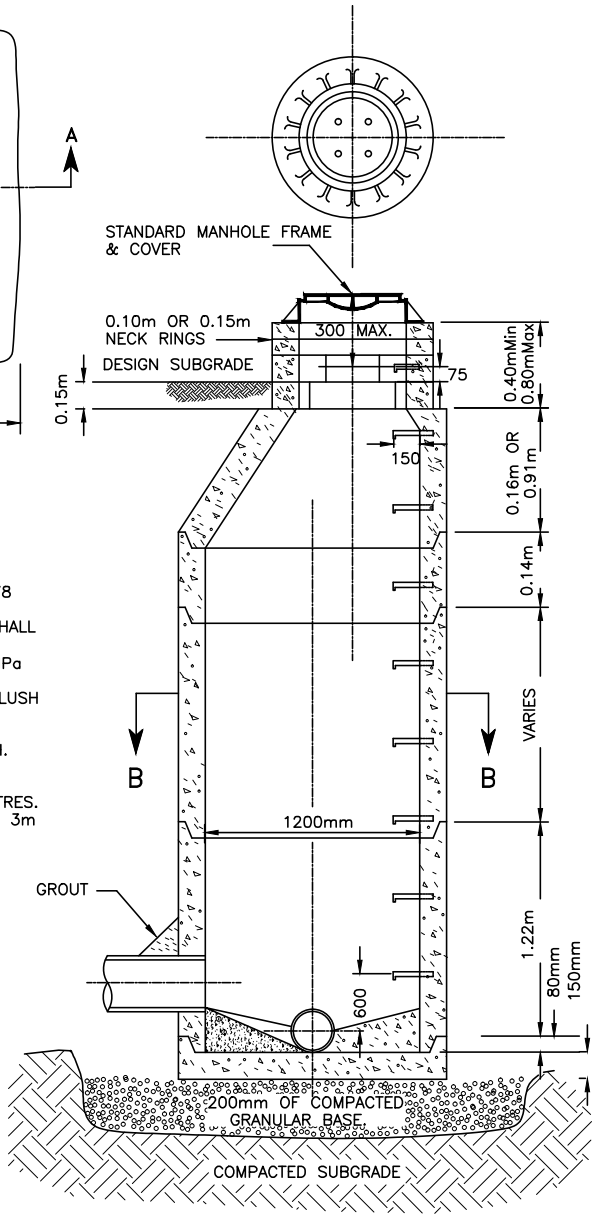
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		STANDARD TRENCH DIMENSIONS FOR CIRCULAR PIPE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–02
Date: APRIL 2009	Drawn: TLB	Scale NTS		



SECTION B – B



SECTION A – A

NOTES

1. STANDARD M.H. FRAME & COVER.
2. MANHOLE BARRELS TO MEET A.S.T.M. C478
3. FORMANHOLES OVER 5.00m IN DEPTH, PRECAST OR POURED IN PLACE BASES SHALL BE REINFORCED WITH BARS.
4. POURED IN PLACE CONCRETE TO BE 30MPa AT 28 DAYS.
5. INLET & OUTLET PIPE TO BE GROUTED FLUSH WITH WALL.
6. GALVANIZED STEEL SAFETY STEPS AT 0.41m MAXIMUM TO FULL HEIGHT OF M.H.
7. RUBBER GASKET JOINT.
8. SAFETY GRATING TO BE USED WHEN THE DEPTH OF THE MANHOLE EXCEEDS 5 METRES. THE SAFETY GRATING WILL BE PLACED AT 3m BELOW THE MANHOLE TOP.

STANDARD 1200mm MANHOLE

SCALE: N.T.S.
DATE: YY/MM/DD

DWG. No. S–1

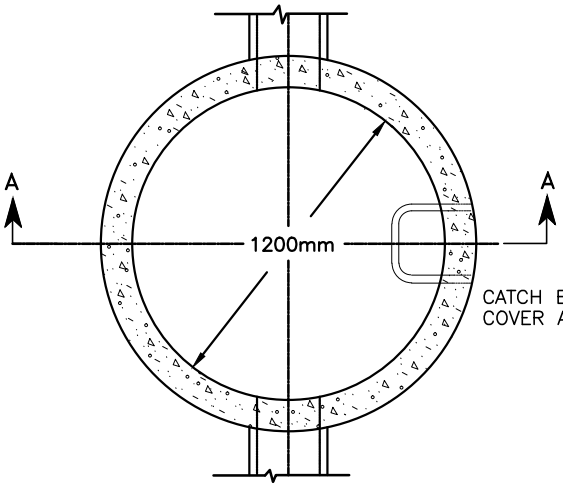
STEWART, WEIR & CO.

LAC LA BICHE COUNTY

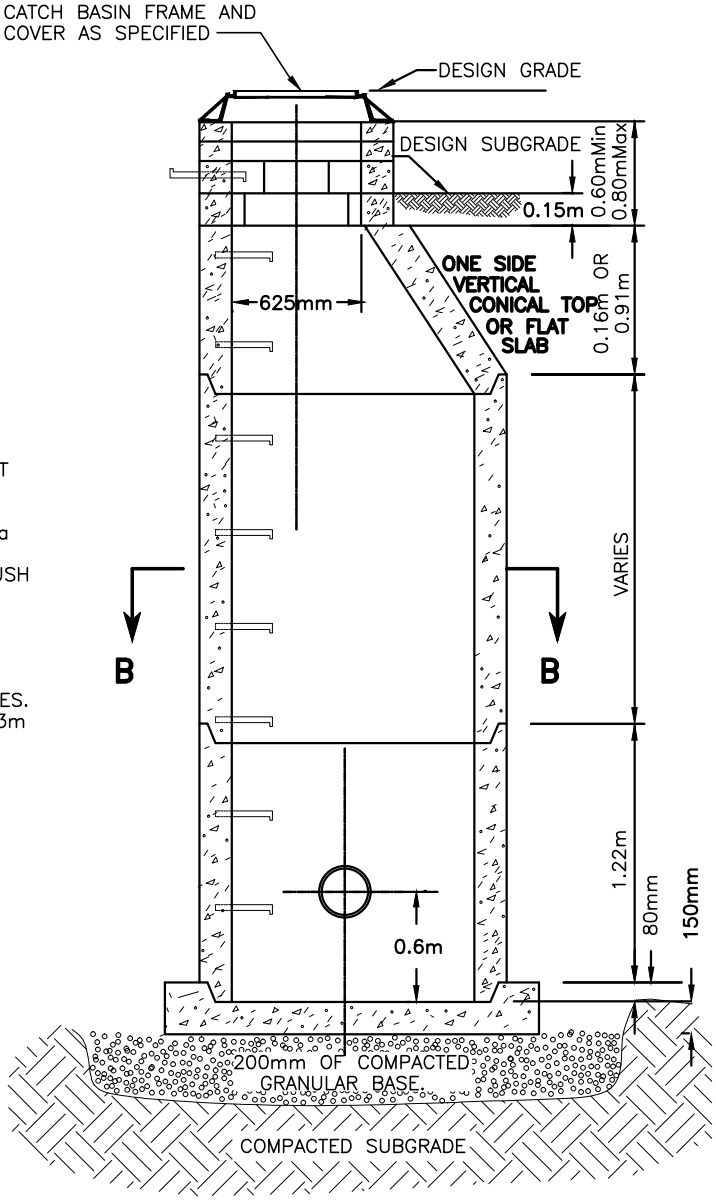
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.			STANDARD 1200mm MANHOLE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–03
Date: APRIL 2009	Drawn: TLB	Scale NTS		



SECTION B – B



SECTION A – A

NOTES

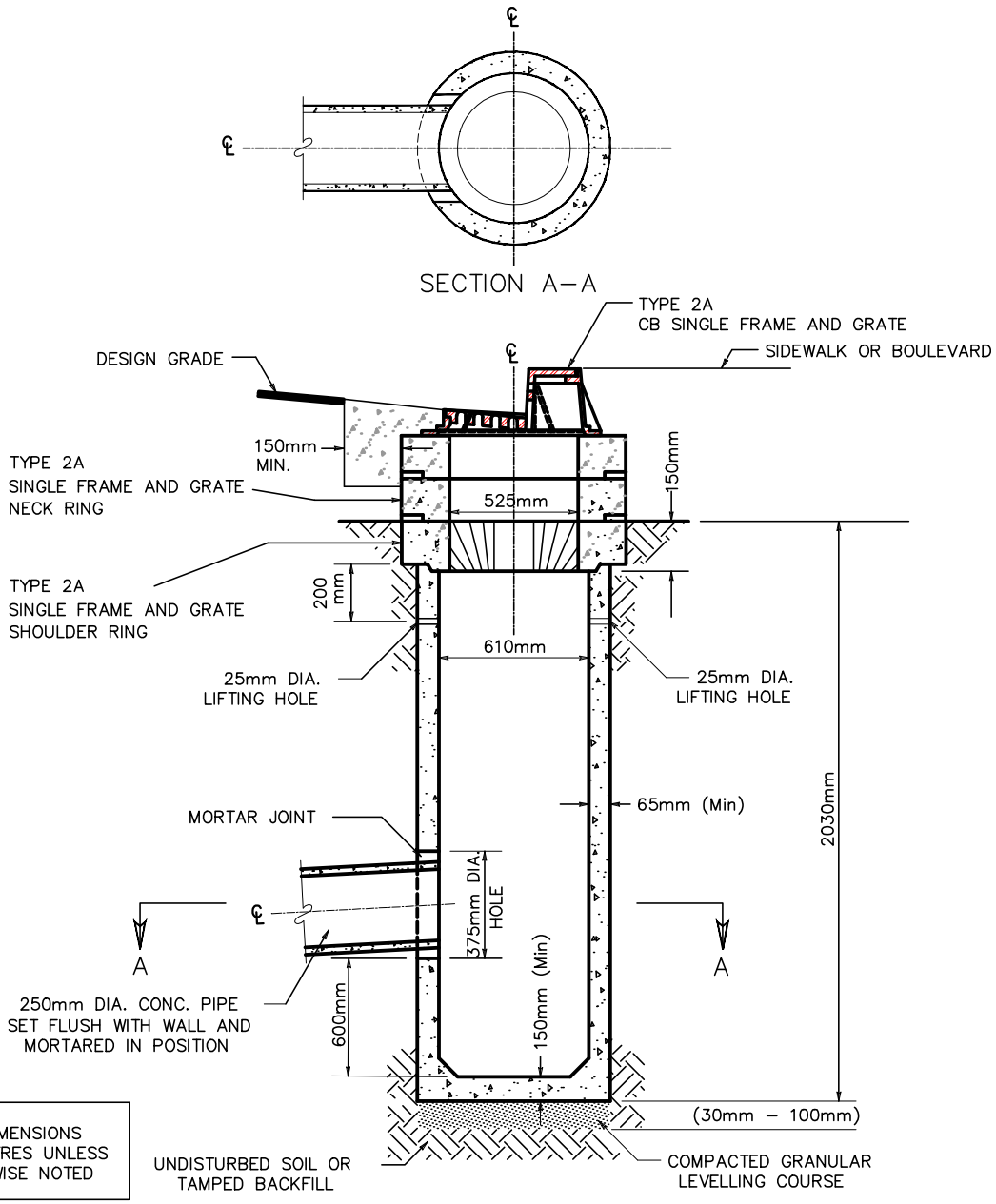
1. MANHOLE BARRELS TO MEET ASTM. C478.
2. POURED IN PLACE CONCRETE BASES MAY BE USED.
3. FOR CBMH. OVER 5.0m IN DEPTH, PRECAST OR POURED IN PLACE BASES SHALL BE REINFORCED WITH BARS.
4. POURED IN PLACE CONCRETE TO BE 20MPa AT 28 DAYS.
5. INLET & OUTLET PIPE TO BE GROUTED FLUSH WITH WALL.
6. GALVANIZED STEEL SAFETY STEPS AT 0.41m MAXIMUM TO FULL HEIGHT OF M.H.
7. RUBBER GASKET JOINTS.
8. SAFETY GRATING TO BE USED WHEN THE DEPTH OF THE MANHOLE EXCEEDS 5 METRES. THE SAFETY GRATING WILL BE PLACED AT 3m BELOW THE MANHOLE TOP.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.			STANDARD 1200mm C.B. MANHOLE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–04
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES:

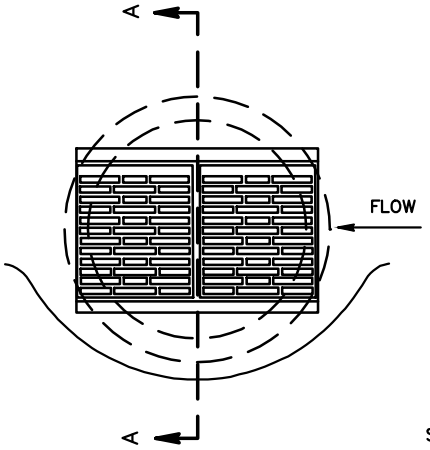
1. RUBBER GASKET, KENT SEAL OR EQUIVALENT TO BE INSTALLED BETWEEN BARREL, ALL SHOULDER AND NECK RINGS AND CATCH BASIN FRAME.
2. ALL ROUGH JOINTS SHALL BE POINTED WITH MORTAR TO ENSURE SMOOTHNESS.
3. ALL CATCH BASIN COMPONENTS TO BE IN ACCORDANCE WITH ASTM C478.

LAC LA BICHE COUNTY

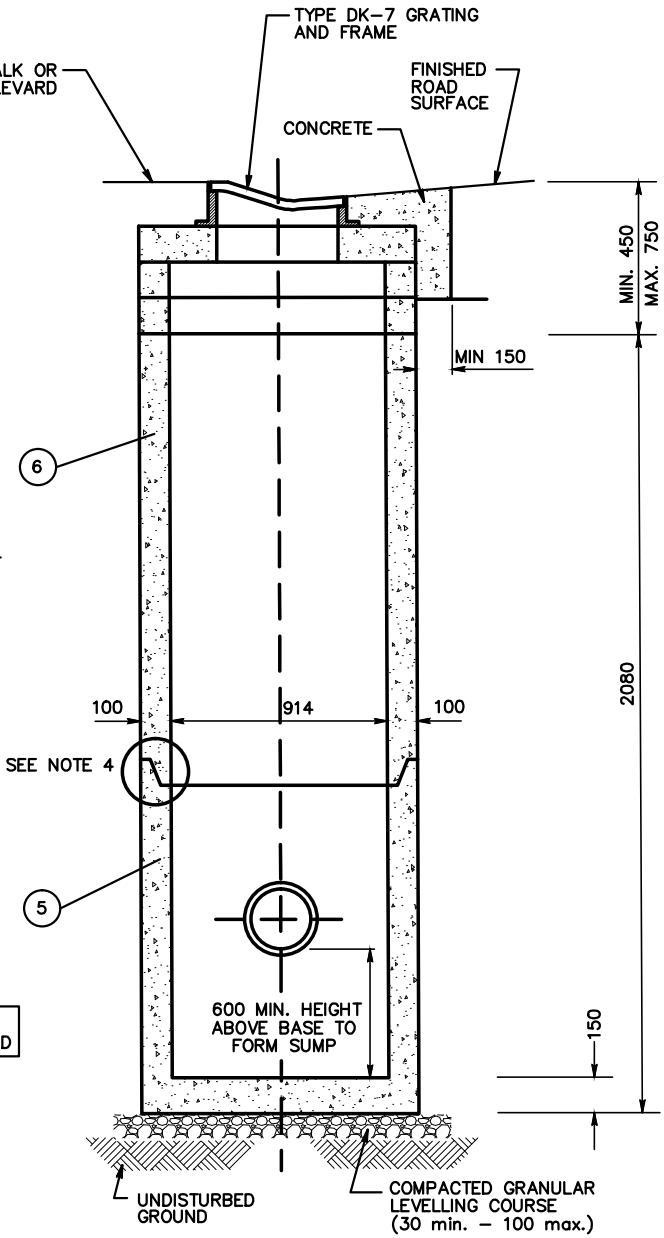
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		PRECAST 610 CATCH BASIN	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–05
Date: APRIL 2009	Drawn: TLB	Scale NTS		



PLAN VIEW OF C.B.



SECTION A–A

ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED

NOTES:

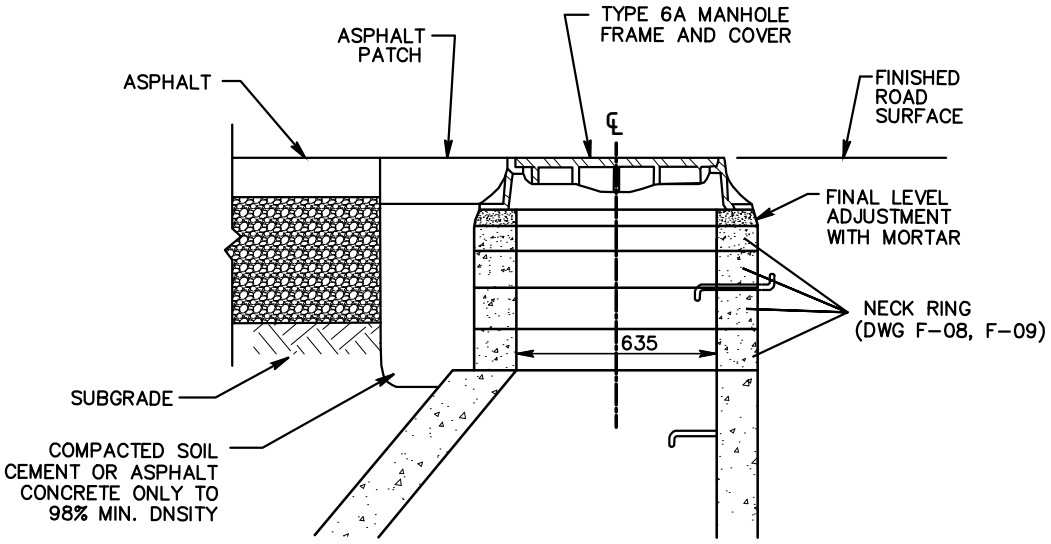
1. ITEM 5 COULD BE MADE UP FROM TWO ITEMS (BASE AND BARREL).
2. ITEM 6 COULD BE MADE UP FROM TWO ITEMS (SHOULDER RING SLAB TOP AND BARREL).
3. ITEMS 5 AND 6 COULD BE MADE AS ONE UNIT.
4. OPPOSITE ORIENTATION OF JOINS IS ACCEPTABLE.

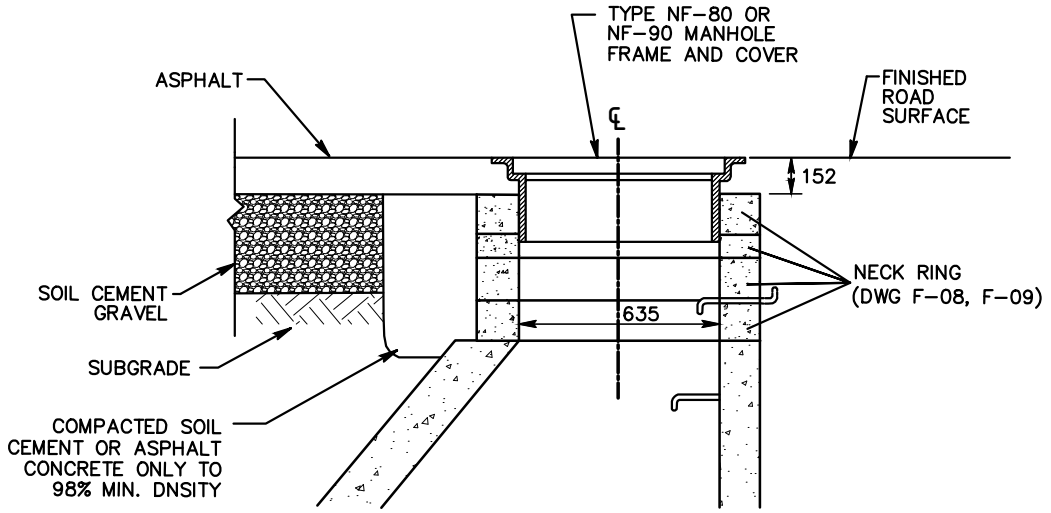
LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		STANDARD 900 CATCH BASIN WITH TYPE DK-7 GRATING AND FRAME	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–06
Date: APRIL 2009	Drawn: TLB	Scale NTS		





ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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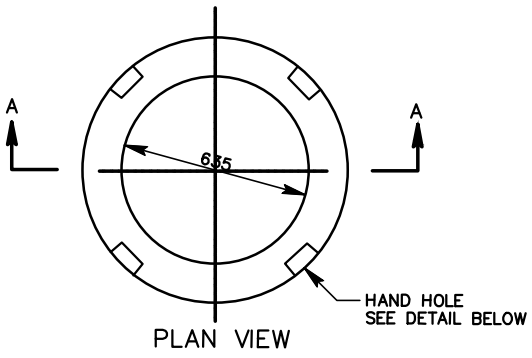
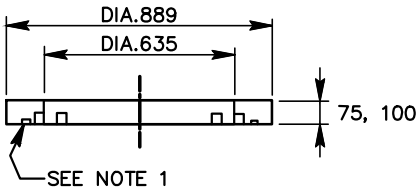
Rev.			NECK SECTION DETAILS FOR STANDARD 1200 MANHOLE	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F-07
Date: APRIL 2009	Drawn: TLB	Scale NTS		



PLAN VIEW

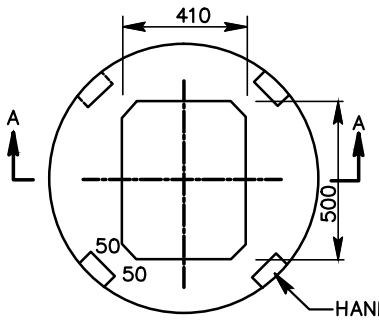


SECTION A–A

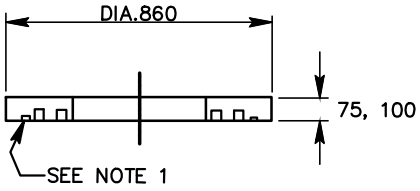
635 RING

(NECK RING FOR USE WITH TYPES 4A,6,6A,8,NF–80,NF–90 FRAMES AMD CPVERS/GRATINGS)

ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED



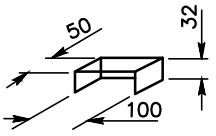
PLAN VIEW



SECTION A–A

K–7 RING

(NECK RING FOR USE WITH TYPE K–7 OR F–5I WITHOUT SIDE INLET FRAMES ANDGRATINGS)



HAND HOLE DETAIL

NOTES:

1. A CONCENTRIC GROOVE LOCATED AT MID CROSS SECTION, SUITABLE FOR SEALANT IS REQUIRED FOR NECK RINGS AND EXTENSION RINGS.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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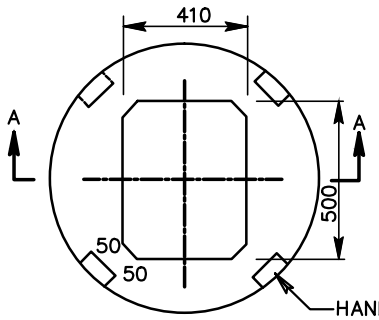
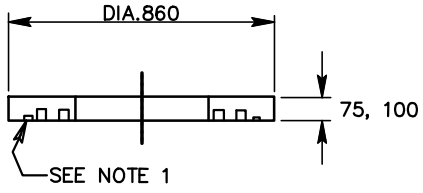
Rev.	wsp		NECK RINGS	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–08
Date: APRIL 2009	Drawn: TLB	Scale NTS		

ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED



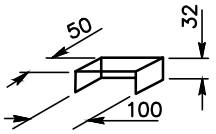
PLAN VIEW



SECTION A–A

K–7 RING

(NECK RING FOR USE WITH TYPE K–7 OR F–5I
WITHOUT SIDE INLET FRAMES ANDGRATINGS)



HAND HOLE DETAIL

NOTES:

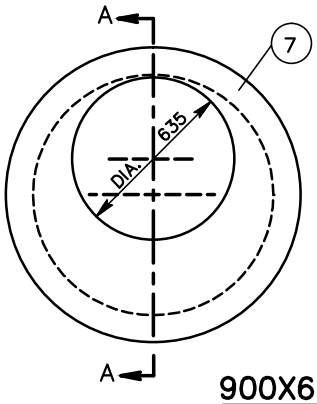
1. A CONCENTRIC GROOVE LOCATED AT MID CROSS SECTION, SUITABLE FOR SEALANT IS REQUIRED FOR NECK RINGS AND EXTENSION RINGS.

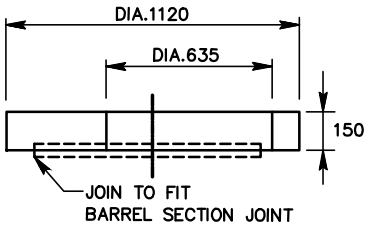
LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.			K-7 NECK RING	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–09
Date: APRIL 2009	Drawn: TLB	Scale NTS		

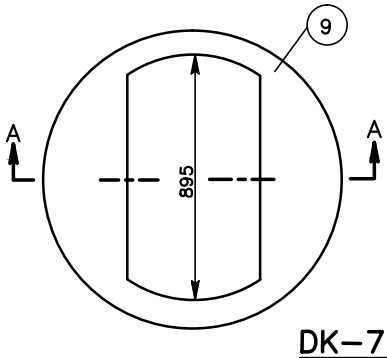


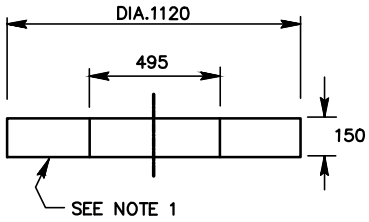


SECTION A–A

900X635 SLAB TOP

(TOP BELOW NECK FOR USE WITH 4A, 6, 8 FRAME AND GRATING)

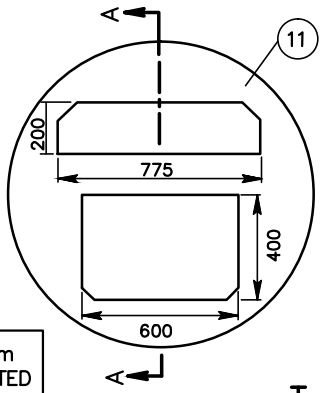


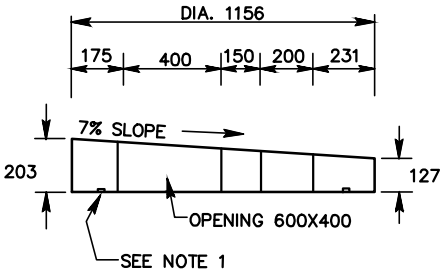


SECTION A–A

DK–7 TOP

(SLAB TOP FOR USE WITH DK–7 FRAME AND GRATING)





SECTION A–A

ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

T–TOP

(TEE TOP FOR USE WITH F–5I WITH SIDE INLET)

NOTES:

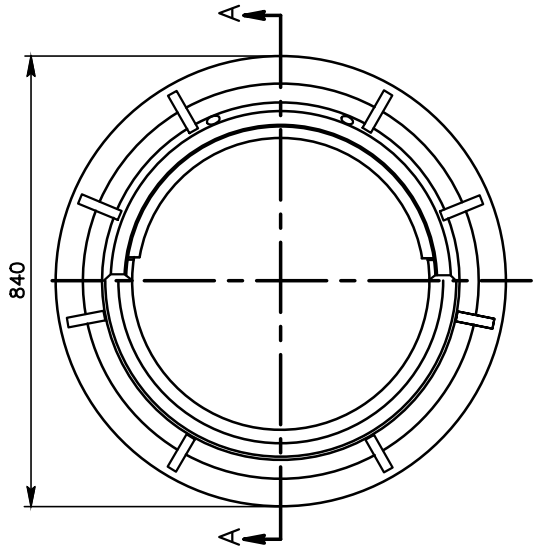
1. A CONCENTRIC GROOVE LOCATED AT MID CROSS SECTION, SUITABLE FOR SEALANT IS REQUIRED FOR NECK RINGS AND EXTENSION RINGS.

LAC LA BICHE COUNTY

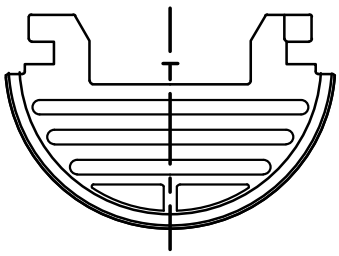
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

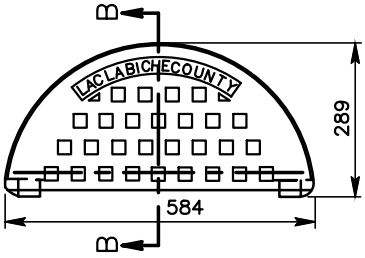
Rev. Rev. Rev.	wsp		SLAB TOPS FOR STANDARD 900 CATCH BASIN	
Rev. JUNE 2018 – RV Date: APRIL 2009	File No.: ED55.39469 Drawn: TLB	Design: Scale NTS	Approved:	Drawing F–10



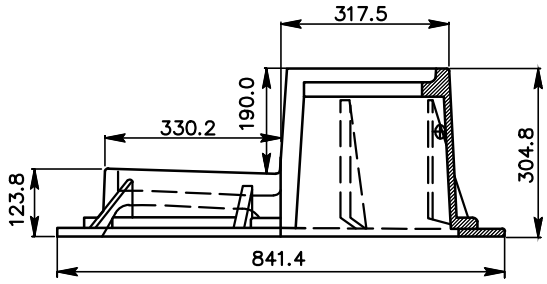
TOP VIEW (FRAME)



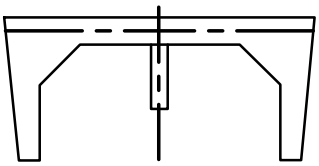
TOP VIEW – COVER (PART A)



TOP VIEW – COVER (PART B)



SECTION A–A

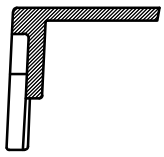


FRONT VIEW – COVER (PART B)

ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

MATERIAL:

FRAME: GRAY IRON CLASS 20B
COVER: PART A IRON CLASS 20B
PART B DUCTILE IRON GRADE 65–45–12



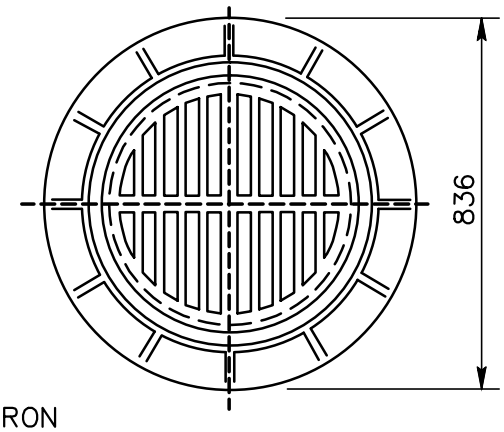
SECTION B–B

LAC LA BICHE COUNTY

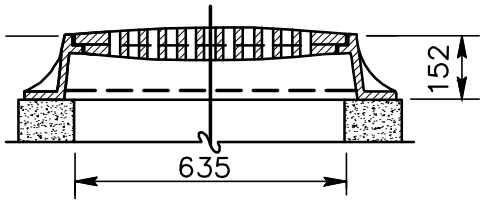
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.			TWO PIECE TYPE 4A GRATING AND FRAME	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–11
Date: APRIL 2009	Drawn: TLB	Scale NTS		

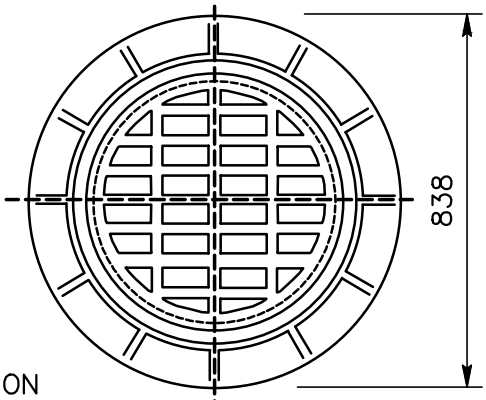


MATERIAL: GRAY IRON
FRAME: CLASS 20B
COVER: CLASS 20B

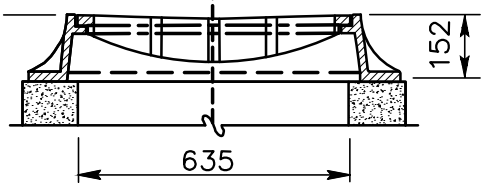


NO.6 ROUND TOP CATCHBASIN
OR MH FRAME & COVER

ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED



MATERIAL: GRAY IRON
FRAME: CLASS 20B
COVER: CLASS 20B



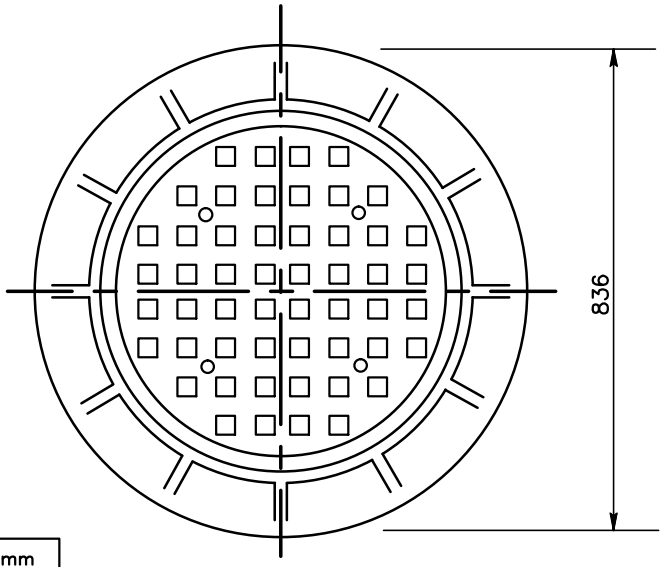
NO.8 LARGE PAVING AND CURB RAMP
CATCHBASIN OR MH FRAME & COVER

LAC LA BICHE COUNTY

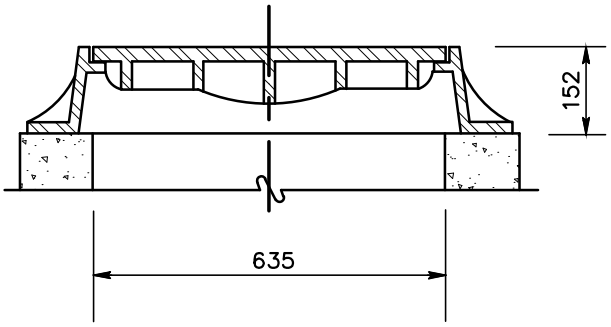
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		FRAME AND GRATING TYPE 6 AND 8	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–12
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED



MATERIAL:

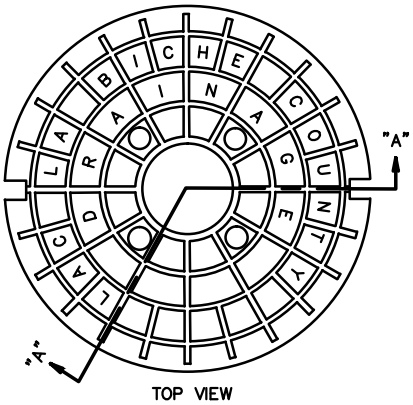
FRAME: GRAY IRON CLASS 20B
COVER: GRAY IRON CLASS 20B

LAC LA BICHE COUNTY

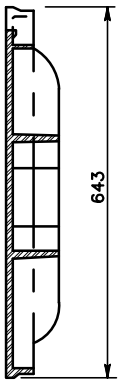
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

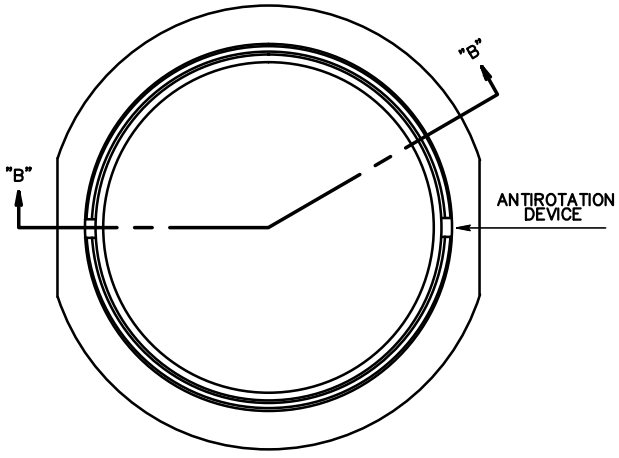
Rev.			TYPE 6A COVER AND FRAME	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–13
Date: APRIL 2009	Drawn: TLB	Scale NTS		



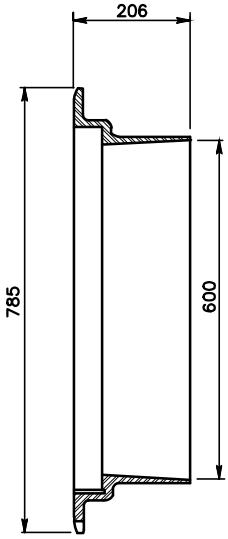
TOP VIEW
MANHOLE COVER
WITH 4 VENTHOLES



SECTION "A–A"



PLAN



SECTION "B–B"

ALL DIMENSIONS IN mm
UNLESS OTHERWISE NOTED

TYPE NF–80 FLOATING MANHOLE FRAME

NOTES:

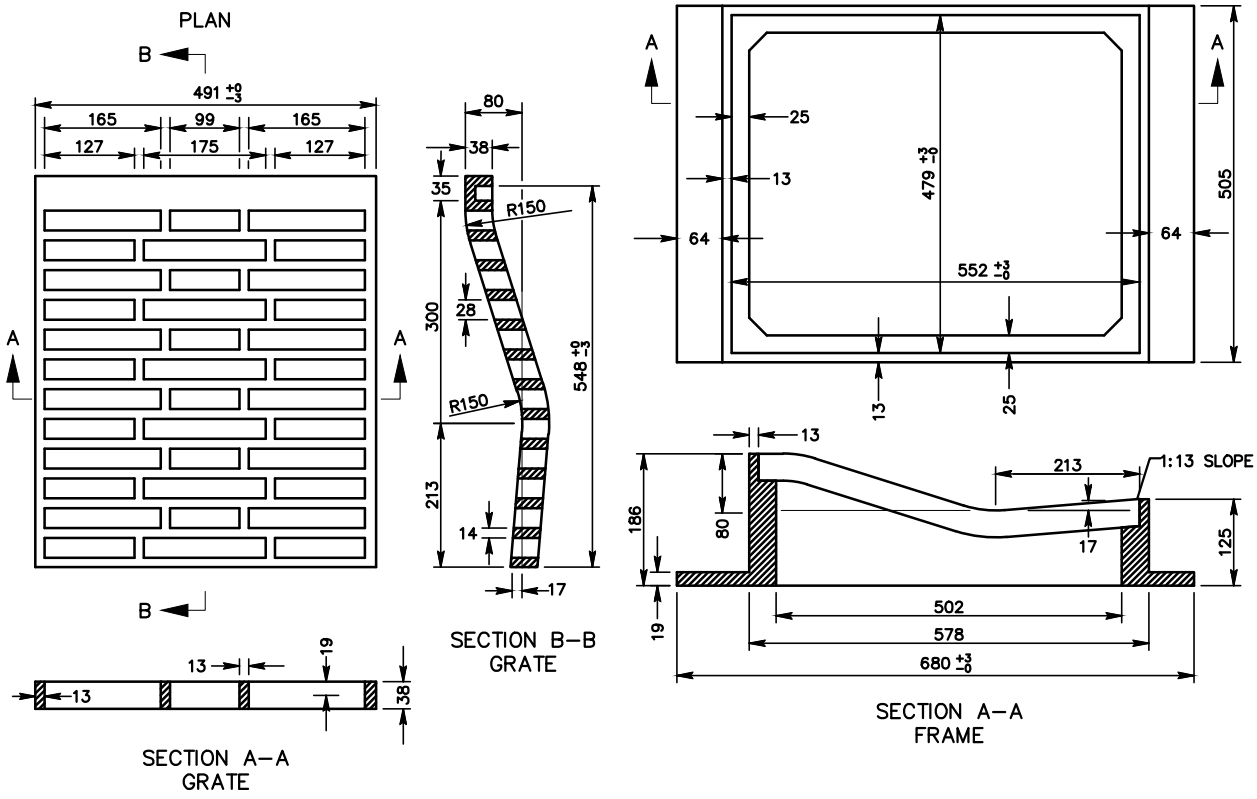
1. MATERIAL SPECIFICATION:
   CUCTILE IRON TO CONFORM TO A.S.T.M. A536 (LATEST EDITION) GRADE 80–60–03
2. NF–90 FRAME AND COVER IS WATERTIGHT VARIATION OF NF–80.
   THERE ARE NO VENTING HOLES IN NF–90 COVER AND A GASKET IS
   PLACED BETWEEN THE FRAME AND COVER

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		TYPE NF-80 AND NF-90	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–14
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES: GRATE

1. GREY CAST IRON TO CONFORM TO CLASS 25B A.S.T.M. A48 (LATEST EDITION)
2. MASS =

FRAME

1. DUCTILE IRON TO CONFORM TO A.S.T.M. A536 (LATEST EDITION) GRADE 80–55–06
2. MASS =

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

LAC LA BICHE COUNTY

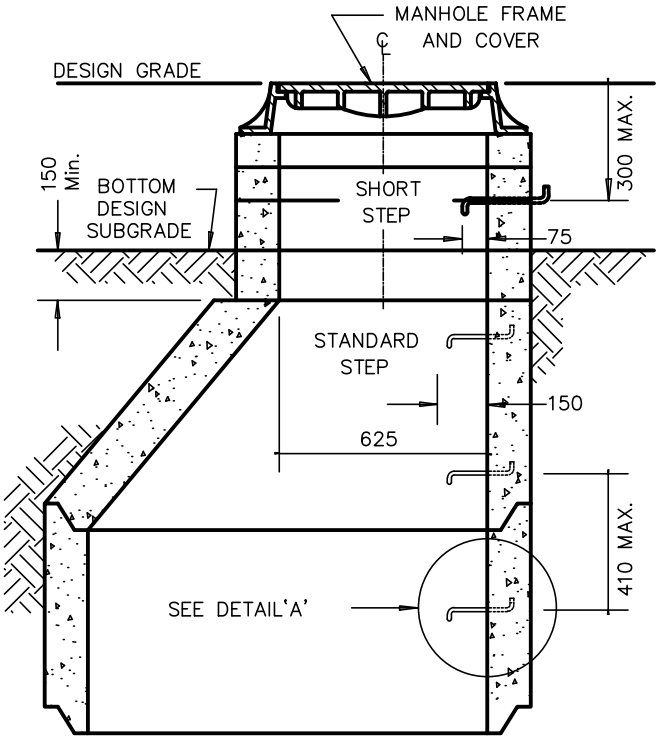
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

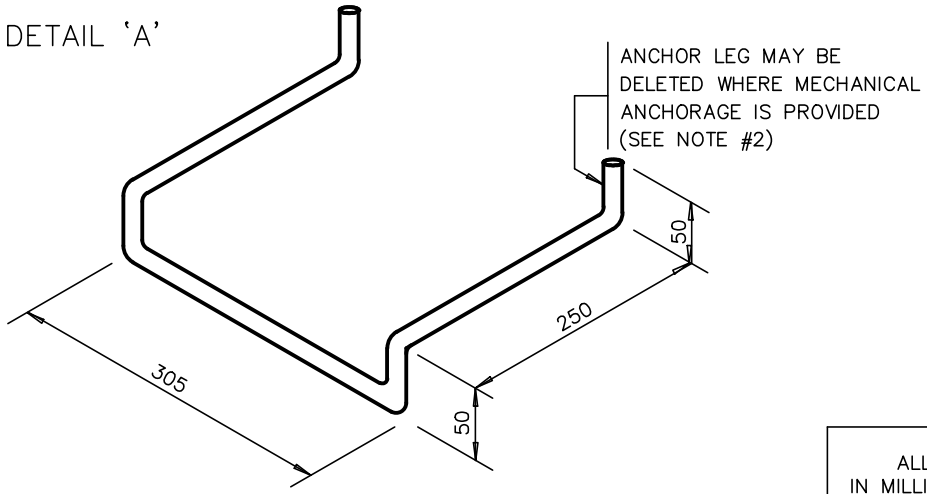
Rev.			FRAME & GRATING TYPE K-7	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–15
Date: APRIL 2009	Drawn: TLB	Scale NTS		

PLACEMENT:

1. EXCEPT WHERE SPECIFIED OTHERWISE, SAFETY STEPS SHALL BE INSTALLED IN ALL PRECAST MANHOLE SECTIONS & CONES, IN THE GRADE ADJUSTMENT SECTIONS AND IN CAST IN PLACE SECTIONS SO THAT WHEN THE VARIOUS SECTIONS ARE ASSEMBLED IN ANY COMBINATION THEY WILL FORM A CONTINUOUS VERTICAL LADDER WITH RUNGS EQUALLY SPACED AT A MAXIMUM OF 410mm TO WITHIN 300mm BELOW THE COVER AND TO WITHIN 600mm OF THE BASE OR BENCHING.
2. STEPS SHALL BE CAST FIRMLY IN PLACE OR SECURED WITH A SUITABLE MECHANICAL ANCHORAGE TO PREVENT PULLOUT, AND MAINTAIN WATER TIGHTNESS.
3. "STANDARD STEPS" SHALL PROJECT A DISTANCE OF 150mm MEASURED AT THE POINT OF EMBEDMENT.
4. A "SHORT STEP" WITH A PROJECTION OF 75mm SHALL BE INSTALLED WITHIN THE GRADE ADJUSTMENT SECTION, CAST INTO THE NECK OR FIRMLY MORTARED IN PLACE BETWEEN THE NECK RINGS, WITH THE ANCHOR LEGS OUTSIDE OF THE NECK RING.
5. EXCEPT AS SPECIFIED ABOVE, DESIGN AND INSTALLATION OF SAFETY STEPS SHALL CONFORM TO A.S.T.M. C478.



TYPICAL MANHOLE SECTION



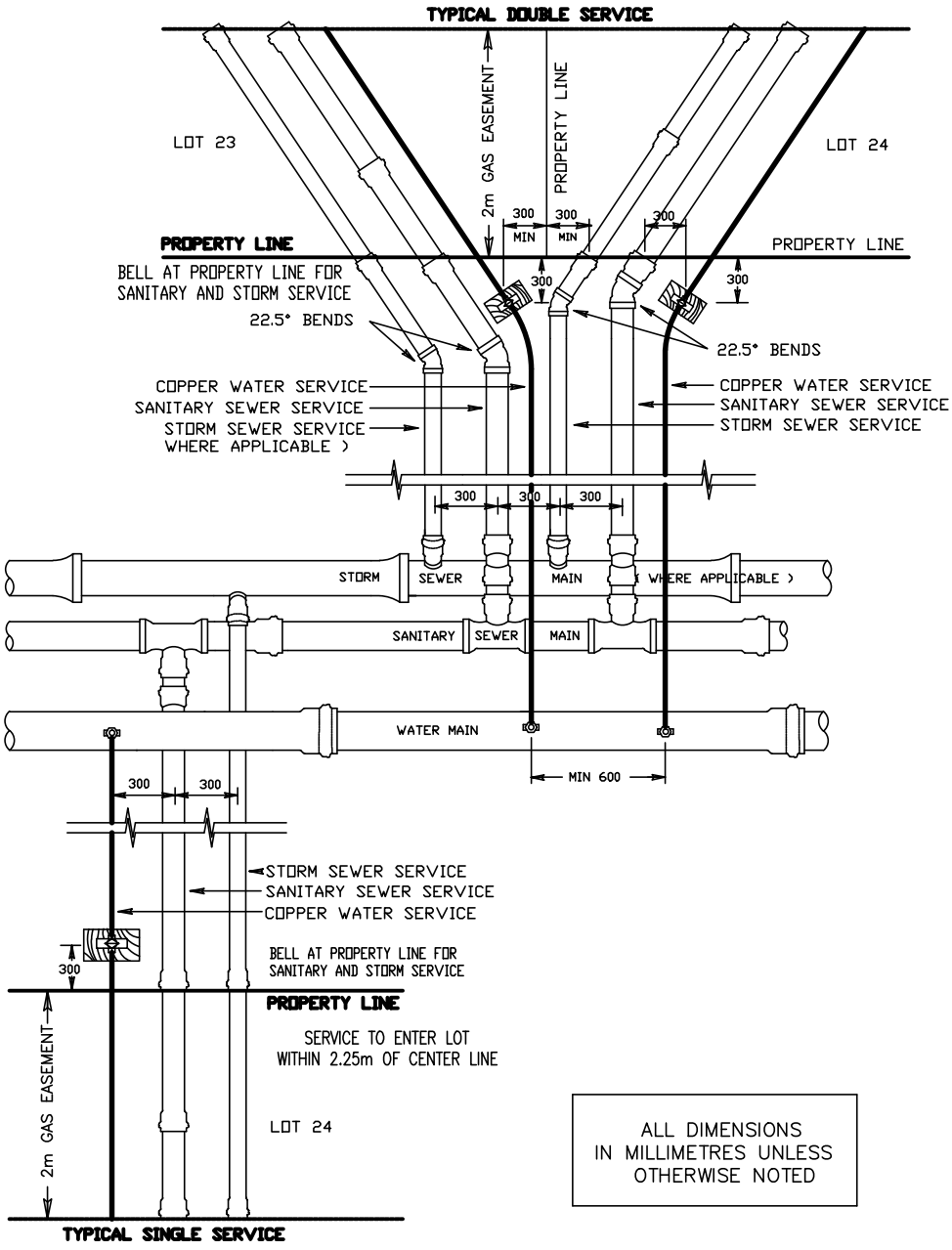
ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.			SAFETY STEPS FOR MANHOLES	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–16
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

NOTES:

1. WATER AND SEWER SERVICES MAY BE EXTENDED TO EDGE OF 2.0m GAS EASEMENT.
2. THE CITY ACCEPTS NO RESPONSIBILITY FOR THE CONSTRUCTION OR MAINTENANCE OF SERVICES INSTALLED WITHIN THE EASEMENT.
3. MARK ENDS OF SERVICES AT EDGE OF GAS EASEMENT WITH A 50mm X 100mm X 750mm STAKE PROTRUDING 450mm ABOVE GROUND AND PAINTED BLUE. MARK THE CURB CONTROL VALVE WITH A SIMILAR STAKE PAINTED RED.
4. THE END OF COPPER WATER SERVICE PIPING SHOULD NOT BE CRIMPED CLOSED, PERMEABLE FILTER CLOTH MAY BE USED TO PREVENT INTRUSION OF DEBRIS AND TO ALLOW TESTING FLOW OF CURBSTOP.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		TYPICAL SERVICES (SINGLE & DUAL)	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing F–17
Date: APRIL 2009	Drawn: TLB	Scale NTS		

SECTION G TRANSPORTATION

G.1 INTENT

.1 This section is intended to provide guidelines to assist the County and/or Developer in the design of the road, sidewalk and trail improvements that will meet the servicing requirements for commercial, industrial and residential development within Lac La Biche County.

.2 The servicing standards have been developed with goals in mind:

.1 To ensure that the County is provided with a quality product that will meet an acceptable long-term life expectancy while maintaining cost efficiency and practicality so as not to prohibit land development.

.2 To minimize the maintenance requirements associated with roads and subdivisions.

.3 The guidelines and standards presented in this section should only be considered as minimum requirements. The Developer remains fully responsible for the design and construction of municipal improvements according to accepted engineering practice and standards that address and meet the specific needs and site conditions of the development. Certain site-specific conditions may warrant more stringent standards be met.

.4 It is the Developer's responsibility to satisfy, in addition to these requirements, all regulations and conditions required by the following:

.1 Public Lands Act,

.2 Municipal Government Act,

.3 Water Act,

.4 Environment & Enhancement Act,

.5 Provincial Wetlands Policy,

.6 Alberta Environment, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems

.7 Lac La Biche County General Municipal Servicing Standards

.8 Alberta Highway Design Guide

.9 Transportation Association of Canada (TAC) Geometric Design Guidelines

.10 TAC Uniform Traffic Control Devices for Canadian Roads

.11 TAC Highway Lighting Design Guide

.12 Municipal Bylaws

.13 Lac La Biche County Policy Nos. PW1-19,

.14 Fisheries Act,

.15 Species at Risk Act,

.16 Navigable Water Protection Act, other

.17 Provincial/Federal Government Authorities

G.2 LEVEL OF SERVICE ROADWAYS

.1 The Developer must be responsible for determining an estimated annual average daily traffic (AADT) generated by the development in order to determine the required cross-sectional elements and pavement structure.

.2 Generally, local roads with an AADT of 200 or less are built as if the gravel surface is the final surface finish; Lac La Biche County may require provision for a wider subgrade to allow for future base paving.

G.3 GENERAL

.1 For each new development, the appropriate roadway classifications and design designation must be determined during the planning stages in consultation with County officials. A general guideline identifying the minimum applicable roadway designation for each type of Land Use Districts is provided in Section C.

.2 Where conflicts or inconsistencies with the General Municipal Servicing Standards arise due to the adoption of other transportation planning documents, the Developer must be responsible for satisfying the more stringent requirement.

.3 Should the need arise that any of the standards cannot be met; a written request outlining the variance is to be forwarded to the County. The request will be reviewed, and a written response will be returned.

.4 The Developer must be responsible for quality control testing related to the roadway construction including but not necessarily limited to sieve analysis, densities, mix design, core sampling and concrete testing. Quality control must be performed by an independent party and certified by a professional engineer licensed to practice in the province of Alberta.

G.4 DESIGN CRITERIA

.1 It is the Developer's responsibility to assess the traffic impacts associated with proposed land development. This assessment must include a projection of the average annual daily traffic (AADT) over a 20-year design life for the internal subdivision roads as well as any adjacent provincial highways or municipal roadways.

.2 All off-site road improvements required as a result of land development must be identified in the design stage by the Developer. An off-site levy will be assessed and charged to the Developer.

.3 The trip generation rate for single detached housing in Lac La Biche County must be 9 one–way trips per household. Trip generation rates for other types of development must be justified by the Developer and approved by the County.

G.5 DESIGN DESIGNATIONS

.1 Lac La Biche County uses the following design designations for rural and urban roads. The cross-section elements for each of these design designations are shown in drawings G-01 to G-014 at the back of this section.

.2 For the purpose of these servicing standards, all roadways within Lac La Biche County other than primary and secondary highways and some major grid roads will be considered local roads. Although some may perform minor collector functions, the above design designations should apply to most roadways.

.3 The roadway design must be prepared considering the future requirements, economic factors, safety considerations, staging, and other road uses not associated with the development.

.4 The design speed selected should relate to the expected operating speed on the road after improvement. It should reflect public expectations and include an allowance for safety. The design speed is typically 10 km/hr higher than the anticipated posted speed limit.

Geometric Design Requirements

Designation	Surface	AADT*	Truck Traffic	Min. ROW** (m)	Preferred ROW** (m)	Design Speed (km/h)	Posted Speed (km/h)	SSD† (m)	Crest k (m)	Sag k (m)	Min. Horiz. Radius (m)
Access Road	Gravel	< 25	None	20	30	40	30	65	7	11	
(new) Rural 8.0m Gravel	Gravel	< 100	Minimal	20	30	60	50	85	15	20	90
Standard Local Road	Gravel	< 200	Minimal	30	30	60	50	85	15	20	90
Collector Road 9.0m	Gravel	> 200		30	40	60	50	85	15	20	90
Collector Road 10m	Gravel	> 200	Significant	30	40	70	60	140	35	30	190
Paved Local Road 8.0m	ACP	< 200	Minimal	30	40	60	50	85	15	20	90
Paved Local Road 9.0m	ACP	< 200		30	40	60	50	85	15	20	90
(existing) Arterial 9.0m	ACP	< 500	Minimal	30	40	60	50	85	15	20	90
(proposed) Arterial 9.0m	ACP	< 500		40	40	60	50	85	15	20	90
Arterial 10m	ACP	< 2000		40	40	70	60	140	35	30	190
Arterial 11.5m	ACP	> 2000	Significant	40	40	70	60	140	35	30	190
Urban 9.0m	ACP	< 2000		20	30	60	50	85	15	20	90
Urban 11.5m	ACP	> 2000	Significant	30	30	70	60	140	35	30	190

* AADT = Average Annual Daily Traffic

** ROW = Right-of-Way

† SSD = Stopping Sight Distance

Note: The recommended design speeds are for internal roadway systems only.

G.6 STRIPPING TOPSOIL

.1 Topsoil must be stripped off of the road right-of-way and areas of excavation. Topsoil from these areas will be used on Public Lands or boulevards as required. Any remaining topsoil must be stockpiled at approved locations and will become the property of the County. The topsoil, when used as fill must be placed such as to add to existing topsoil, thereby utilizing it for landscaping purposes. Surplus topsoil is to be stockpiled for use in the final grading of parks, boulevards, buffer strips, and developed lots.

G.7 PAVEMENT STRUCTURE

.1 Pavement structures must be based on the results of a geotechnical investigation. A report must be submitted specifying the required structure and all design factors including design traffic loading and the pavement design life. The pavement structures indicated on the cross sections are intended as minimum standards only. It is the Developer's responsibility to design the subdivision roadways to meet or exceed these standards in accordance with good engineering practices and specific site conditions.

G.8 SUBGRADE PREPARATION

.1 The subgrade must be prepared by compacting the soil below the subgrade to an average of 100% Standard Proctor Density, with no test result being less than 97% Standard Proctor Density. The soil below the subgrade must be compacted in layers not exceeding 150 mm. Each compacted layer must be accurately shaped and graded parallel to the design grades and cross-sections. If compaction range cannot be met, then the subgrade is to receive cement stabilization treatment as determined by a qualified geotechnical engineer.

.2 During compaction, the soil must be at its optimum moisture content as determined by a qualified geotechnical engineer. When a deficiency in moisture content exists, the soil must be watered and thoroughly mixed until the optimum moisture content is uniformly attained. When there is an excess of moisture, the soil must be worked and aerated until the optimum moisture content is reached. One-mould proctor density testing will not be permitted as an alternate testing procedure due to wet soil conditions. The Developer will be required to suggest appropriate measures such as drying in-site material or importing suitable material in order to meet the required Standard Proctor Densities.

G.9 PIT-RUN MATERIAL

.1 Pit-run must be used to stabilize the sub-base in areas where silty in-situ materials exist. The minimum structure requirements are listed on the standard cross-section drawings.

.2 After over-excavation of any unsuitable sub-base material, pit-run must be placed in the excavation and compacted to 100% of Standard Proctor Density. Additional layers of pit-run required to bring the sub-base elevation to the bottom of the base course must be placed in layers not exceeding 150 mm in depth and compacted to 100% of Standard Proctor Density. Water must be applied and mixed uniformly with the crushed gravel until the final moisture content is at least the optimum moisture for the mixture, and preferably from 1% to 2% above the optimum moisture. The optimum moisture content for the mixture must be determined by a qualified geotechnical engineer or firm. If necessary, water must be added or applied to the material during compaction to maintain the required uniform moisture content.

G.10 BASE COURSE

.1 Each lift must be compacted to 100% Standard Proctor Density. Water must be applied and mixed uniformly with the crushed gravel until the final moisture content is at least the optimum moisture for the mixture, and preferably from 1% to 2% above the optimum moisture. The optimum moisture content for the mixture must be determined by a qualified geotechnical engineer or firm. If necessary, water must be added or applied to the material during compaction to maintain the required uniform moisture content.

.2 Base course material must be laid and compacted in a single layer when the compacted thickness specified does not exceed 150 mm. When a thickness in excess of 150 mm is specified the material must be laid and compacted in layers not exceeding 150 mm.

G.11 CUL-DE-SACS

.1 The maximum length for any cul-de-sac without a Public Utility Lot (PUL) is 120m from the centreline of the intersecting street to the start of the bulb. Cul-de-sacs in excess of 120m must require a 6.0m wide PUL allowing emergency vehicle access and watermain looping. See drawing G-14 at the back of this section.

.2 PUL's provided to allow for emergency access must not be utilized for stormwater storage. The PUL must be properly graded to ensure positive drainage toward the road and seeded or sodded to prevent erosion.

.3 Cul-de-sacs should be graded to drain towards the intersection unless a PUL is provided to allow drainage to escape.

.4 The cul-de-sac bulb radii for residential areas are shown on drawing G-14.

G.12 INTERSECTIONS

.1 Intersections must be designed at 90 degrees wherever possible. The minimum angle of intersection for two roadways must be 75 degrees unless otherwise approved by the County.

.2 Intersection design must incorporate accepted sight distances based on the roadway classification and good engineering practice.

.3 Minimum intersection spacing must be 60m measured from centreline to centreline.

.4 Intersectional treatments must be designed based on estimated 20-year traffic volumes. All necessary widenings of existing right-of-way's must be provided by the Developer.

G.13 CONCRETE CURB AND GUTTER

.1 Concrete curb and gutter must be constructed on all urban cross-sections according to the typical cross sections shown in drawings G-12 and G-13.

.2 The vertical face curb and gutter cross section must be used on all roads fronting public lands such as parks and public utility lots. Vertical face curbs must also be used within the right-of-way when crossing pipelines unless separate vehicle barriers are provided to prevent unauthorized access.

.3 The rolled face curb and gutter cross-section may be used on all local/residential roadways allowing driveway access.

.4 Curb returns on all residential street intersections must have a minimum radius of 9.0m.

.5 Curb returns on all commercial/industrial intersections must have a minimum radius of 15.0m and must be designed to accommodate truck turning movements.

.6 The minimum gutter grade must be 0.5% except for cul-de-sac bulbs, curb returns and catch basin approaches, which must be 0.8%. The 0.5% minimum grade must be maintained throughout sag vertical curves to avoid the short length at near horizontal grade.

.7 Curbs must be constructed using Portland Cement to CSA A3000. Materials, production, delivery, placement and finishing must conform to CSA A23.1.

.8 The minimum 28-day compressive strength of concrete must be 25 MPa. Air entrainment must be within 5 – 8 % by volume. Concrete testing is required for every 60m^3 of cast in place concrete.

.9 Curbs must be constructed on prepared subgrade, cement stabilized subgrade, granular base course, soil cement or asphalt concrete.

.10 For all urban cross sections, wick drains must be placed below the curb, between the subgrade and granular base course. The wick drain must be connected to the nearest catch basin.

.11 Curbs must be backfilled with suitable clay within 7 days of concrete placement and prior to placement of the roadway structure. The clay material must be backfilled to within 100mm of the top of the curb to allow for the placement of topsoil material.

.12 The use of swale gutters must be limited to minor and residential streets. Swale gutter cross section must be a minimum of 1.0m wide and 200mm thick with steel reinforcing.

.13 All driveways crossing a swale must be reinforced with a minimum of two No. 4 rebars.

G.14 SIDEWALKS AND PAVED STRUCTURES

.1 Sidewalks must be accessible to all persons as well as being safe, functional and aesthetically pleasing.

.2 Sidewalks installed for new subdivisions must integrate with the existing walkway system on intersecting roadways.

.3 Separate sidewalks must be a minimum of 1.5m wide.

.4 The requirements for sidewalks in commercial and industrial areas must be reviewed on a site-specific basis in conjunction with the proposed use and other required services.

.5 Curb ramps must be used at all curbed intersections.

.6 All sidewalks must be imprinted with the Contractor’s stamp indicating year of construction every 200m.

.7 Sidewalks must be imprinted with a “CC” at all cub cock locations.

.8 Minimum 28-day compressive strength must be 30 MPa. Air entrainment must be within 6 – 8%. All sidewalks are to be adequately reinforced as per drawing G-20.

.9 The granular base course must consist of 150mm compacted thickness of Designation 3 Class 20A aggregate. The subgrade and gravel base course under the sidewalk must be compacted to 100% Standard Proctor Density.

.10 Horizontal sidewalk alignment for separate sidewalks must be at a constant offset from the adjacent roadway centreline.

.11 Sidewalks must be graded to facilitate positive drainage flow. The minimum grade is 0.5%. Wick drains must be provided under a monolithic sidewalk, curb and gutter structures.

.12 Cold weather concrete pouring below 5º C must require prior approval by the County and must be placed according to CSA A23.1.

G.15 GRANULAR WALKWAYS AND WOOD MULCH HIKING TRAILS

.1 The Developer must be responsible for the design and construction of walkways or trails as required by the Development Agreement. Rest areas are to be incorporated into the right-of-way width every 800m.

.2 Where a walkway/trail is required to be incorporated into development, the alignments and locations within the development must allow for adequate public access to parks, recreational areas and environmental and municipal reserves.

.3 Top of bank walkways/trails must be designed and constructed so as not to impede natural and post-development drainage down the embankment. Grading is to ensure that concentrated overland flows are not generated anywhere along the bank unless an engineered outlet structure is present.

.4 Where walkways/trails cross drainage swales, ditches or natural drainage courses, culverts or footbridges must be designed to accommodate a 1: 25-year storm without overtopping. Culverts and footbridges will require approval by Alberta Environment and applicable Federal Agencies. Design of footbridges will be in accordance with Part 4 of the Alberta Building Code.

.5 Wherever possible, walkways/trails should be centred within the right-of-way. Walkways/trails may be offset from the centreline in situations where this will prevent conflicts with utilities sharing the same right-of-way.

.6 Walkway/trail grading must ensure positive drainage with a minimum grade of 2.0%. Grading must be designed in order to incorporate the overall drainage pattern of the development.

.7 Where the walkway/trail is located within an existing utility right-of-way, the Developer must be responsible for obtaining necessary agreements from the proper authority.

.8 Where the walkway/trial right-of-way is not shared with other utilities, it must be a minimum of 6m wide with a minimum clearance of 2m from the edge of the walkway/trail to the property line.

.9 The subgrade must be compacted to a minimum 95% Standard Proctor Density (SPD) for a depth of 150mm.

.10 For granular walkways, the excavation is to be lined with a geotextile fabric liner prior to placement of the granular material. The edge return for the geotextile fabric is to be anchored .06m below excavation depth. The granular material must be spread uniformly and compacted to 95% SPD.

.11 For woodchip mulch hiking trails, the excavation is to be lined with a geotextile fabric liner prior to placement of the woodchip mulch. The edge return for the geotextile fabric is to be anchored .06m below excavation depth. The woodchip mulch must be spread uniformly with a minimum 2% crown/cross fall and roller compacted in-place ensuring a uniform depth and surface appearance.

.12 Where walkways/trails are planned through wooded areas, the minimum width is to be 1.5m or as specified by the Development Authority. The minimum headroom clearance at the center line of the walkway/trail is to be 3.0m. Vegetation is to be cleared a minimum of 0.6m from the edge of the walkway/trail edge.

.13 Surfacing material must be approved by the County prior to installation. Materials must be selected to minimize maintenance and replacement costs.

.14 Rest areas are to incorporate a bench and waste receptacle as approved by the County.

G.16 APPROACHES

.1 Approaches must be situated such that they do not access directly onto a roadway with an estimated AADT of greater than 4000.

.2 Approaches must have a minimum clearance of 1.0 metres from any surface feature such as hydrants, power poles, and curb cocks.

.3 Approaches must not be situated on a curb return.

.4 For corner lots, the approaches should access the road with a lesser traffic volume wherever possible. Wherever possible, approaches should not be located within 100m of an intersection except for multi-lot subdivisions.

.5 For industrial lots, the selection of the approach location may be delayed until parking lot configurations are determined. A caveat on the title will be required to inform future owners of their responsibility to pay for the installation while adhering to design recommendations.

.6 Residential approaches must be no less than 7.5m and no greater than 10.0m in width. Industrial approaches must be no less than 10.0m and no greater than 14.0m in width.

.7 All approaches must have the same structure as the adjoining roadway and be constructed up to the property line.

.8 Residential Access from County Grid Roads

.1 Posted 80 km/h Roads

.1 Directly opposite an existing roadway or access.

.2 A minimum of 90.0 metres centreline to centreline from any existing roadway or access, regardless of which side of the grad road it is located on.

.3 Must have a minimum vertical and horizontal sightline of 170.0 m in both directions.

.2 Posted 50 km/h Roads

.1 Directly opposite an existing roadway or access.

.2 A minimum of 60.0 metres centreline to centreline from any existing roadway intersection.

.3 A minimum of 45.0 metres centreline to centreline from any existing access, regardless of which side of the grad road it is located on.

.4 Must have a minimum vertical and horizontal sightline of 85 m in both directions.

G.17 SIGNAGE

.1 The supply and installation of traffic control and street identification signs as per Drawing G-31 is the responsibility of the Developer.

.2 Traffic control signs must be manufactured and installed in accordance with the latest edition of "Uniform Traffic Control Devices for Canada."

.3 Street addressing signs must be located within 10.0m of the intersection in the direction of the near-side approaching traffic. Signs must be offset at least 1.0m from the edge of the road and mounted 3.0m to 3.5m above the finished road surface. Street addressing signs must be a minimum size of 15cm x 60cm and a maximum of 15cm x 90cm. The lettering must be 10cm high. If the address does not fit on the maximum size, two signs may be joined with an end bracket and H-clip. Signs must have silver lettering with a blue background. Street name sign locations must be approved by Lac La Biche County.

.4 Except in urban areas, a clearly visible panel containing the proper number of the parcel of land accompanied by the proper road number or number which complies with the following specifications; numbers and letters are not to be less than four (4) inches in height, light reflective, white in color, mounted on a light reflective green panel, and the sign is to be posted six (6) feet (1.8 meters) to the left of the access/entrance of the parcel of land, and one (1) foot (0.3 meters) inside the property line and a minimum of four (4) feet (1.22 meters) above the natural ground level so as to be clearly visible from the road.

.5 In urban areas, the proper number for the parcel of land such numbers being not less than four (4) inches in height.

.6 Street names must be approved by Lac La Biche County and included in the Development Agreement.

.7 All signs must be placed so as not to obstruct the view of oncoming vehicles.

.8 Permanent subdivision identification signs located at the entrance must:

.1 Be designed to be maintenance free for a minimum of 15 years;

.2 Be constructed and installed to hold signs rigidly in their proper and permanent position;

.3 Be constructed of concrete, masonry, stone, non-ferrous metal or a combination thereof. No permanent wood signage will be permitted.

.4 Be maintained by the Developer to the end of the maintenance period

.9 Material for temporary signs, such as subdivision layout signs, must be approved by the County prior to installation. Removal of temporary signs must be the responsibility of the Developer prior to the end of the maintenance period.

.10 The Developer must install a County prepared Municipal Address Sign within the road right-of-way, adjacent to the first lot on the right-hand side at the main subdivision entrance. The sign design and location must be submitted to the County for approval. The Developer will be

responsible for the supply of the post and sign installation. The Municipal Address Sign must be in compliance with the bylaw.

.11 All parcels of land in Lac La Biche County fronting upon a road, which are occupied by a structure, must be assigned an address by Lac La Biche County.

G.18 DRAINAGE AND CULVERTS

.1 It is the Developers responsibility to construct a drainage system that will meet the flow requirements outlined in Section F for both rural and urban cross sections.

.2 Ditches for rural roadways must have backslopes no steeper than 2H:1V.

.3 Ditch grades must match the road grades wherever possible.

.4 Ditch grades must have a minimum grade of 0.5% wherever possible. Grades less than 0.5% must be subject to review and approval by the County.

.5 Drainage channels must be provided with ditch checks and/or other means of erosion control as necessary. All drainages must be seeded. See Section H for seed mixture.

.6 Ditches must have a flat bottom, width as per applicable design standard.

.7 Culvert sizing is the responsibility of the County. Culverts and ditches must be designed to accommodate a 1: 25-year rainfall event. Ditches must be allowed to back up during such an event to the height of the subgrade.

.8 Culverts must be new galvanized corrugated steel pipe with a minimum wall thickness of 1.6mm or as required to meet the loading criteria.

.9 Minimum pipe sizes for various uses are as follows:

Residential Approach Culvert	500mm diameter
Industrial Approach Culvert	600mm diameter
Roadway Centreline Culverts	600mm diameter

.10 All culverts must have appropriate end treatments depending on the application. Inverts must be extended to the toe of the side slope.

.11 The culvert grade must not be less than the ditch grades at the inlet and outlet.

.12 Culverts must have a sufficient amount of coverage to protect against damage from the expected traffic loading. The minimum coverage must be 300mm or one-half the diameter of the culvert, whichever is greater as measured from the finished shoulder grade to the top of the culvert.

G.19 ROAD GRAVELLING (RURAL ROADS)

.1 Calculating the roadway gravelling application rate is the responsibility of the Developer and must be determined by a geotechnical engineer based on the roadway use and soil conditions.

.2 All rural residential driveways must be gravelled at a minimum rate of 8 cubic metres per approach, from the roadway shoulder to the property line.

.3 Gradation of surface gravel must be approved by the County.

G.20 PAVEMENT PAYMENT PENALTIES

.1 If the average core thickness does not meet specifications, at the discretion of Lac La Biche County, the asphalt may be assigned a pay factor according to the City of Edmonton Construction Specifications, Section 02741 Hot-Mix Asphalt Paving, Table 02741.1 Asphalt Thickness Pay Factors.

.2 If the average core density does not meet specifications, at the discretion of Lac La Biche County, the asphalt may be assigned a pay factor according to the City of Edmonton Construction Specifications, Section 02741 Hot-Mix Asphalt Paving, Table 02741.2, Asphalt Density Pay Factors.

.3 It must be the responsibility of the Developer to submit the pay factor calculations as applied to the contract price to the County for approval prior to acceptance of the Construction Completion Certificate.

G.21 BOAT LAUNCH

.1 Background

.1 Lac La Biche County recognizes shorelines of lakes and streams provide an abundance of recreational values. Shoreline areas are protected by several Provincial and Federal Acts and legislation to ensure that sensitive and productive fish and wildlife habitats are maintained. Boat launch structures, such as ramps, can have direct, indirect and cumulative impacts on these sensitive habitat areas.

.2 With increasing development on lakes, there is an increased demand for lake access by recreational watercraft. The construction of public and private boat launches along lakeshores to satisfy this demand has the potential to degrade sensitive near shore habitats.

.3 Traditional methods of boat launch construction such as the placement of fill or the construction of hardened launch surfaces in shallow waters harm shallow aquatic ecosystems.

.4 During construction, protective measures are to be incorporated to eliminate sediments, disturbance of silt and other contaminants from entering the water.

.2 Objectives

.1 To ensure the proposed works associated with boat launch development and maintenance protect water quality, fish, wildlife and aquatic and shoreline habitat.

.3 Applicable Provincial and Federal Legislation

.1 Public Lands Act,

.2 Water Act,

.3 Provincial Wetlands Policy,

.4 Alberta Environment, Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems

.5 Canadian Environmental Assessment Act

.6 Fisheries Act

.7 Species at Risk Act

.8 Navigable Water Protection Act

.4 Best Management Practices

.1 Due to their potential to cause harmful alteration, disruption or destruction (HADD) of fish habitat, hard surface boat launches typically require authorization to be obtained prior to construction from Department of Fisheries and Oceans (DFO) under section 35(2) of the Fisheries Act.

.2 Application of a best management practice (BMP) does not reduce the importance of individual project design and assessment, which may identify additional measures necessary to protect unique site attributes or address the potential impacts of atypical project components.

.3 Alternative designs such as elevated railway-like tracks can in most instances provide for the launching of personal watercraft while avoiding potential harm to fish habitat and are the first preference for private boat launch facilities in most situations.

.4 It is advisable to work with a qualified professional or team of professionals to provide the design and construction of a boat launch, depending on the scale and/or scope of the activity. This could include the use of a biologist, hydrologist, fluvial geomorphologist and/or engineer, alone or in some combination.

.5 Municipal Launch Facilities

.1 For developments adjacent water bodies, the County may require provisions for public infrastructure to service recreational boating demand on lakes and larger rivers. It is expected that most new public boat launches will be hard surface designs, likely to cause a harmful alteration, disruption or destruction (HADD) of fish habitat and requiring an authorization to be obtained prior to construction from DFO under section 35(2) of the Fisheries Act.

.2 The development of well-planned lakeshore access points, boat launches and moorage facilities for the local community can facilitate effective public access while helping to avoid direct, indirect and cumulative impacts to the foreshore and riparian habitat areas. Such plans should consider:

.1 The number of access points based on both current and projected demand, including both the level and season of use;

.2 The location of existing public and private boat launches;

.3 Whether existing public facilities are located in suitable locations and whether the development of new sites and/or rehabilitation of existing facilities (within the context of an overall plan for the area) would better meet current and projected demand, reduce short and long-term maintenance requirements and reduce potential environmental impacts. Important considerations will include;

.4 The location of boat launch facilities to maximize the season of use and minimize potential environmental impacts;

.5 The type of launch facilities required based on the types of watercraft to be supported;

.6 Adequate provisions for turn-around/parking areas and associated services;

.7 Installation of signage for appropriate use and identification of sensitive habitats in close proximity to the boat launch area;

.8 Use of applicable best management practices (BMP) to reduce or avoid impacts to the environment during boat launch construction and maintenance;

.3 The following design details should be incorporated, where appropriate, during the project design process:

.1 The offshore limit of a proposed boat launch facilities should be located no less than 1 meter below the 100-year low water level during the proposed season(s) of use. This is to ensure adequate water depth to float an average boat from its trailer. An effective stop mechanism should be incorporated at this offshore limit to protect against disturbance of lake sediments during boat loading.

.2 For a hard-surfaced boat launch ramp, the location and designed is to ensure that the majority of any required excavation occurs above the lake high water mark (HWM), with portions of the ramp located below the HWM to closely match the natural shoreline grade.

.3 Widths of hard surface boat launch ramps should be sufficient to accommodate boaters of various abilities to maneuver their trailers. The ramp width should also be wide enough to accommodate boarding floats/decks resting on the ramp surface during low water. Multiple lane designs need to consider lane overlap efficiencies to reduce the overall footprint.

.4 Pre-cast concrete planks are required for construction of the underwater portion of hard surface boat launch ramps.

.6 Maintenance and Upgrading of Existing Facilities

.1 Where existing facilities require maintenance either as a result of general launch use or as a previous design failure, notification to DFO is required with a variance request to proceed without a Fisheries Act section 35(2) authorization if:

.1 proposed maintenance or upgrade activities are limited to the existing area of disturbance;

.2 there are no impacts to riparian and/or littoral vegetation outside of the seasonal launch footprint; and,

.3 the operational best practices detailed Section G17.7 are employed. This information should accompany the Water Act application and be copied to the appropriate DFO Field Office for their consideration as early as possible in the project design process.

.7 Operational Best Practices

.1 Boat launch construction and maintenance are to be completed at a time of year that will reduce the in-stream risk as approved by the regional DFO Field Office.

.2 Construction must be monitored by an appropriate qualified professional (biologist, hydrologist, fluvial geomorphologist and/or engineer) on a full-time basis during project start-up and during any in-stream work or sensitive activity periods. Otherwise, these projects may

be monitored on a daily basis to the completion of the project. The environmental monitor is to be provided with written authority to modify and/or halt any construction activity if deemed necessary for the protection of fish and wildlife populations or their habitats. A sign should be posted listing the monitor's company name and phone number at the entrance to, or in the immediate vicinity of, the job site.

.3 A copy of the design standards and best practices for your works and all appropriate plans, drawings and documents should be forwarded to the contractor/crew supervisor and kept readily available at all times at the site while the work is proceeding.

.4 A pre-construction meeting must be held between the environmental monitor and the contractor undertaking the work on the site to ensure a common understanding of the mitigative best practices for the project.

.5 Within 60 days of completion of the project, the environmental monitor must complete and submit a minimum of one (1) copy of a monitoring report to their client, and one (1) copy to Lac La Biche County

.6 Only construction, modification, or maintenance works required to meet design specifications should be undertaken below the lake high water mark. No foreshore filling or land reclamation must occur, nor should human or machine disturbance of foreshore and/or riparian vegetation occur during boat launch construction.

.8 Design Best Practices

.1 Qualified professionals should ensure that the site assessment and design consider the following factors:

.1 Local soil characteristics;

.2 Local shoreline and stream mouth accretion/erosion dynamics, including local water currents and associated patterns of sediment transport and deposition;

.3 Existing lakeshore morphology and potential impacts or changes;

.4 Historical lake water levels during the proposed season(s) of use;

.5 Minimize direct, indirect and cumulative impacts on existing or potential fish and wildlife use, aquatic and riparian habitat;

.6 The ability to access, repair and maintain the works with minimal impact;

.7 Potential erosion or sediment releases resulting from proposed works;

.8 Implement control measures that may be required to reduce the potential for the establishment of invasive aquatic plants;

.9 Minimizing the potential for stormwater and contaminated runoff from parking areas reaching the lake;

.10 Minimizing the footprint of the works and associated foreshore disturbance;

.11 Minimize the effects of boat wakes on adjacent shoreline areas and reduce the potential for sediment accumulation on the ramp;

.12 Avoiding direct and indirect impacts on other properties or services;

.13 Pre-cast concrete, plastic or steel pilings should be considered as an environmentally sound and more durable alternative to untreated wooden pilings. As concrete is very toxic to aquatic organisms until it fully hardens;

.14 Lac La Biche County does not promote the use of wood preservatives in or around fish-bearing water bodies and prefers the use of untreated wood or inert materials;

.15 Upon completion of construction activities, all work areas below the lake high water mark should be left in a smooth condition free of any depressions that may result in fry entrapment.

.2 In all cases, the design footprint of proposed structures below the lake high water mark should be minimized to limit potential habitat impacts. Where spawning records are not available, a qualified professional should be engaged to assess whether the site is likely to support shore spawning.

.3 In particular, when selecting a location for a boat launch, your professional/contractor should consider what types of habitats are present and select a site where the boat launch will cause the least impact.

.4 Minimize the area disturbed by construction activities and preserve trees, shrubs and grasses near the shoreline - existing rocks and logs in the aquatic environment are important fish habitats and should not be used as building materials.

.9 If your qualified professionals' assessment determines that a HADD of fish habitat may occur due to your proposal, then your qualified professional should contact your nearest DFO Field Office to discuss the potential for authorization of the HADD of fish habitat. If you wish to proceed to apply for an authorization from DFO, then submissions for an authorization need to include an assessment of potential direct, indirect (e.g. changes in longshore drift and sedimentation patterns) and cumulative impacts of boat launch construction and operation on riparian vegetation and fish and fish habitat. These impacts need to be considered for listed wildlife individuals populations and species as well as most authorizations will also trigger a review under the Canadian Environmental Assessment Act. Contact your local DFO office for specific forms.

.10 Keep a spill containment kit readily accessible on site in the event of a release of a deleterious substance to the environment and train on-site staff in its use. Immediately report any spill of a substance that is toxic, polluting or deleterious to aquatic life and of reportable quantities to the Provincial Emergency Program.

.11 Construction Materials

.1 Portland Cement

.1 Ensure Portland cement or lime-containing construction materials will not deposit sediments, debris, concrete, concrete fines, wash or contact the water body adjacent the work site. Concrete materials cast in place must remain inside sealed formed structures. Concrete leachate is alkaline and highly toxic to fish and other aquatic life. Pre-cast materials pose less of a risk to the environment.

.2 A CO_2 tank with regulator, hose and gas diffuser must be readily available during concrete work to neutralize pH levels should a spill occur and staff should be trained in its use.

.3 An isolated containment facility for the wash-down water from concrete vehicles, equipment and other tools is required.

.4 In the event of spills of sediments, debris, concrete fines, wash enter the water body implement emergency mitigation and clean-up measures (such as the use of CO_2 and immediate removal of the material) Report all occurrences to DFO.

.5 Monitor the pH frequently in the watercourse immediately downstream of the isolated worksite until the works are completed. Emergency measures should be implemented if downstream pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level or is recorded to be below 6.0 or above 9.0 pH units.

.2 Treated Wood

.1 Caution is advised where preserved wood and preservative treatments are used. Manufactures' precautions and instructions are to be followed at all times. Wood preservatives cannot be applied near or over the water surface.

.3 Untreated Wood

.1 Cedar or hemlock is recommended for use as they contain natural preservatives that protect the wood from rot caused by repetitive water exposure and drying cycles. Less expensive wood species may be used in areas below the water line where they are not exposed to the air.

.4 Metals

.1 Steel is generally not a recommended material for construction uses in or near water. Painted steel is to be avoided at all times.

.5 Plastics

.1 Plastic materials do not affect the water quality; they are generally tough and float well.

.2 White expanded polystyrene has little effect on water quality; however, is not recommended for use as it tends to break down over time. The white foam beads can then become a hazard to fish.

.3 Closed cell polystyrene forms are recommended for use as floatation devices. The billets require wrapping with polyethylene sheeting to help protect them from degradation due to accident gas/oil spills.

.12 Sediment Control

.1 Minimize disturbance to existing vegetation on and adjacent to the lakeshore.

.2 Put sediment control measures (e.g. silt curtain and/or silt fencing) in place before starting any works that may result in sediment mobilization.

.3 Remove excavated material and debris from the site or place it in a stable area above the high-water mark or active floodplain of the lake and as far as possible from the lakeshore. Protect this material and any remaining exposed soils within the work site from erosion and reintroduction to the lake by using mitigative measures.

.13 Removal of Existing Structures & Site Restoration

.1 A qualified professional should be engaged to ensure that the removal works are undertaken in a manner that minimizes impact and ensures that areas requiring restoration are appropriately restored.

.2 Removal of existing boat launches should be completed in a manner that prevents disturbance to the lake, foreshore and/or generates sediment. Construction waste must not be deposited or stored within the lake-foreshore or riparian areas.

.3 Sites restoration is to provide for long-term recovery and eliminate any depressions that may result in fry entrapment during low water.

.4 Disturbed areas above the lake high water mark are to be graded to a stable angle of repose.

.5 Disturbed areas are to be seeded and/or revegetated to prevent surface erosion by hydroseeding with a heavy mulch, tackifier and seed mix; by installing erosion blankets; and/or, by heavily seeding/planting with native vegetation.

.6 Remove any remaining sediment and erosion control measures.

.7 Ensure that all equipment, supplies and non-biodegradable materials have been removed from the site.

G.22 PARKING FACILITIES

.1 Off-Street Vehicular Parking

.1 When any new development is proposed, including a change of use of existing development, or when any existing development is, in the opinion of the Development Authority, substantially enlarged or increased in capacity, off-street vehicular parking or garage spaces must be provided in accordance with the Standards of Off-Street Vehicular Parking.

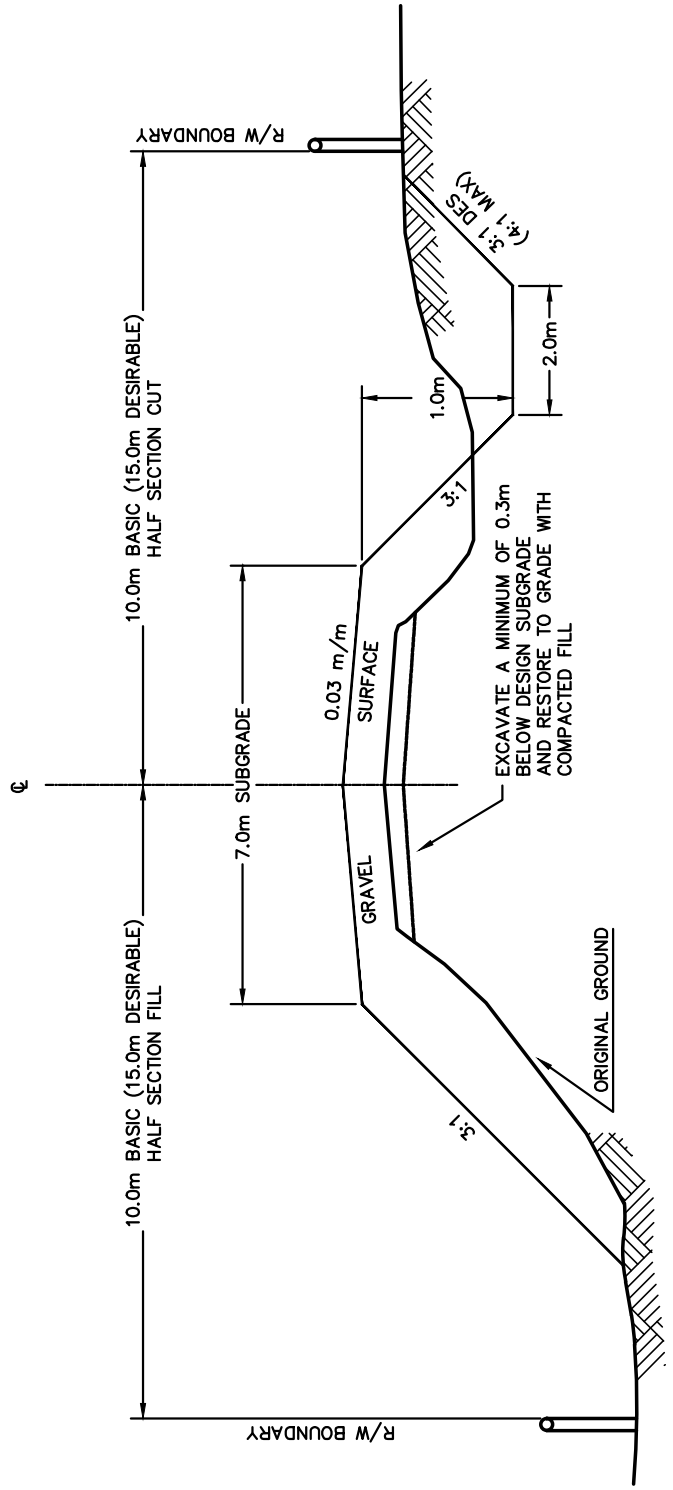
.2 All off-street vehicular parking spaces must conform to the requirements outlined in the Table below.

Minimum Parking Standards

a Parking Angle in Degrees	b Width of Space	c Depth of Space Perpendicular to Aisle	d Width of Space Parallel to Aisle	e Overall Depth	f Width of Maneuvering Aisle
0	2.8m	2.8m	7.0m	9m	One Way 4m
30	2.8m	5.2m	5.5m	14m	One Way 4m
45	2.8m	5.8m	4.0m	15m	One Way 4m
60	2.8m	6.1m	3.2m	18m	One Way 6m
90	2.8m	6.1m	2.8m	18m	One Way 7m

.3 For other requirements for Off-Street Vehicular Parking see Land Use Bylaw 07-005.

.2 Handicapped Spaces are to be provided as per the building code.



CUT SECTION
- WIDTH OF DITCH – 2.0m STANDARD; V-DITCH MINIMUM
- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD IS INTENDED FOR LOW VOLUME ROADS THAT WILL BE GRAVEL SURFACED ONLY AND WILL HAVE LITTLE OR NO TRUCK TRAFFIC. TYPICALLY THIS 7.0m ROADWAY IS USED ON ROADS WITH AADTS < 25.

FILL SECTION
- 3:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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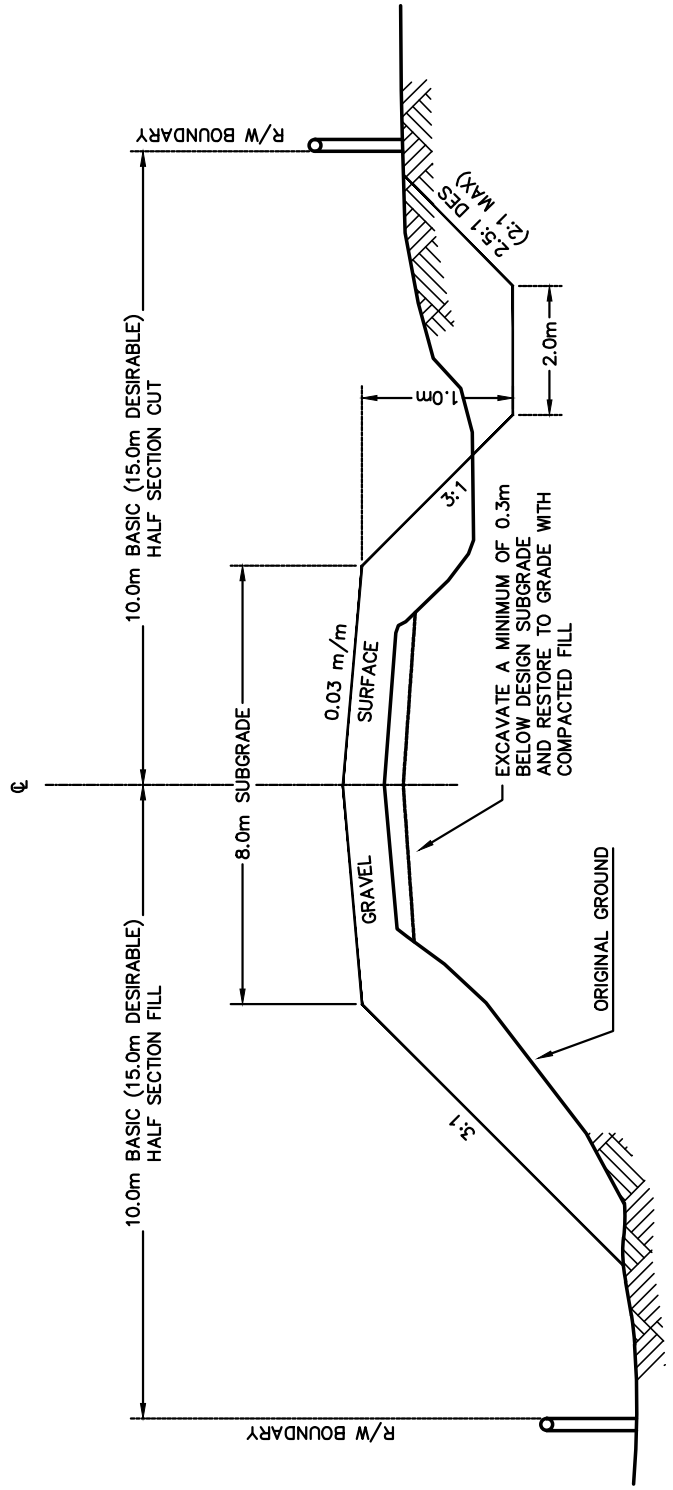
Rev.	wsp		TYPICAL CROSS SECTION FOR GRADING & GRAVEL SURFACING ACCESS ROAD	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–01
Date: APRIL 2009	Drawn: TLB	Scale NTS		



CUT SECTION

- WIDTH OF DITCH – 2.0m STANDARD; V-DITCH MINIMUM
- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD IS INTENDED FOR LOW VOLUME LOCAL ROADS WHICH WILL BE GRAVEL SURFACED ONLY. TYPICALLY THIS 8.0m ROADWAY IS IS FOR ROADS WITH AN AADTS < 100.

FILL SECTION

- 3:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

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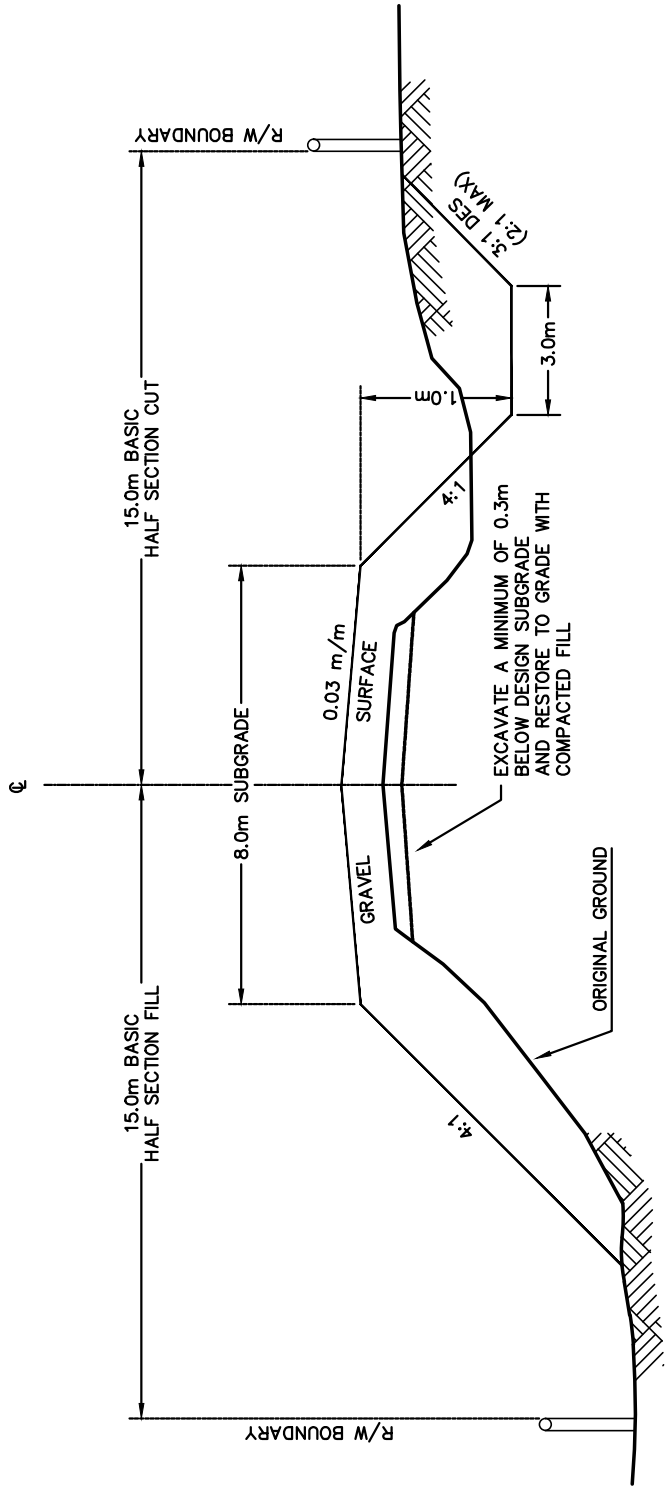
Rev.	wsp		TYPICAL CROSS SECTION FOR GRADING & GRAVEL SURFACING (NEW) RURAL 8.0m GRAVEL	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–02
Date: APRIL 2009	Drawn: TLB	Scale NTS		



CUT SECTION

- WIDTH OF DITCH – 3.0m STANDARD; V-DITCH MINIMUM
- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD IS INTENDED FOR LOW VOLUME LOCAL ROADS WHICH WILL BE GRAVEL SURFACED ONLY. THIS 8.0m ROADWAY IS TYPICALLY USED FOR AADTS < 200.

FILL SECTION

- 4:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

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Rev.			TYPICAL CROSS SECTION FOR GRADING & GRAVEL SURFACING STANDARD LOCAL ROAD	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–03
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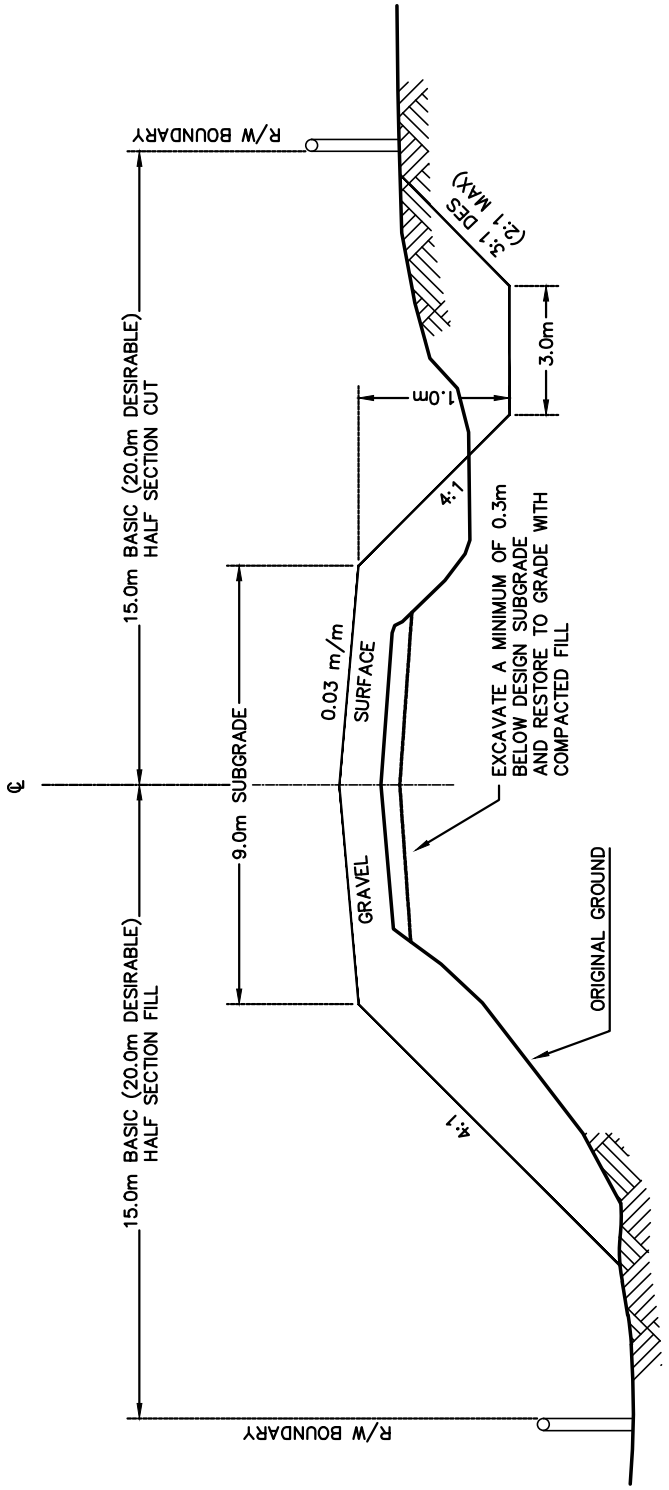

CUT SECTION
- WIDTH OF DITCH – 3.0m STANDARD; V-DITCH MINIMUM
- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD IS INTENDED FOR LOW VOLUME LOCAL ROADS WHICH WILL BE GRAVEL SURFACED ONLY. THIS 9.0m ROADWAY IS TYPICALLY USED FOR AADTS > 200.

FILL SECTION
- 4:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

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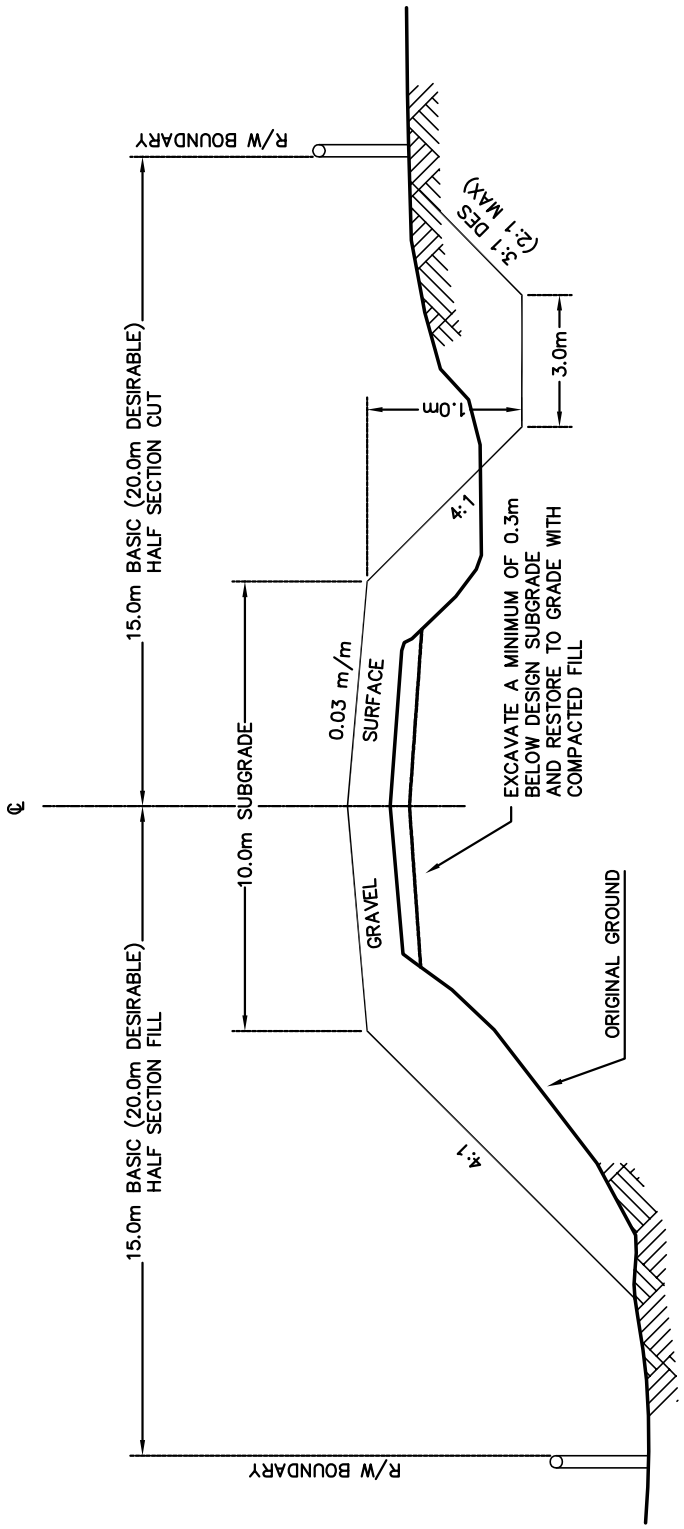
Rev.	wsp		TYPICAL CROSS SECTION FOR GRADING & GRAVEL SURFACING COLLECTOR ROAD 9.0m	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–04
Date: APRIL 2009	Drawn: TLB	Scale NTS		



CUT SECTION

- WIDTH OF DITCH – 3.0m STANDARD; V-DITCH MINIMUM
- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD IS INTENDED FOR LOW VOLUME LOCAL ROADS WHICH WILL BE GRAVEL SURFACED ONLY. THIS 10.0m ROADWAY IS TYPICALLY USED FOR AADTS > 200 WHERE TRUCK VOLUMES WARRANT ADDITIONAL SUBGRADE WIDTH.

FILL SECTION

- 4:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

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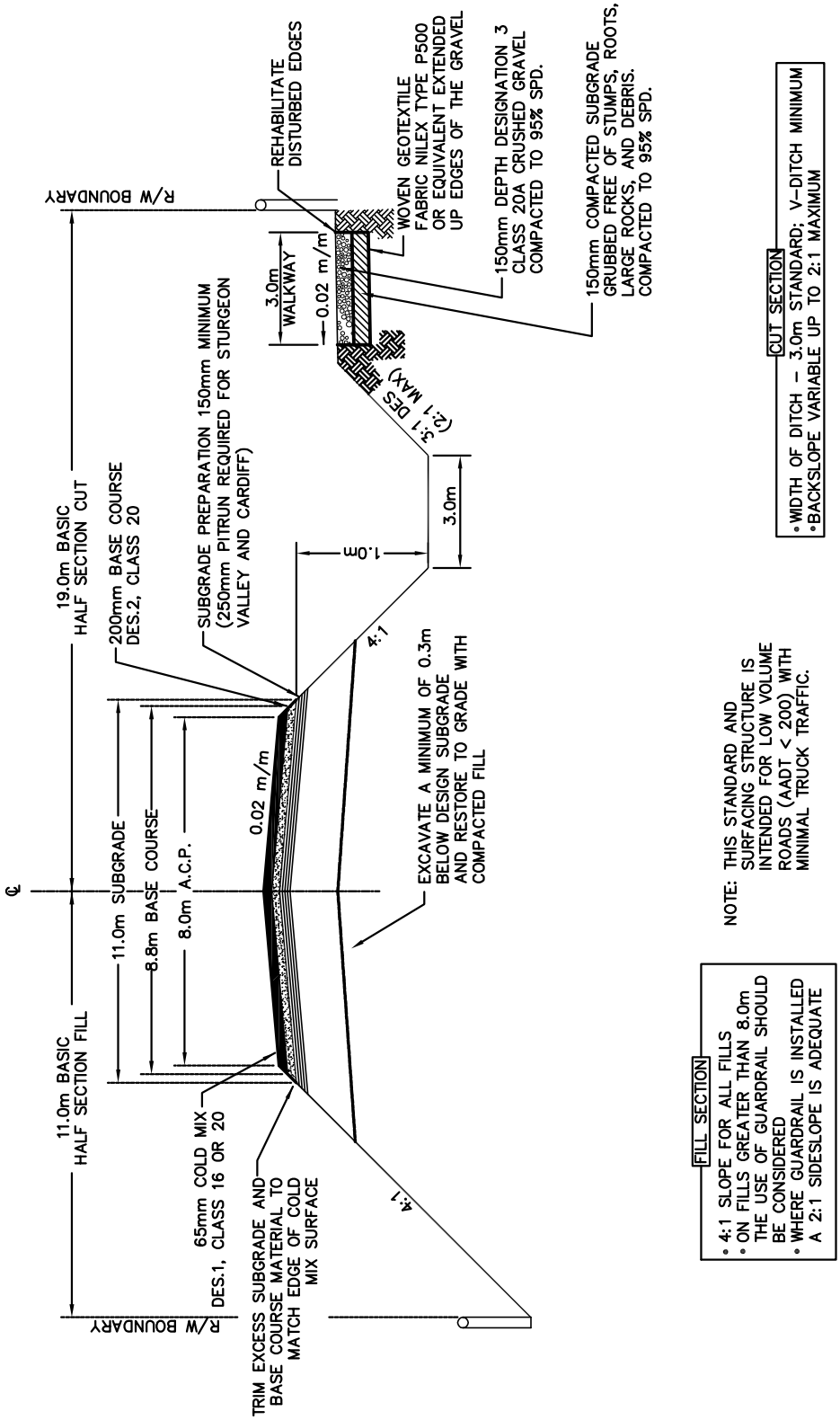
Rev.			TYPICAL CROSS SECTION FOR GRADING & GRAVEL SURFACING COLLECTOR ROAD 10m	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–05
Date: APRIL 2009	Drawn: TLB	Scale NTS		



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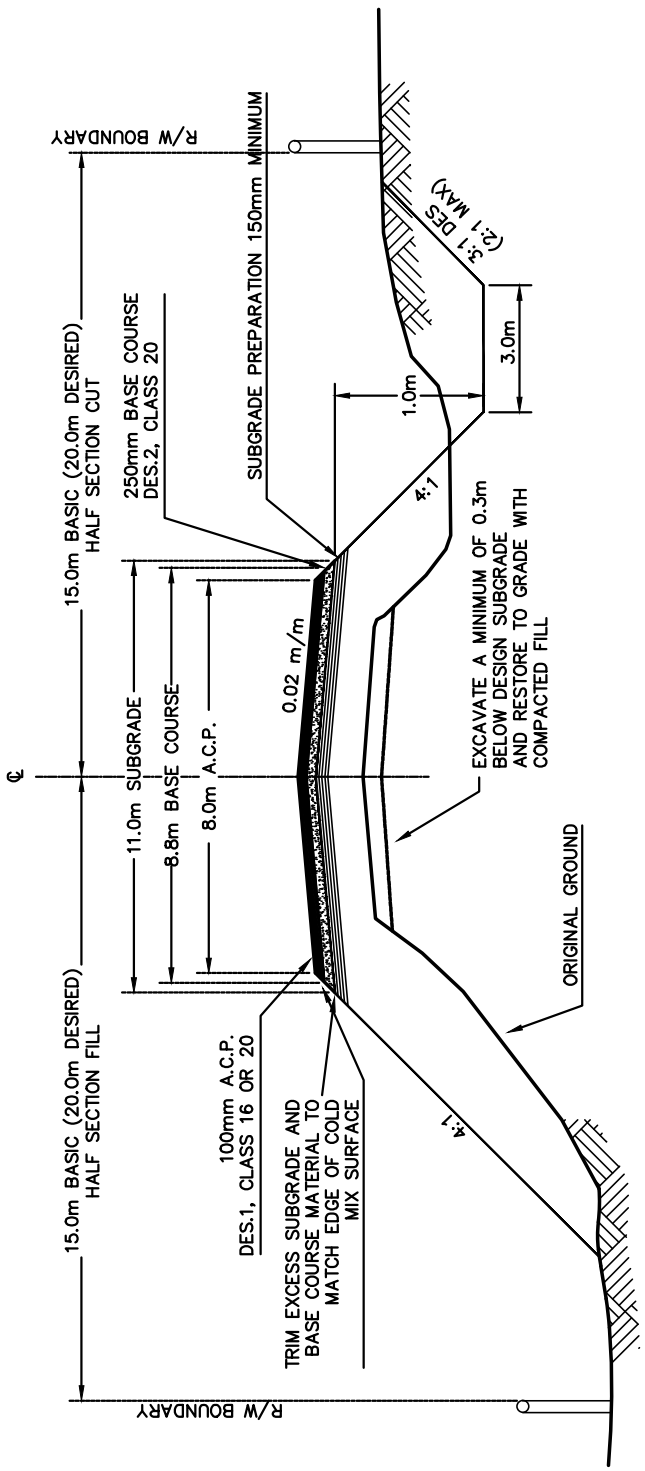
Rev.			TYPICAL CROSS SECTION FOR ASPHALT CONCRETE PAVEMENT SURFACING PAVED LOCAL ROAD 8.0m WITH 3.0m GRANULAR WALKWAY	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–06
Date: APRIL 2009	Drawn: JAD	Scale NTS		



CUT SECTION

- WIDTH OF DITCH – 3.0m STANDARD; V-DITCH MINIMUM
- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD AND SURFACING STRUCTURE IS INTENDED FOR LOW VOLUME ROADS (AADT < 200)

FILL SECTION

- 4:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

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Rev.			TYPICAL CROSS SECTION FOR ASPHALT CONCRETE PAVEMENT SURFACING PAVED LOCAL ROAD 8.0m	
Rev.				
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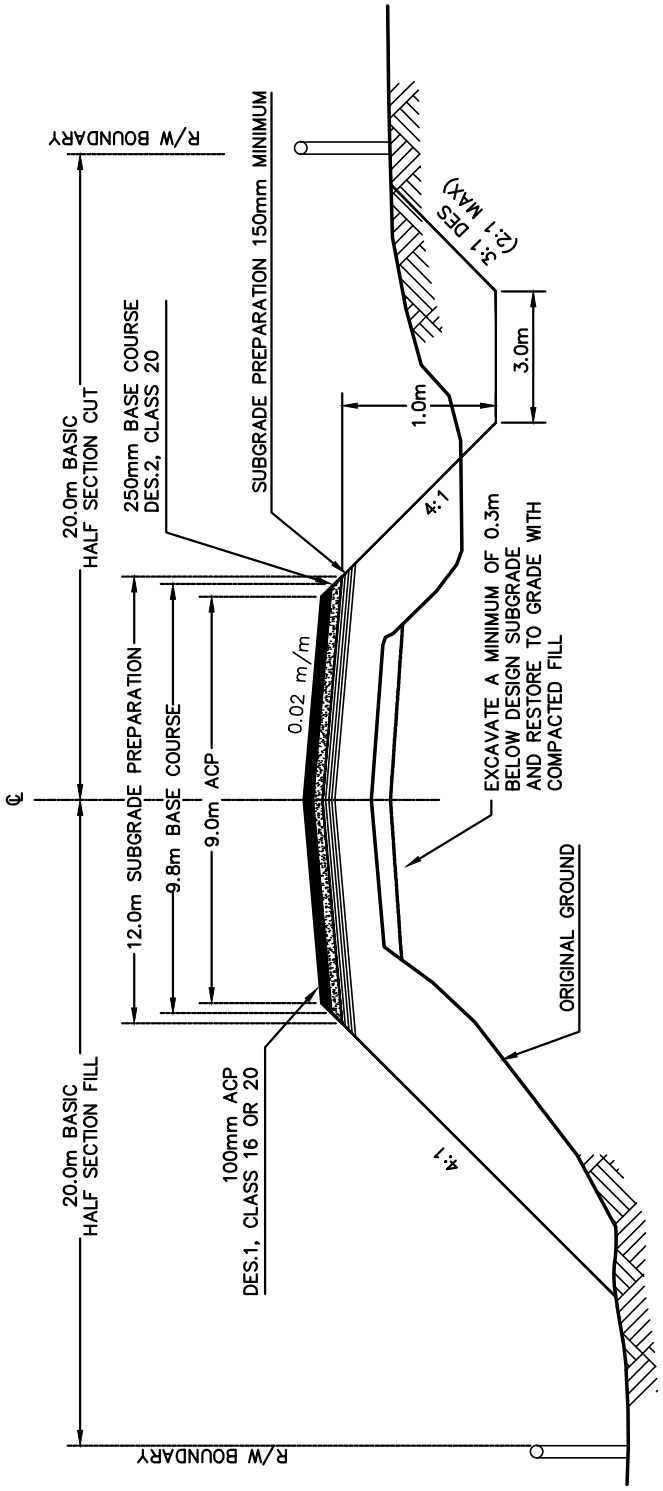
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–07
Date: APRIL 2009	Drawn: TLB	Scale NTS		



CUT SECTION

- WIDTH OF DITCH – 3.0m STANDARD; V-DITCH MINIMUM
- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD AND SURFACING STRUCTURE IS INTENDED FOR LOCAL ROADS WITH AN AADT < 500.

FILL SECTION

- 4:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

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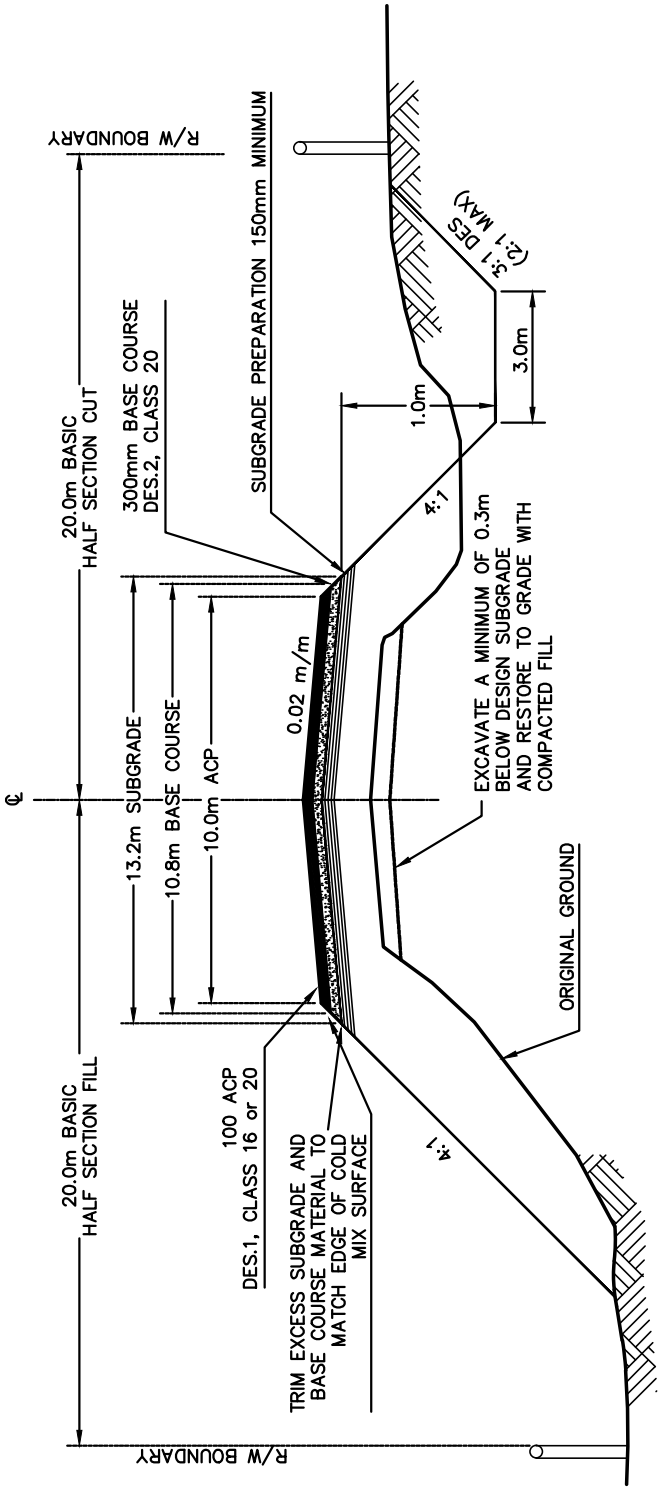
Rev.			TYPICAL CROSS SECTION FOR ASPHALT CONCRETE PAVEMENT SURFACING (PROPOSED) ARTERIAL 9.0m	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–09
Date: APRIL 2009	Drawn: TLB	Scale NTS		



CUT SECTION

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- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD AND SURFACING STRUCTURE IS INTENDED FOR LOCAL ROADS WITH AN AADT < 2000.

FILL SECTION

- 4:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

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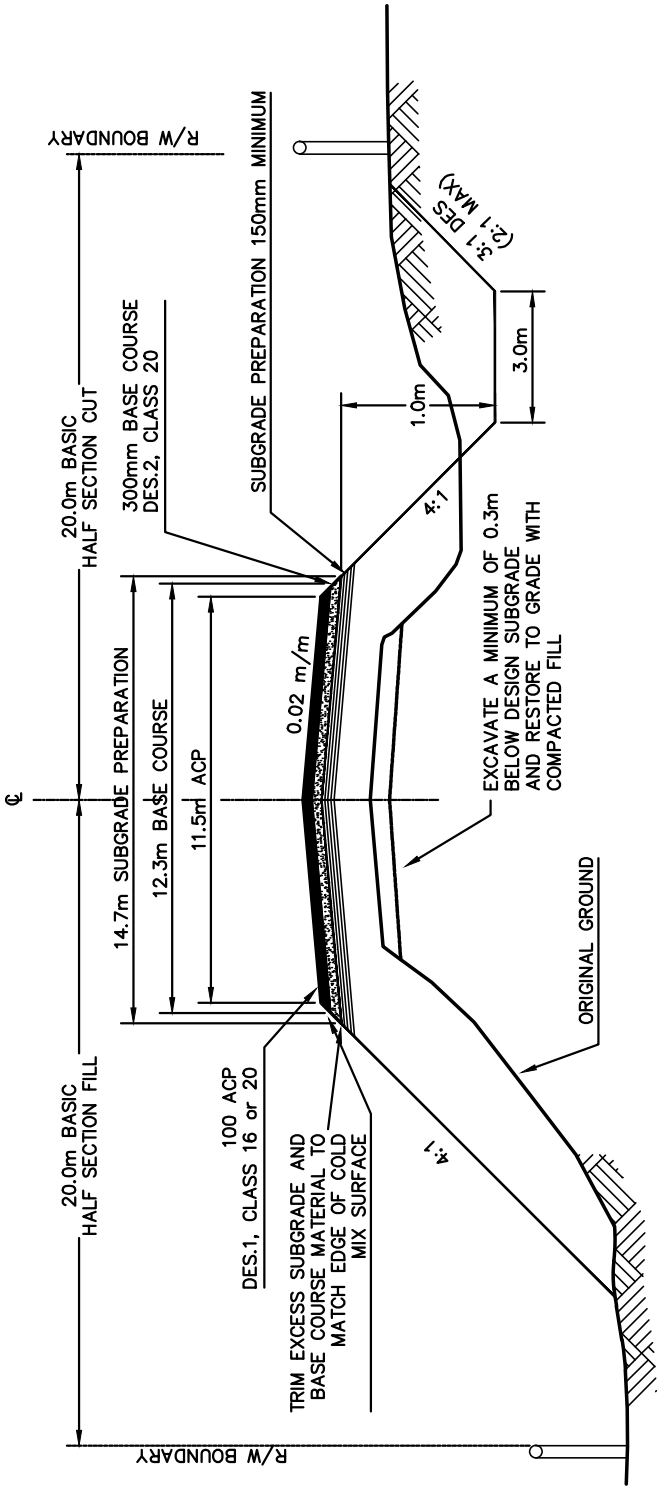
Rev.	wsp		TYPICAL CROSS SECTION FOR ASPHALT CONCRETE PAVEMENT SURFACING ARTERIAL 10m	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–10
Date: APRIL 2009	Drawn: TLB	Scale NTS		



CUT SECTION

- WIDTH OF DITCH – 3.0m STANDARD; V-DITCH MINIMUM
- BACKSLOPE VARIABLE UP TO 2:1 MAXIMUM

NOTE: THIS STANDARD AND SURFACING STRUCTURE IS INTENDED FOR LOCAL ROADS WITH AN AADT > 2000.

FILL SECTION

- 4:1 SLOPE FOR ALL FILLS
- ON FILLS GREATER THAN 8.0m THE USE OF GUARDRAIL SHOULD BE CONSIDERED
- WHERE GUARDRAIL IS INSTALLED A 2:1 SIDESLOPE IS ADEQUATE

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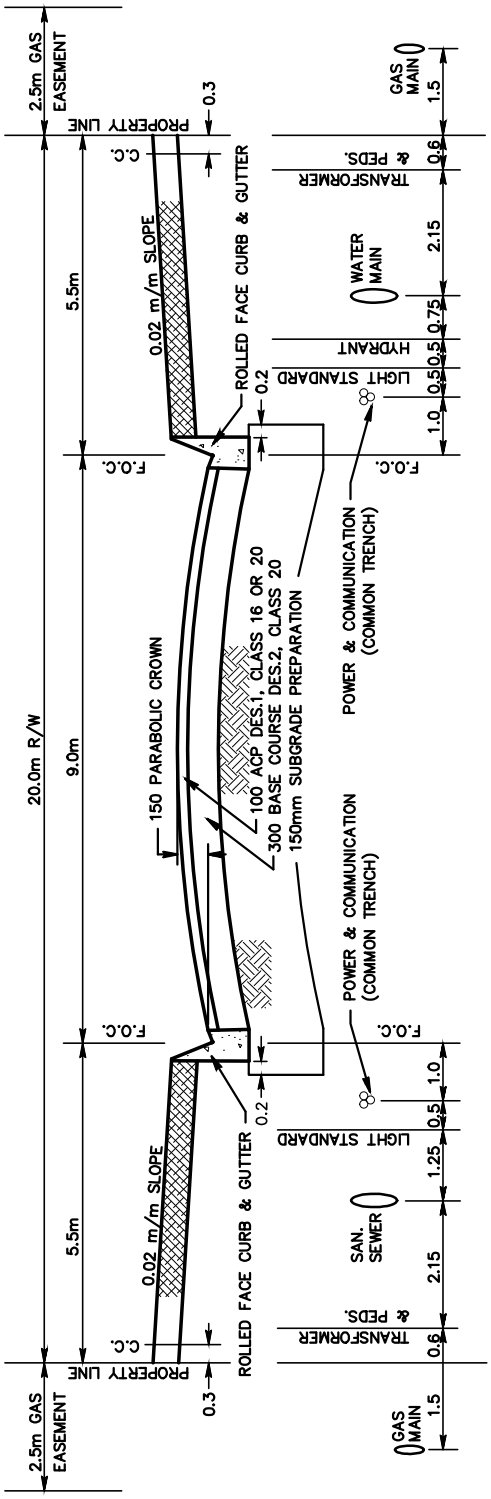
Rev.			TYPICAL CROSS SECTION FOR ASPHALT CONCRETE PAVEMENT SURFACING ARTERIAL 11m	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–11
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES: 1. THIS STANDARD AND SURFACING STRUCTURE IS INTENDED FOR LOCAL ROADS WITH AN AADT < 2000

2. WICK DRAIN SHALL BE PLACED BELOW THE CURB BETWEEN THE SUBGRADE AMD BASE COURSE AND CONNECTED TO THE NEAREST CATCH BASIN.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

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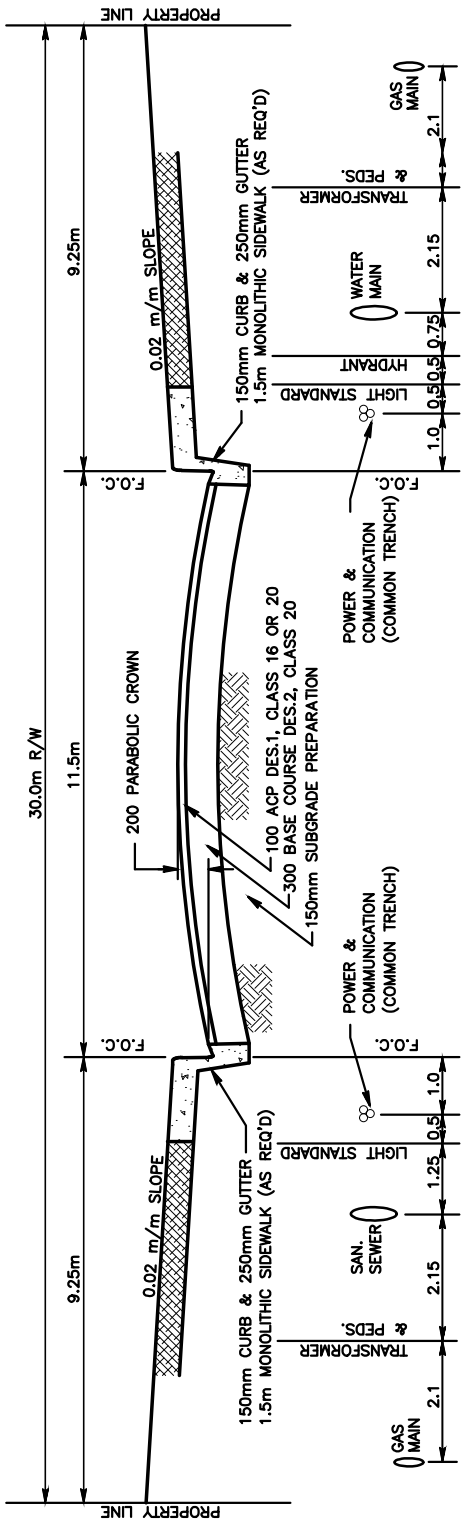
Rev.	wsp		TYPICAL CROSS SECTION & UTILITIES LAYOUT URBAN 9.0m	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–12
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES: 1. THIS STANDARD AND SURFACING STRUCTURE IS INTENDED FOR LOCAL ROADS WITH AN AADT > 2000

2. WICK DRAIN SHALL BE PLACED BELOW THE CURB BETWEEN THE SUBGRADE AMD BASE COURSE AND CONNECTED TO THE NEAREST CATCH BASIN.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

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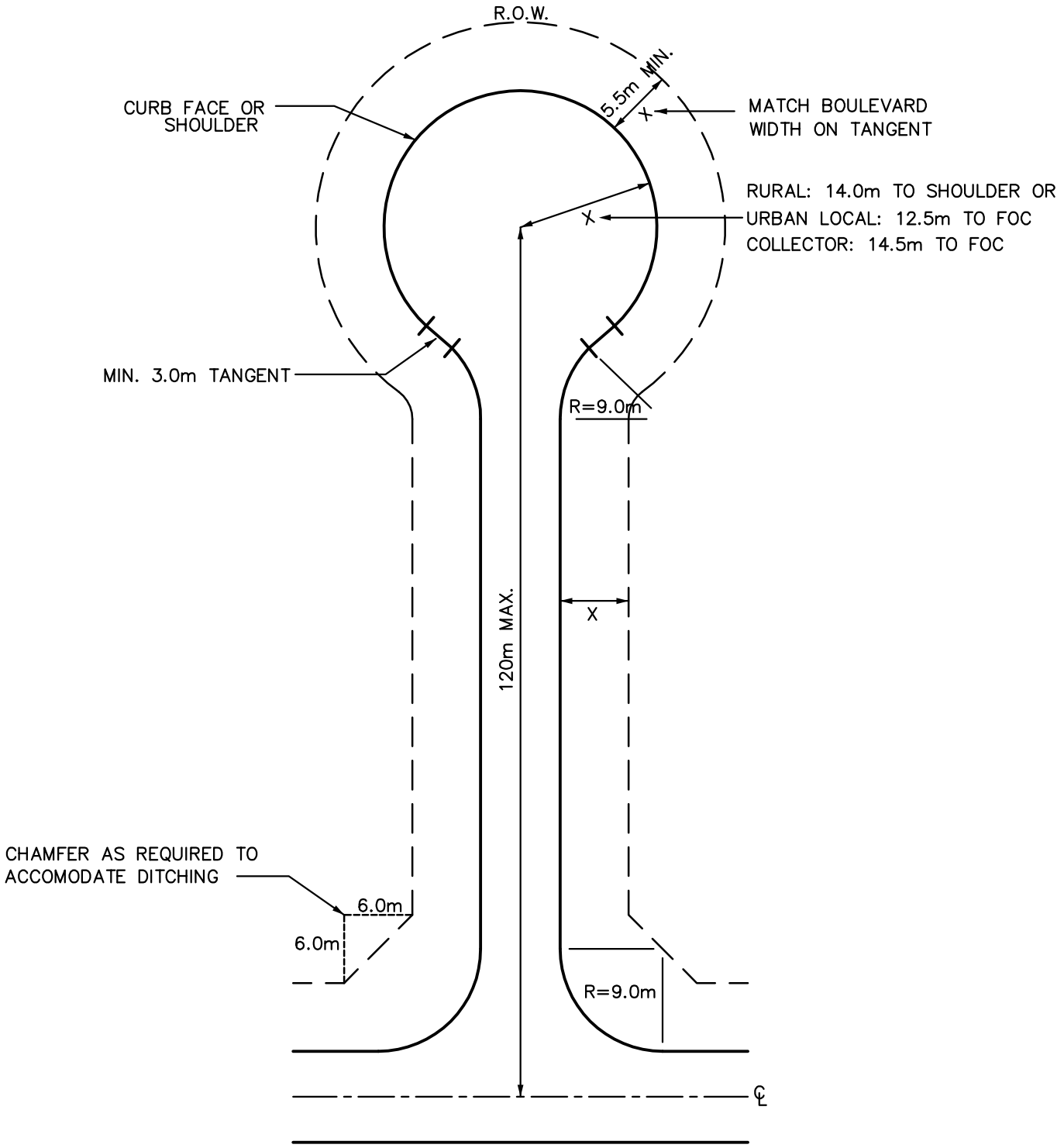
Rev.	wsp		TYPICAL CROSS SECTION & UTILITIES LAYOUT URBAN 11.5m	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–13
Date: APRIL 2009	Drawn: TLB	Scale NTS		

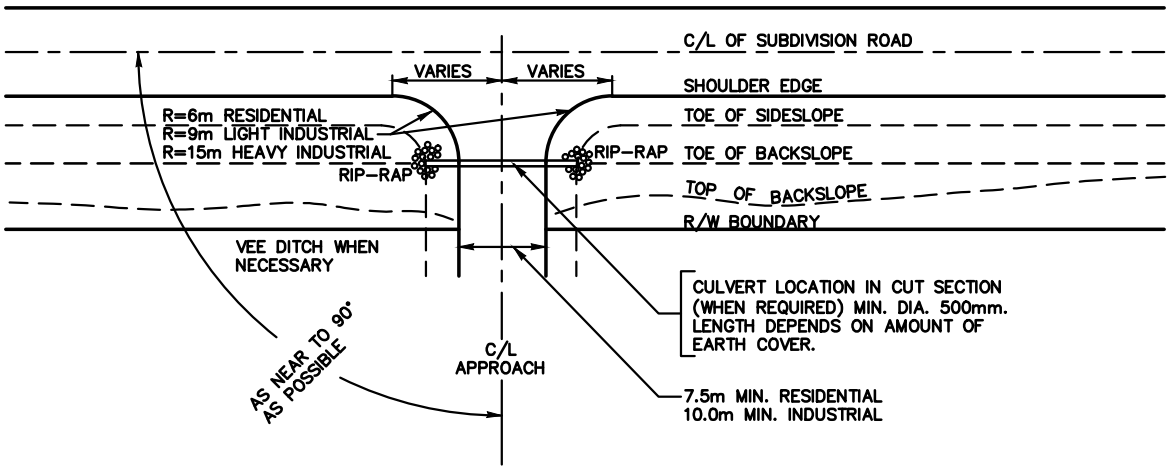


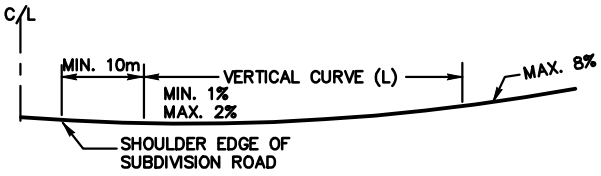
LAC LA BICHE COUNTY

General Municipal Servicing Standards

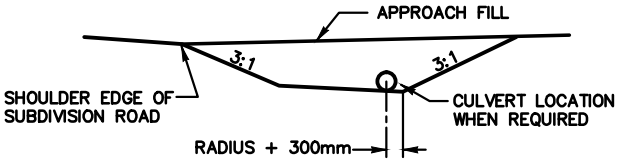
Lac La Biche County
welcoming by nature.

Rev.	WSP		TYPICAL CUL-DE-SAC DETAIL URBAN AND RURAL STANDARD	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G-14
Date: APRIL 2009	Drawn: TLB	Scale NTS		

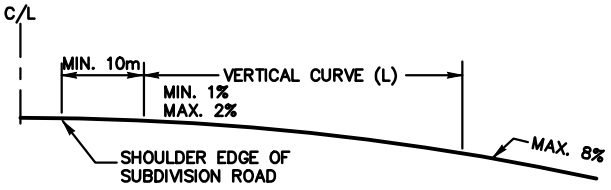




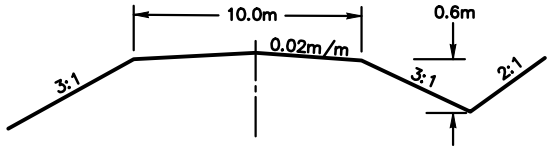
PROFILE – APPROACH IN CUT



DETAIL OF DITCH & CULVERT LOCATION

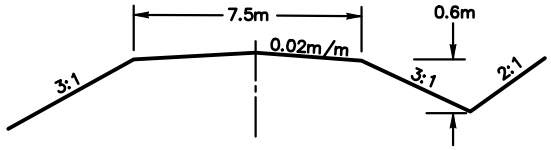


PROFILE – APPROACH IN FILL



MINIMUM INDUSTRIAL APPROACH CROSS SECTION

MINIMUM LENGTH OF VERTICAL CURVE		
ALGEBRAIC DIFFERENCE IN GRADIENT (%)	LENGTH L (METRES)	
	CREST	SAG
1	5	7.5
2	12	15
3	18	23
4	25	30
5	30	38
6	37	46
7		46
8		46
9		46



MINIMUM RESIDENTIAL APPROACH CROSS SECTION

NOTE
ALL ENTRANCES ARE TO BE FROM THE INTERNAL ROAD SYSTEM AND ARE TO PROVIDE REASONABLE ACCESS TO THE LOTS, EACH LOT IS TO HAVE A PRIVATE APPROACH.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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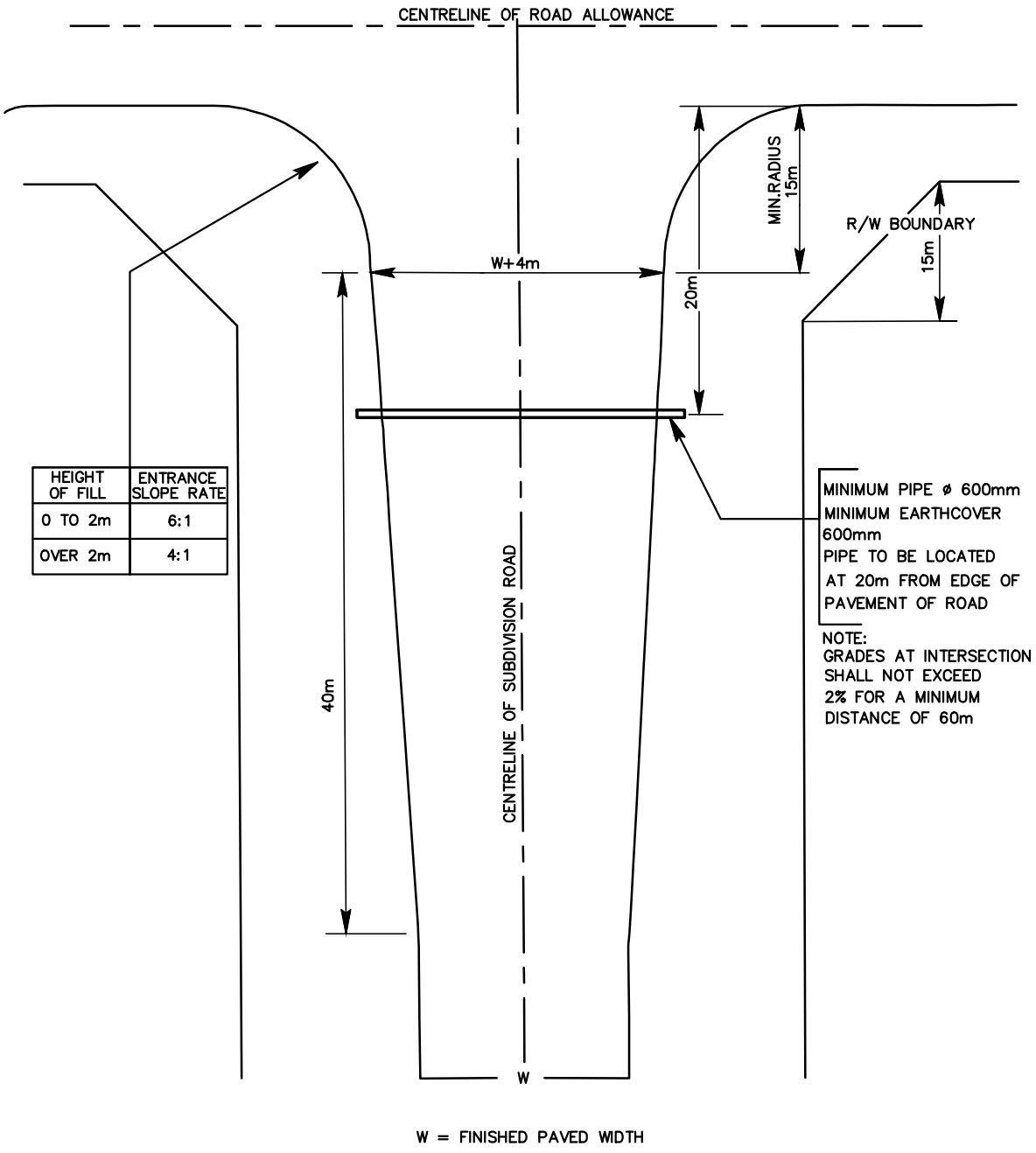
Rev.			RESIDENTIAL / INDUSTRIAL APPROACH STANDARD	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–15
Date: APRIL 2009	Drawn: TLB	Scale NTS		



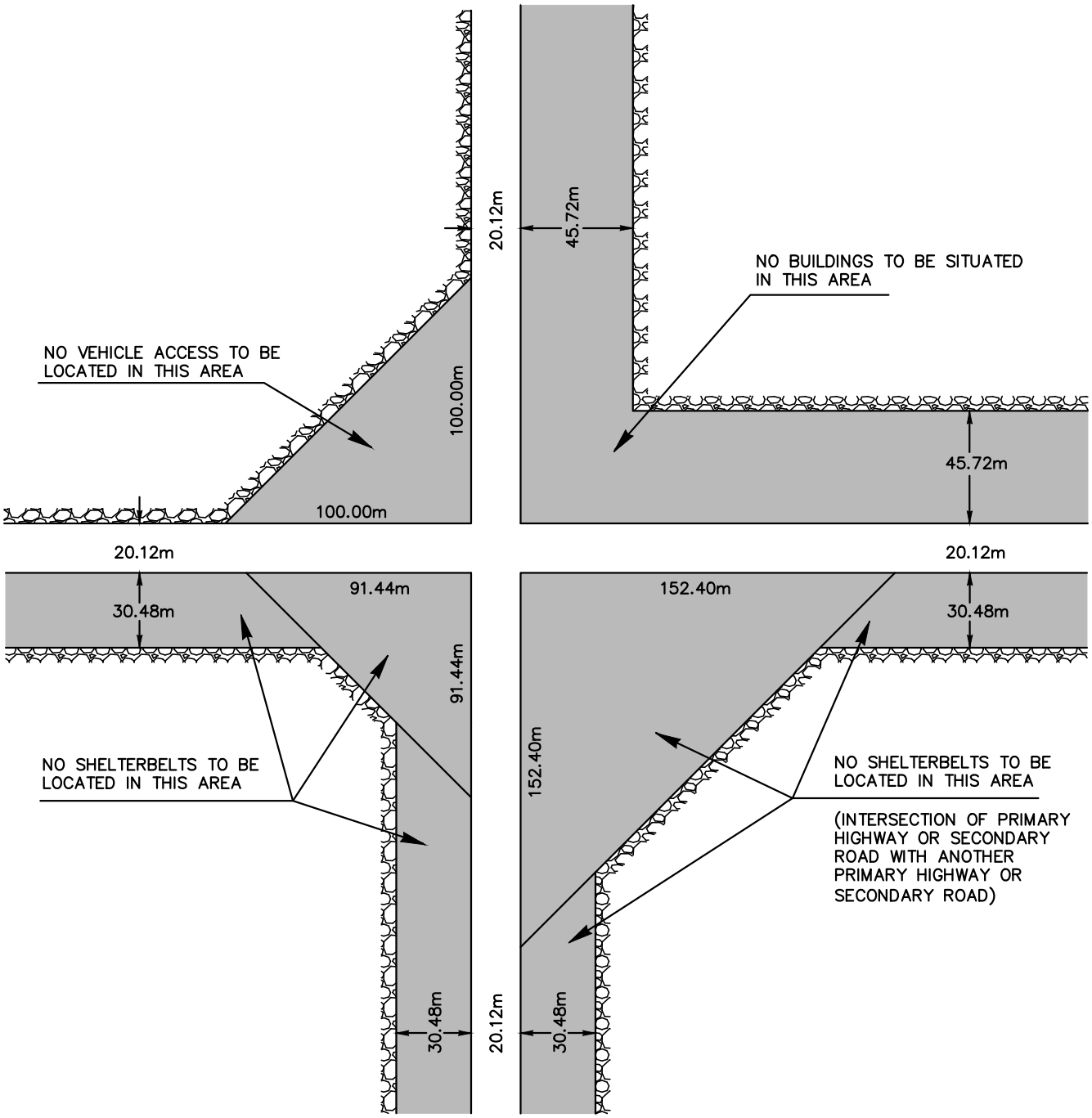
W = FINISHED PAVED WIDTH

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		MAJOR INTERSECTION LAYOUT INDUSTRIAL – RURAL STANDARD	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–16
Date: APRIL 2009	Drawn: TLB	Scale NTS		

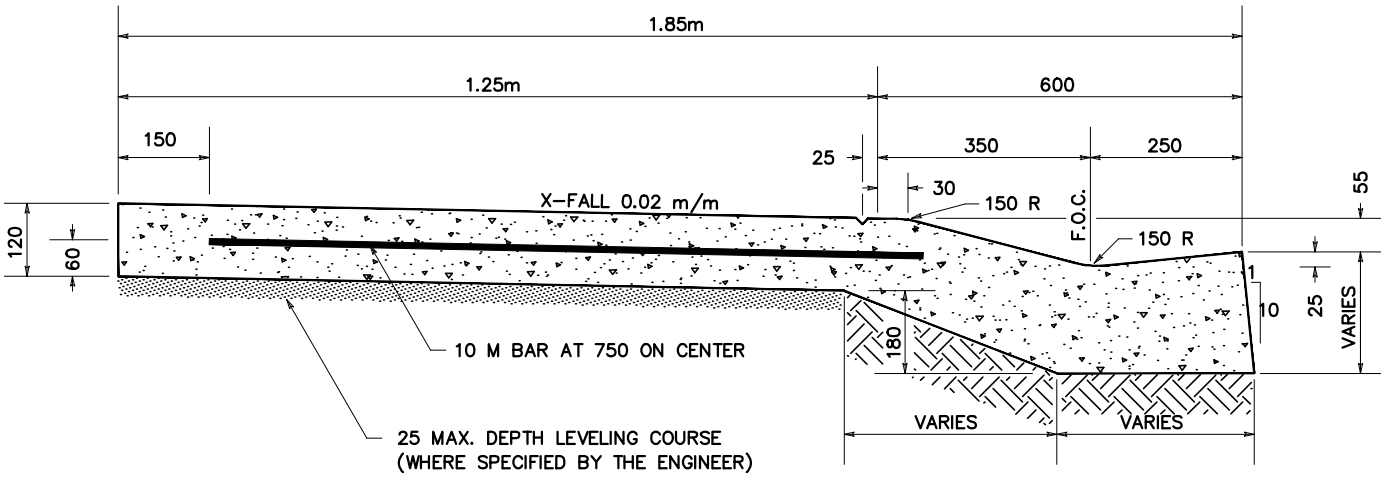


LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		ACCESS & DEVELOPMENT CONTROL MUNICIPAL GRID ROAD INTERSECTION	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–17
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

NOTES:
1. DEPTH OF GUTTER FACE TO MATCH ROAD STRUCTURE.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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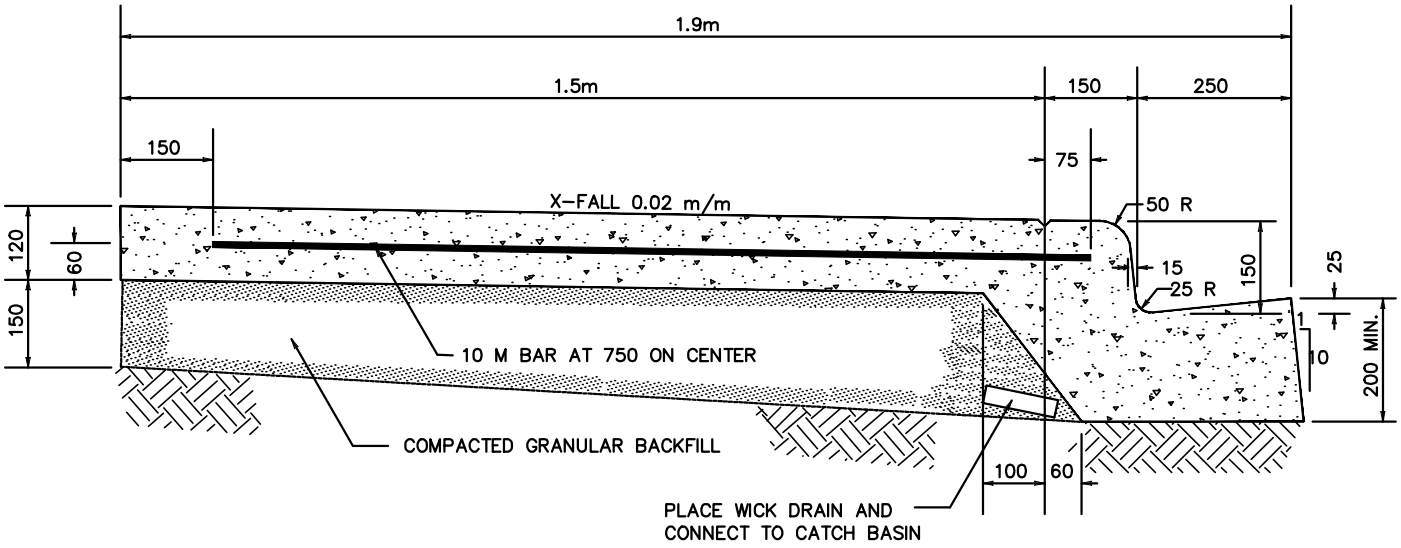
Rev.	wsp		ROLL FACE MONOLITHIC WALK & GUTTER	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–18
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES:

1. DEPTH OF GUTTER FACE TO MATCH ROAD STRUCTURE.

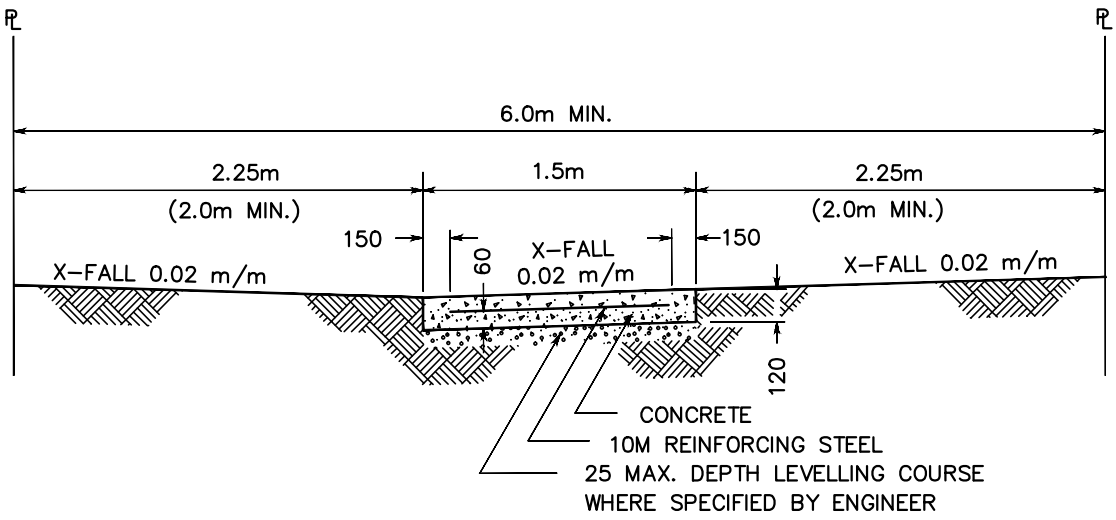
ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

LAC LA BICHE COUNTY

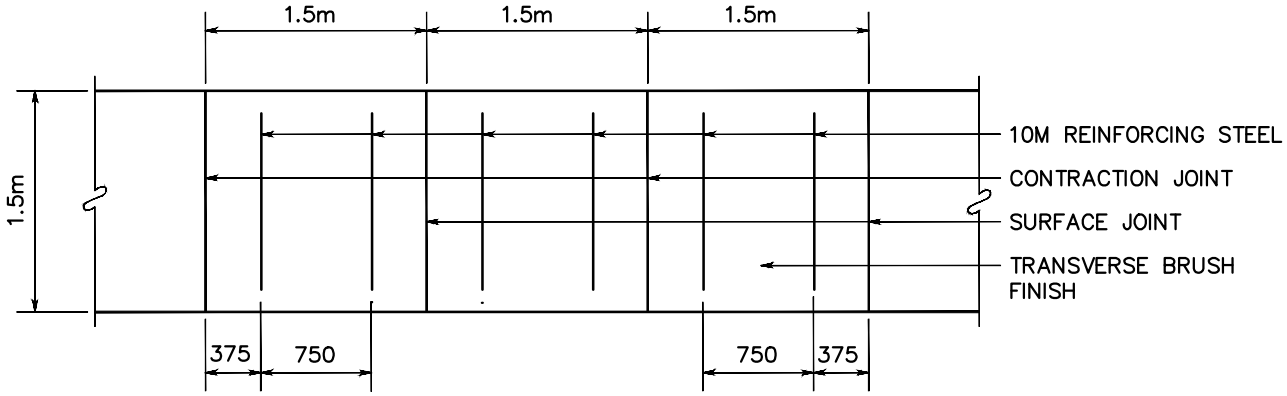
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		1.5m MONOLITHIC WALK WITH 150 CURB & GUTTER	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–19
Date: APRIL 2009	Drawn: TLB	Scale NTS		



TYPICAL SECTION



PLAN VIEW

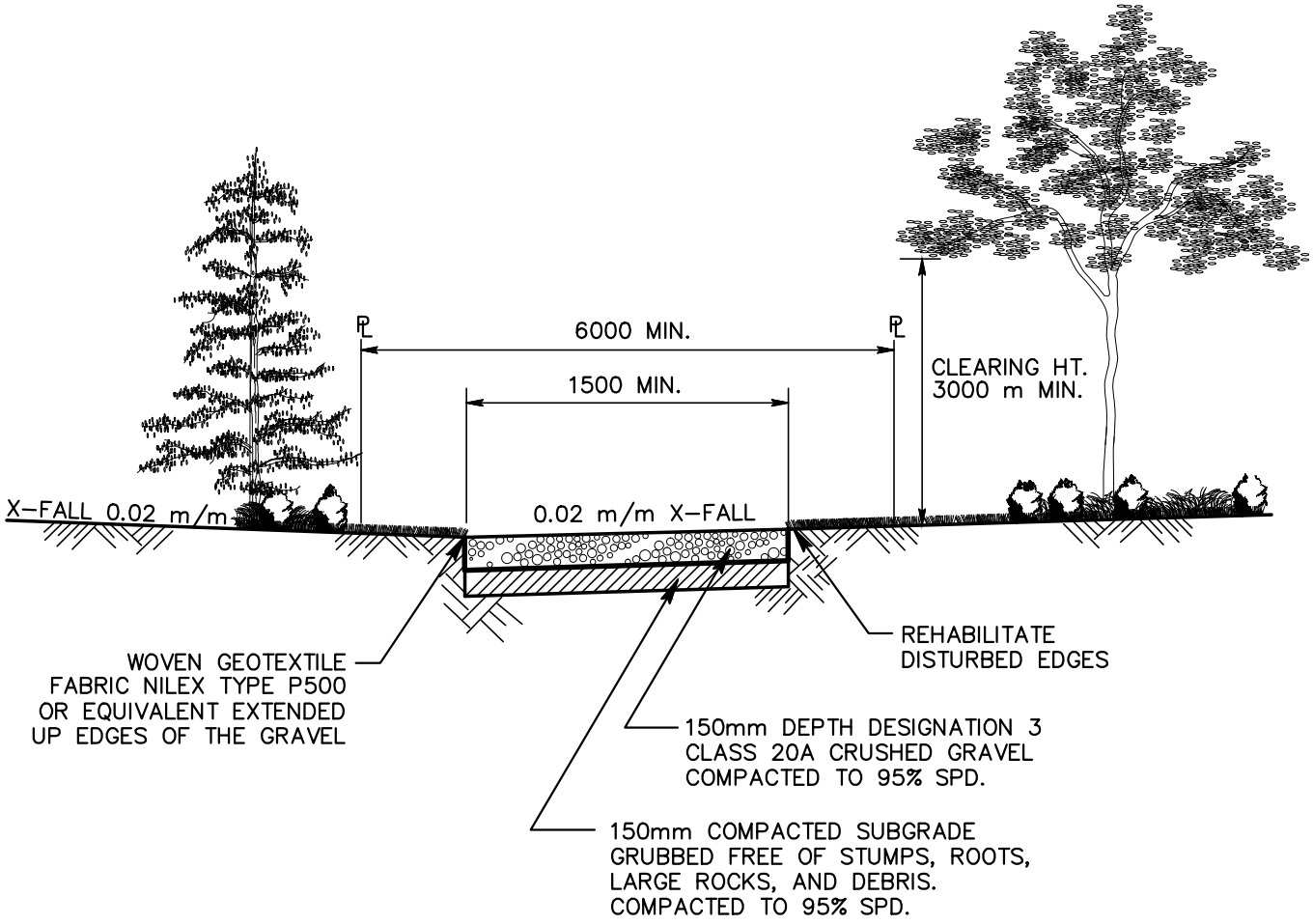
ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		CONCRETE WALKWAY	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–20
Date: APRIL 2009	Drawn: TLB	Scale NTS		



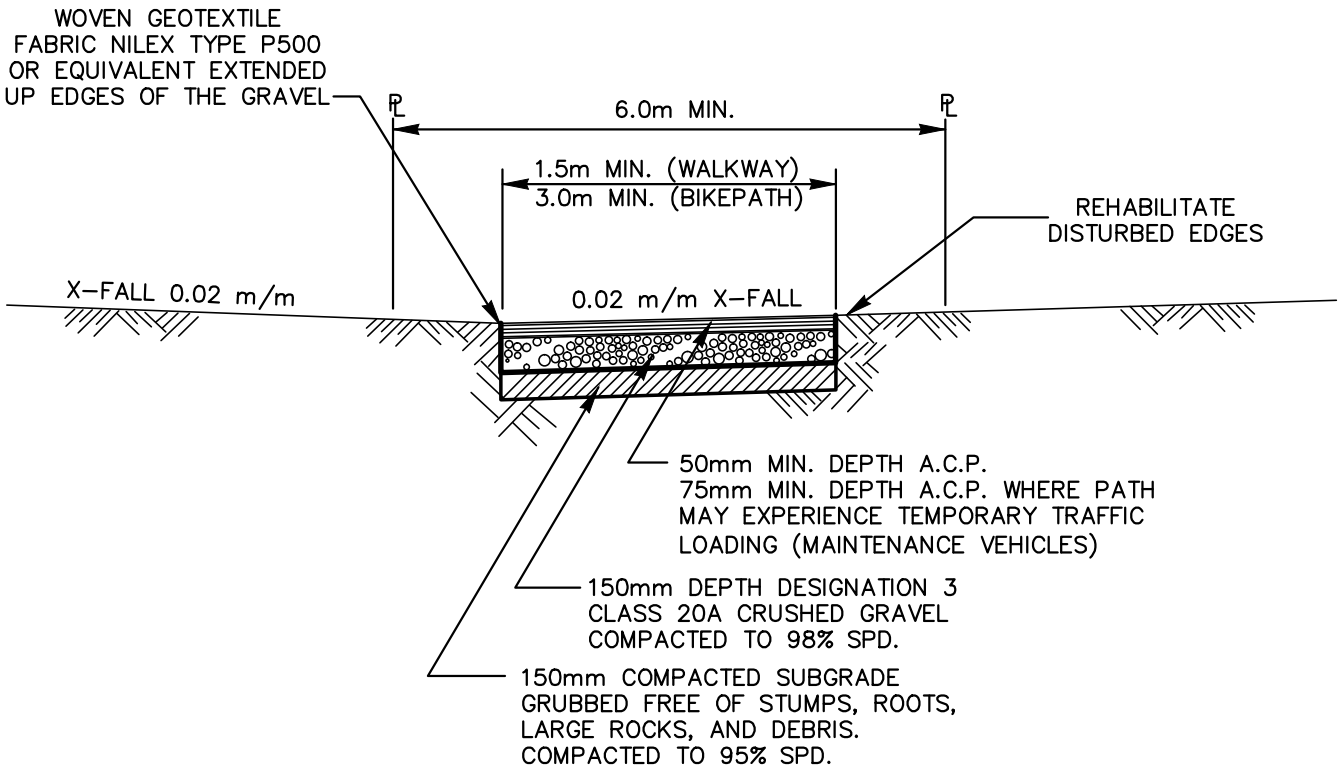
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		GRANULAR WALKWAY	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–21
Date: APRIL 2009	Drawn: TLB	Scale NTS		



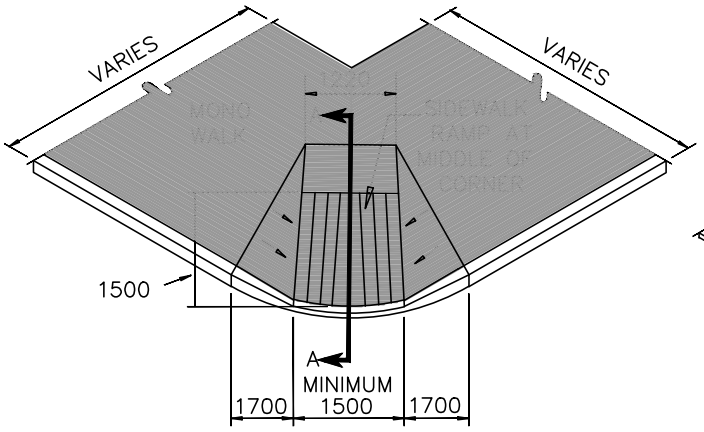
TYPICAL SECTION

LAC LA BICHE COUNTY

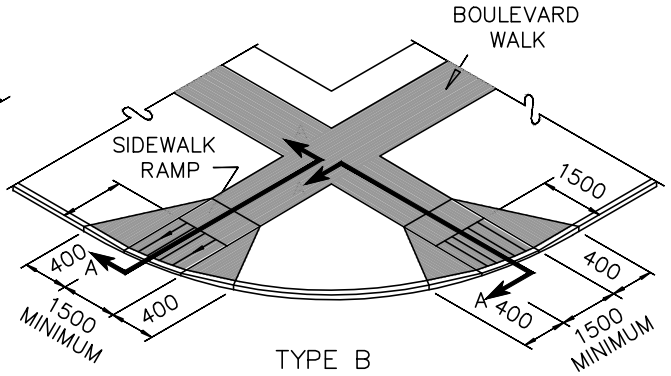
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		PAVED WALKWAY / BIKE PATH	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–22
Date: APRIL 2009	Drawn: TLB	Scale NTS		

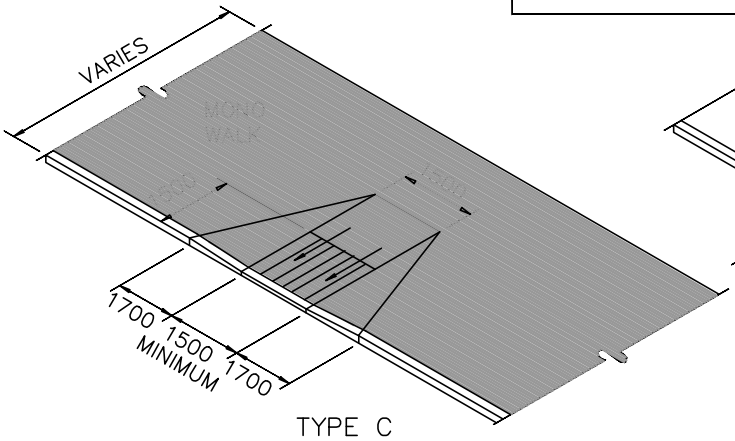


TYPE A

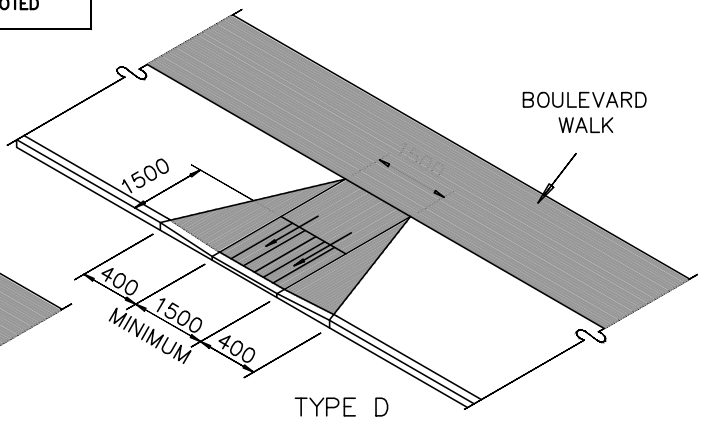


TYPE B

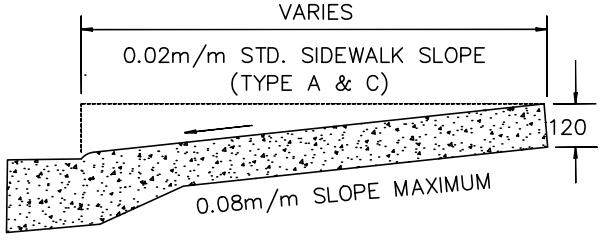
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED



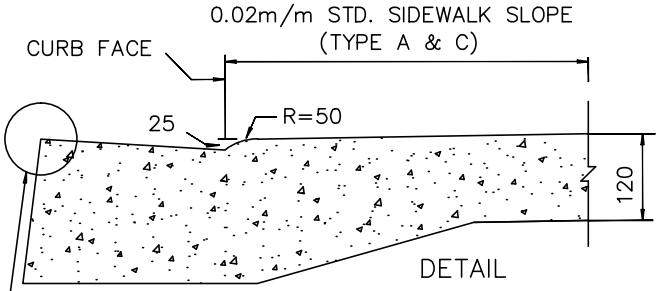
TYPE C



TYPE D



TYPICAL CROSS SECTION A–A



DETAIL

NOTES:

1. TOOLED GROOVES 5mm WIDE X 10mm DEEP, BROOM FINISH GROOVE SPACING 150mm o.c. ADJACENT TO CURB.
2. WHERE RAMP IS TO BE USED AS A TRANSITION, USE THE CENTER OF THE 1500mm RAMP AS THE CENTER OF THE TRANSITION.
3. CURBS AND RAMPS TO BE POURED MONOLITHICALLY.
4. IT MAY BE NECESSARY TO BUILD RAMPS WIDER AT HIGH VOLUME PEDESTRIAN TRAFFIC LOCATIONS.
5. WHEN THE CURB RETURN RADIUS IS LESS THAN 4.0m TWO RAMPS ARE REQUIRED.

a) MATCH ASPHALT SURFACE TO OUTER LIP WITHIN 3mm:
b) IF ASPHALT TOPLIFT IS DEFERRED, PLACE ASPHALT RAMP FOR THE WIDTH OF PARARAMP, AND EXTEND MINIMUM 1.0m INTO ROAD.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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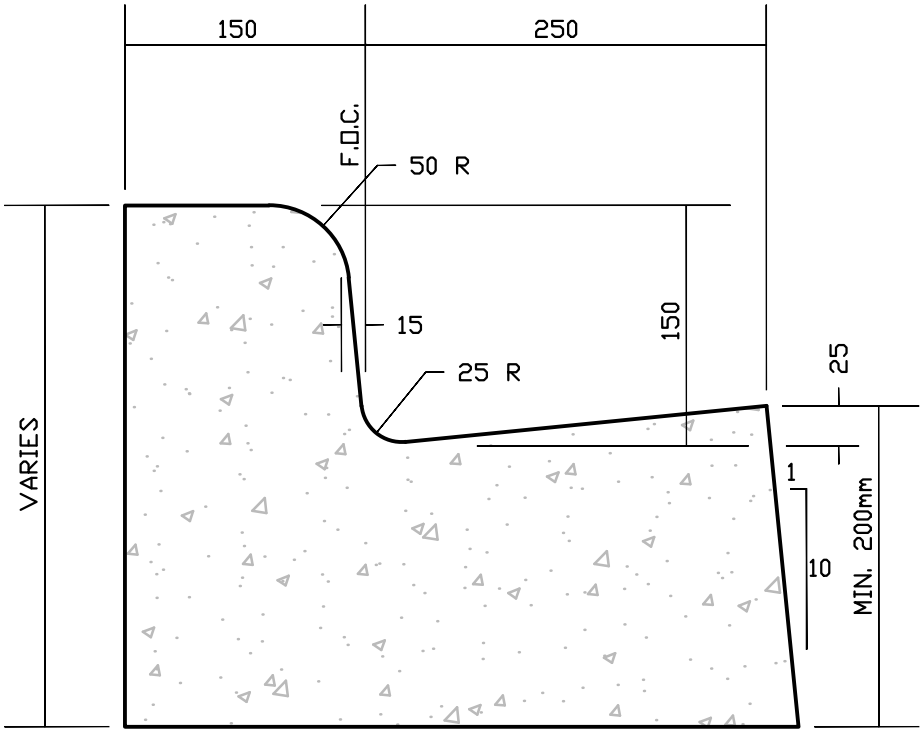
Rev.	wsp		WHEELCHAIR/BIKE RAMP	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–23
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

NOTES:

1. DEPTH OF GUTTER FACE TO MATCH DEPTH OF ROAD STRUCTURE.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
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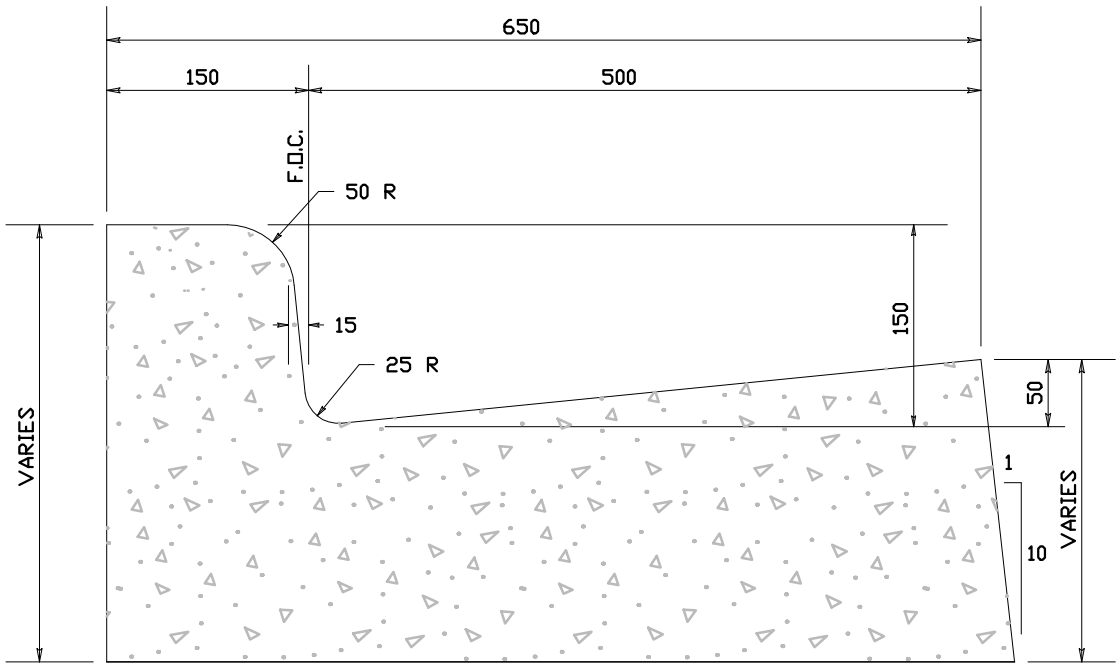
Rev.	wsp		150 CURB WITH 250 GUTTER	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–24
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES:
1. DEPTH OF GUTTER FACE TO MATCH DEPTH OF ROAD STRUCTURE.

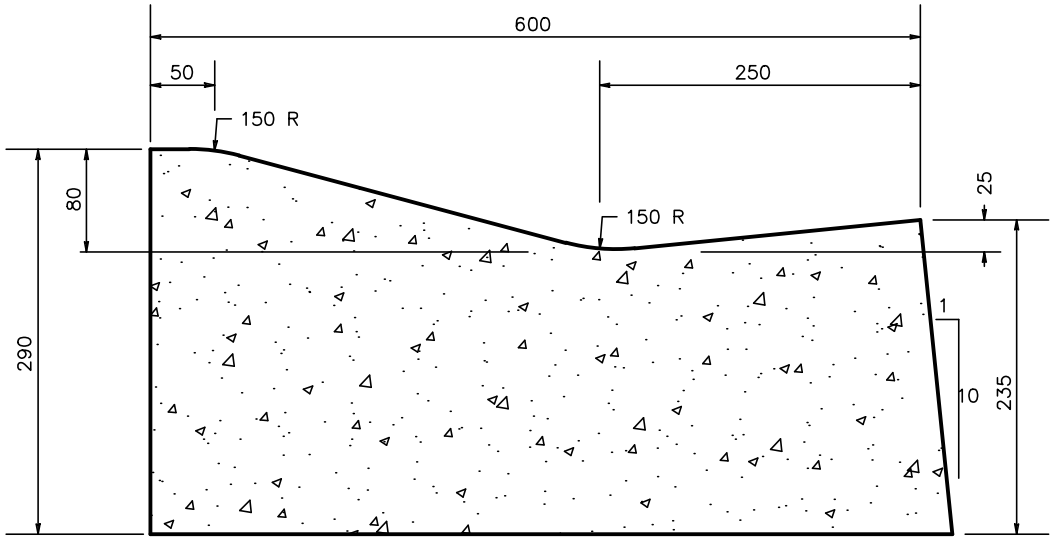
ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		150 CURB WITH 500 GUTTER	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–25
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTES:
1. DEPTH OF GUTTER FACE TO MATCH DEPTH OF ROAD STRUCTURE.

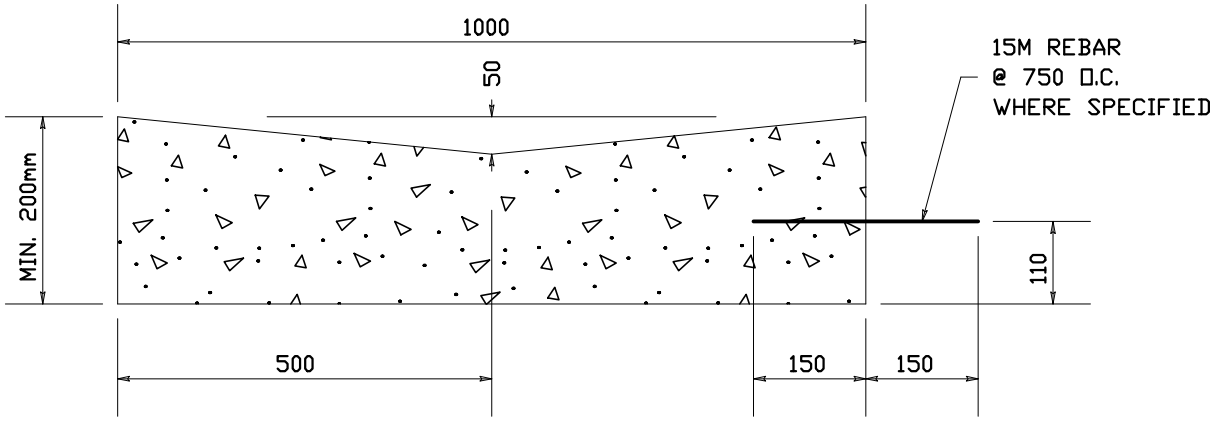
ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

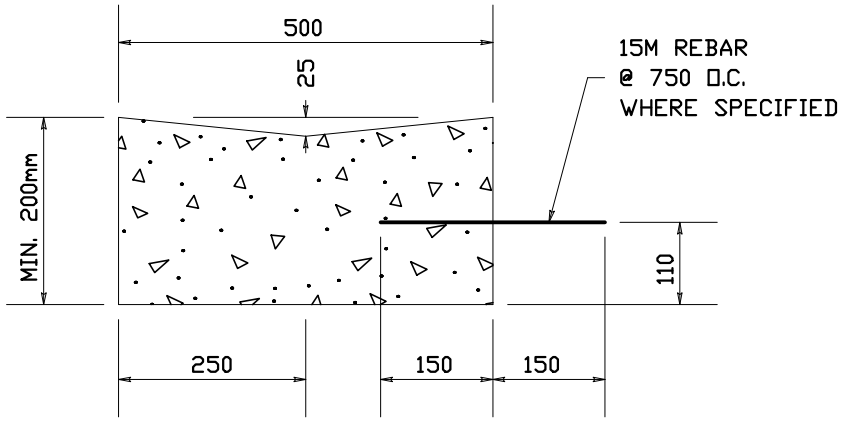
LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.			ROLL FACE CURB AND GUTTER	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–26
Date: APRIL 2009	Drawn: TLB	Scale NTS		





ALL DIMENSIONS
IN MILLIMETRES UNLESS
OTHERWISE NOTED

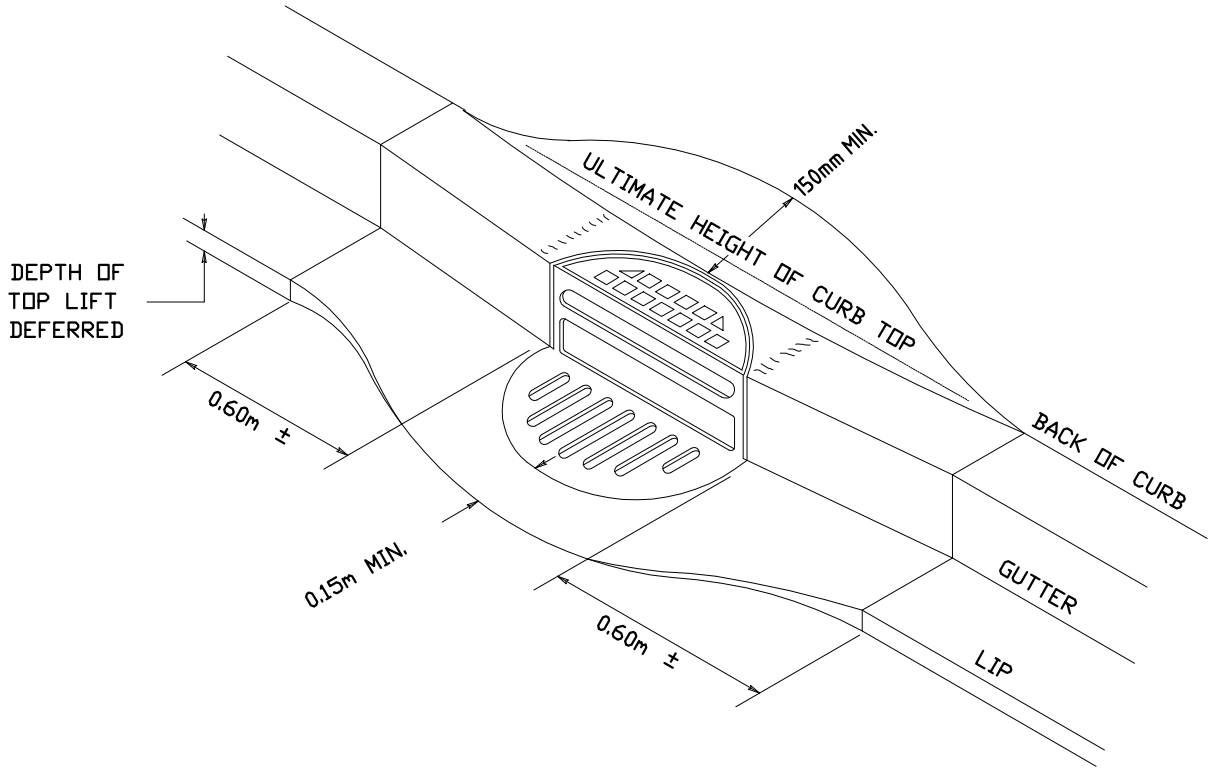
NOTES:
1. DEPTH OF GUTTER FACE TO MATCH ROAD STRUCTURE.

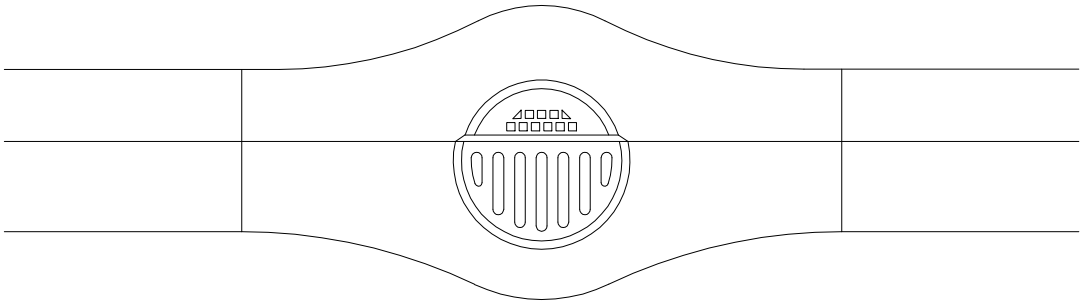
LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		500 & 1000 CONCRETE GUTTER (SWALE)	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–27
Date: APRIL 2009	Drawn: TLB	Scale NTS		





PLAN VIEW

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

NOTES:

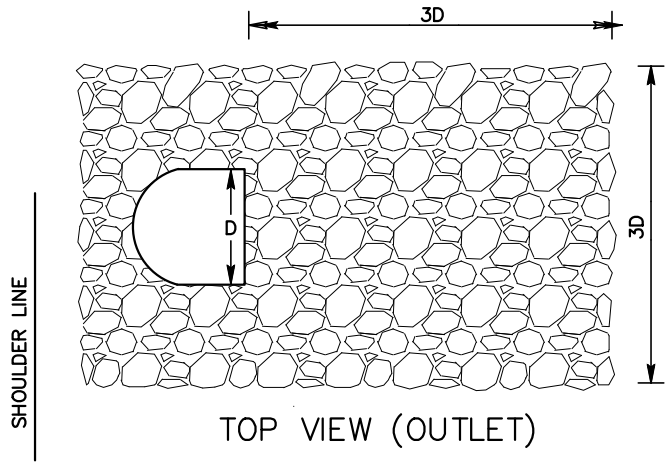
1. TYPICAL CURB & GUTTER TREATMENT AT CATCH BASIN WHEN ASPHALT TOP LIFT IS DEFERRED. LOCATION TO BE DETERMINED BY ENGINEER.

LAC LA BICHE COUNTY

General Municipal Servicing Standards

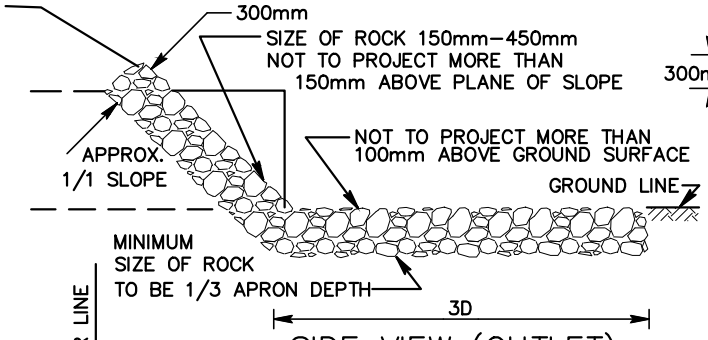
Lac La Biche County
welcoming by nature.

Rev.			DEPRESSED CURB & GUTTER FOR CATCH BASIN	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–28
Date: APRIL 2009	Drawn: TLB	Scale NTS		

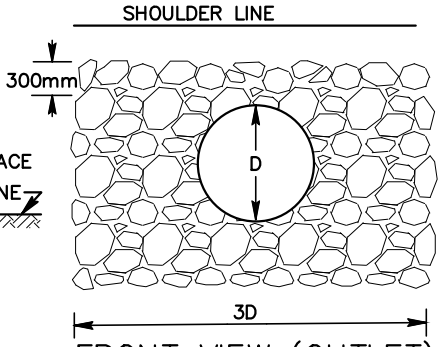


TOP VIEW (OUTLET)

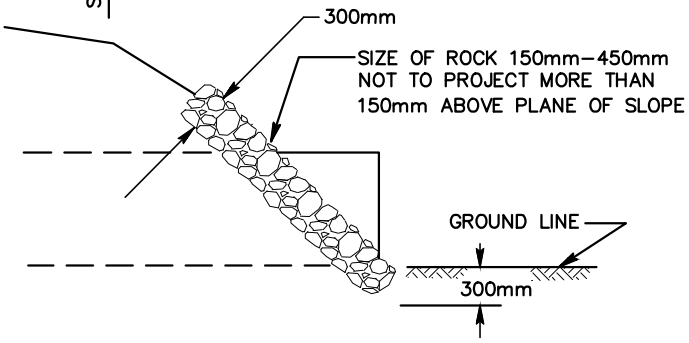
DIAMETER OF PIPE D	EQUIVALENT SIZE OF PIPE ARH
400mm	450mmX340mm
500mm	580mmX390mm
600mm	680mmX480mm
800mm	930mmX645mm
1000mm	1160mmX800mm
1200mm	1425mmX960mm
1400mm	1660mmX1090mm
1600mm	1870mmX1230mm
1800mm	2130mmX1400mm



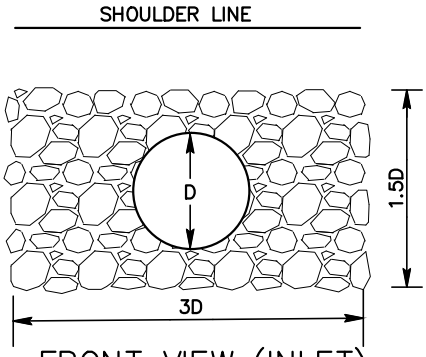
SIDE VIEW (OUTLET)



FRONT VIEW (OUTLET)



SIDE VIEW (INLET)



FRONT VIEW (INLET)

DIAMTER OF PIPE – D	300mm	500mm	600mm	800mm	100mm	1200mm	1400mm	1600mm	1700mm	1800mm
* QUANTITY	1	2	3	5	10	13	16	20	28	33
APRON DEPTH	300mm	500mm			600mm				750mm	

*TOTAL QUANTITY OF RIP–RAP IN CUBIC METRES

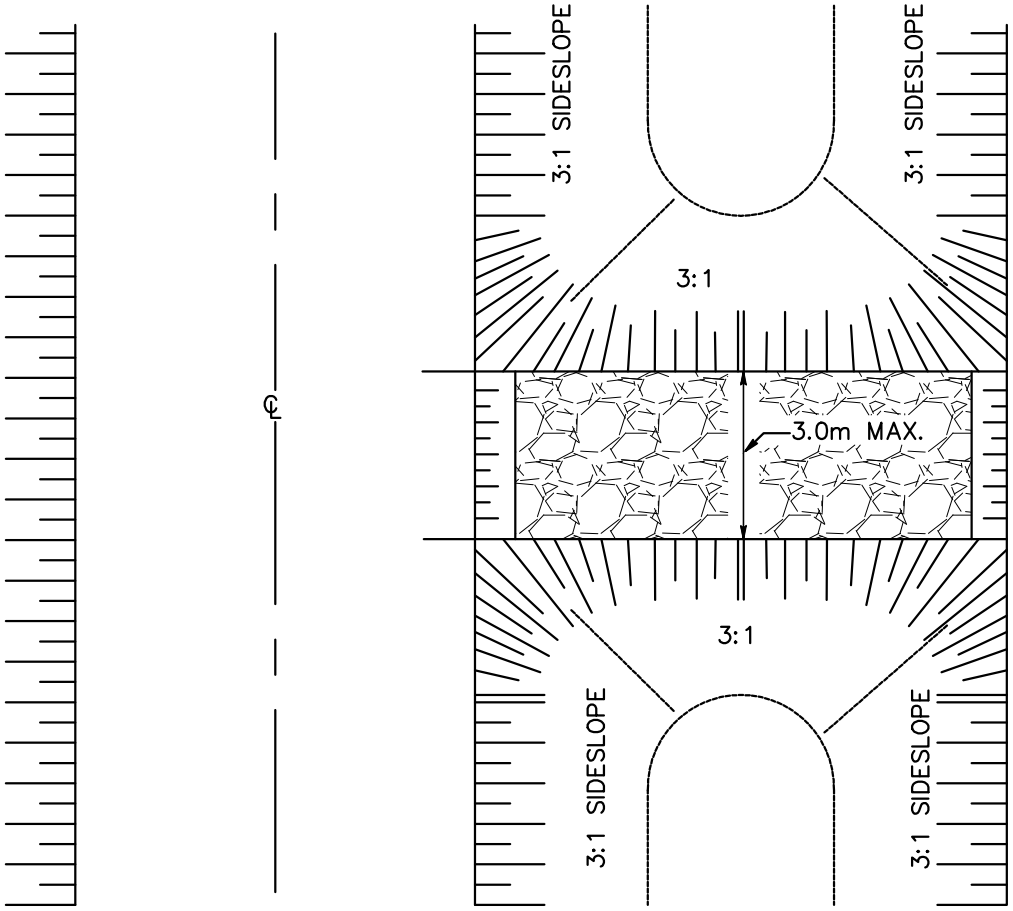
LAC LA BICHE COUNTY

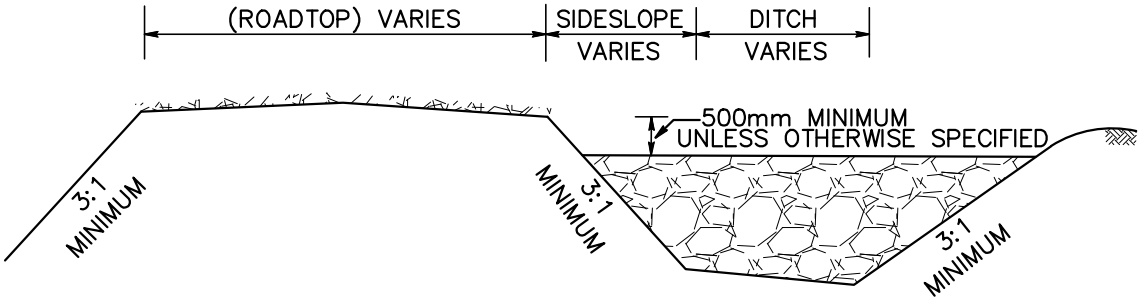
General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp	HAND PLACED RIP–RAP FOR PIPE CULVERTS	
Rev.			
Rev.			
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:
Date: APRIL 2009	Drawn: TLB	Scale NTS	Drawing G–29

PLAN VIEW





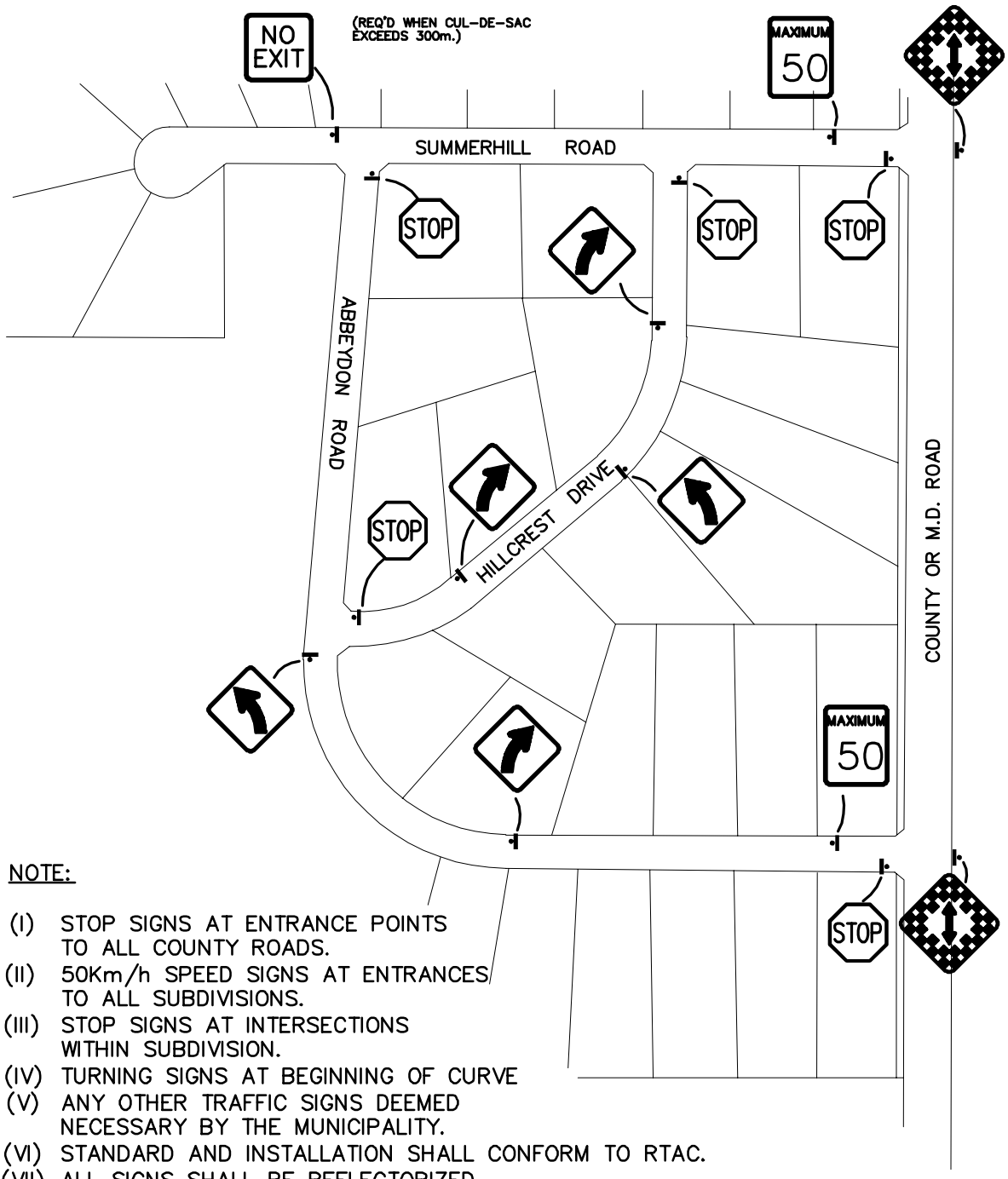
TYPICAL CROSS–SECTION

LAC LA BICHE COUNTY

General Municipal Servicing Standards

Lac La Biche County
welcoming by nature.

Rev.	wsp		TYPICAL VIEWS OF A DITCH BLOCK	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–30
Date: APRIL 2009	Drawn: TLB	Scale NTS		



NOTE:

(I) STOP SIGNS AT ENTRANCE POINTS TO ALL COUNTY ROADS.
(II) 50Km/h SPEED SIGNS AT ENTRANCES TO ALL SUBDIVISIONS.
(III) STOP SIGNS AT INTERSECTIONS WITHIN SUBDIVISION.
(IV) TURNING SIGNS AT BEGINNING OF CURVE
(V) ANY OTHER TRAFFIC SIGNS DEEMED NECESSARY BY THE MUNICIPALITY.
(VI) STANDARD AND INSTALLATION SHALL CONFORM TO RTAC.
(VII) ALL SIGNS SHALL BE REFLECTORIZED

LAC LA BICHE COUNTY

General Municipal Servicing Standards

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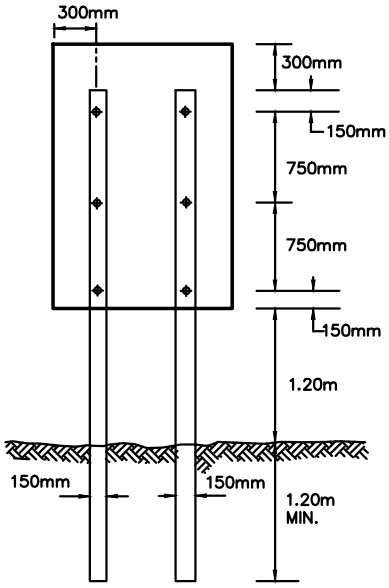
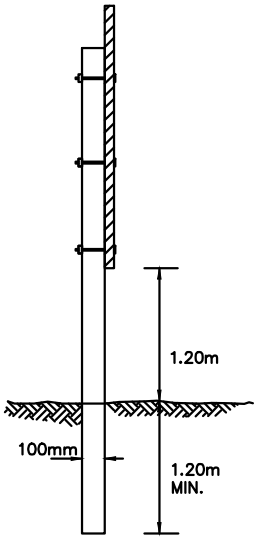
Rev.			TYPICAL TRAFFIC SIGN LAYOUT RURAL STANDARD	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–31
Date: APRIL 2009	Drawn: TLB	Scale NTS		

NOTES (MINIMUM REQUIREMENTS)

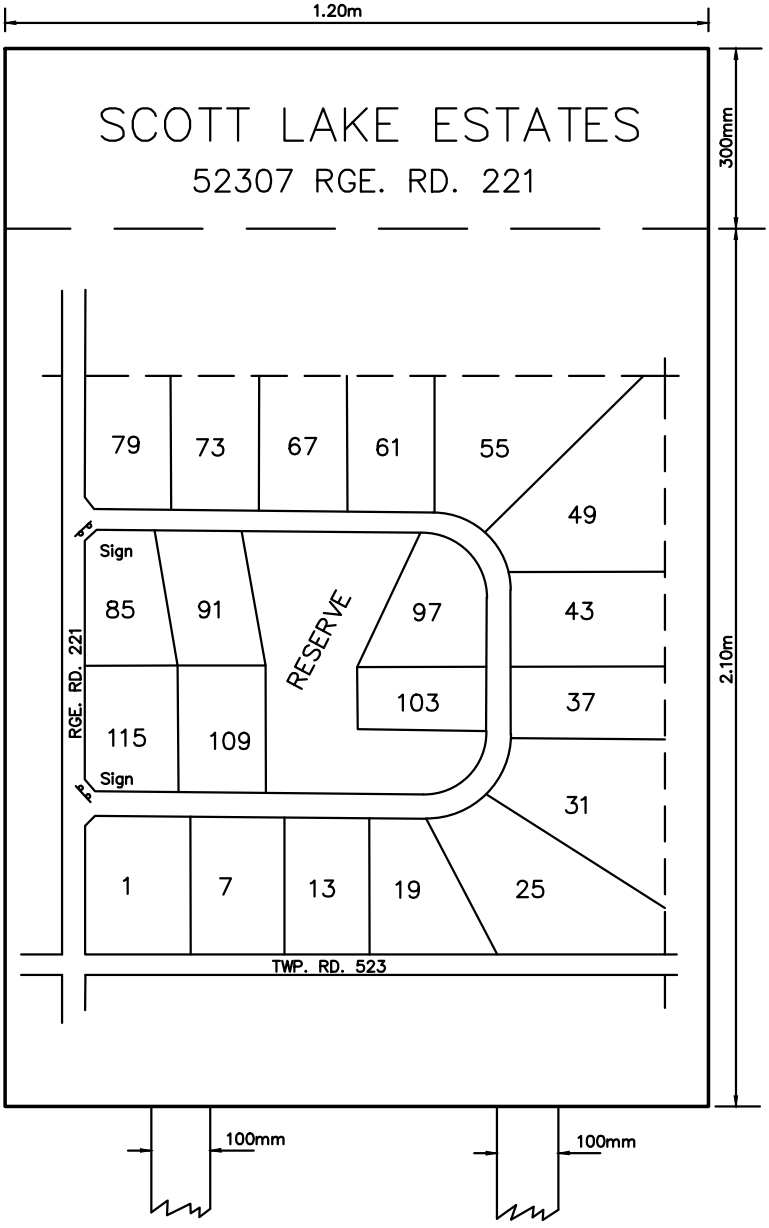
1. SIGN TO BE 1.20 m x 2.40m x 19mm FIR PLYWOOD.
2. SIGN POST TO BE 100mm x 150mm PRESSURE TREATED CEDAR–PAINTED WHITE.
3. POSTS TO BE A MINIMUM 1.20m IN GROUND.
4. 2 POSTS PER SIGN.
5. SIGN TO BE BOLTED TO EACH POST WITH 3 – 8" x 3/4" GALVANIZED BOLTS.
6. SIGN TO BE LOCATED AT EACH ENTRANCE AS SHOWN ON DRAWING.
7. LETTERS FOR NAME TO BE BLACK AND AS LARGE AS POSSIBLE.



BACK VIEW
N.T.S.



SIDE VIEW
N.T.S.



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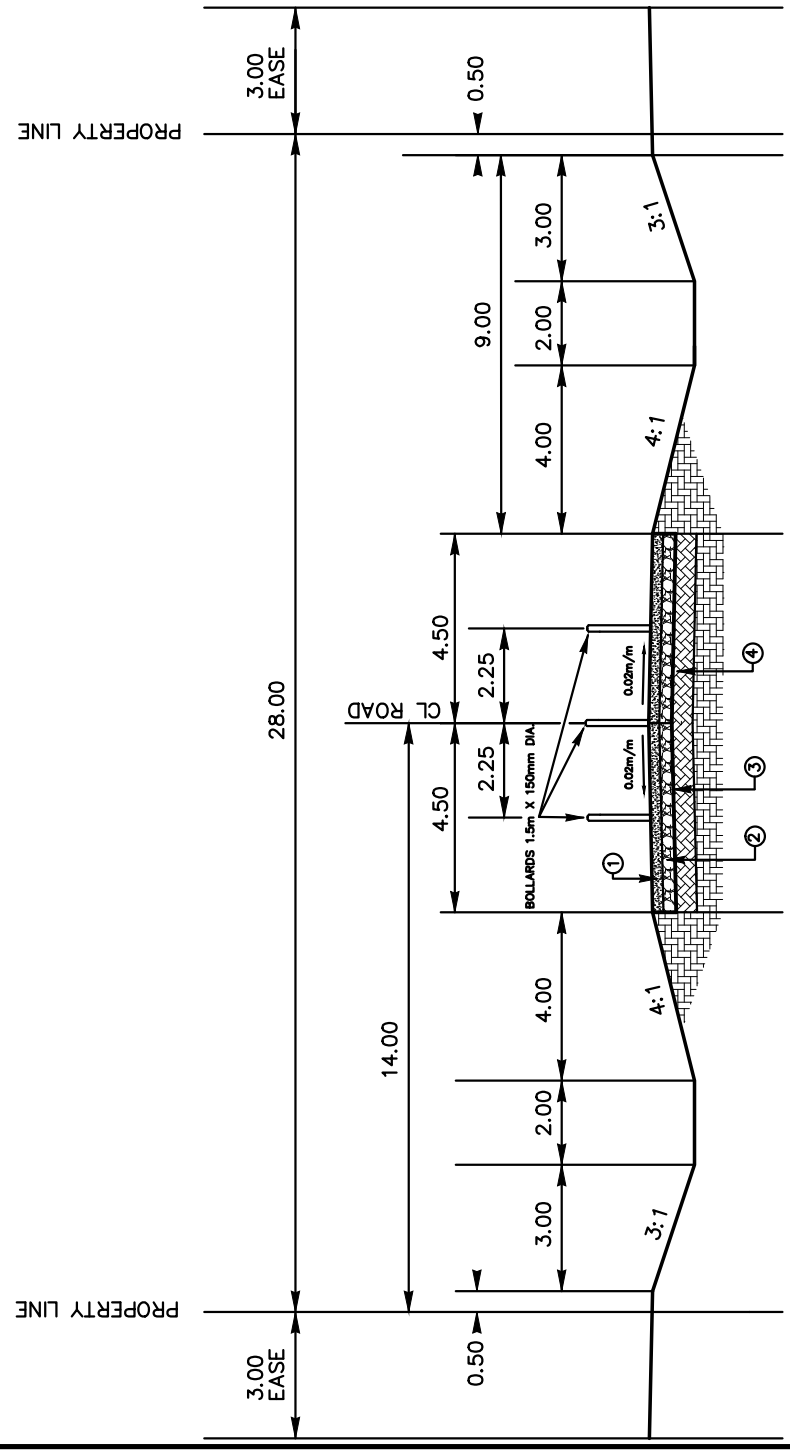
Rev.	wsp		SUBDIVISION SIGNS	
Rev.				
Rev.				
Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–32
Date: APRIL 2009	Drawn: TLB	Scale NTS		



ALL DIMENSIONS IN METRES
UNLESS OTHERWISE NOTED

NOTES

1. 50mm DEPTH COMPACTED GRAVEL/SHALE 10mm – 20mm DIAMETER
2. 75mm DEPTH 20mm DIAMETER CRUSHED GRAVEL BASE COMPACTED TO 98% S.P.D.
3. WOVEN FABRIC UNDER GRAVEL (TENSAR SS1 GEOGRID/NILEX 2006 AMOCO GEOTEXTILE OR APPROVED EQUIVALENT)
4. 150mm DEPTH SUBGRADE COMPACTED TO 98% S.P.D. ON:
   A) NATIVE SUBGRADE – FREE OF TOPSOIL, ROOTS AND/OR DEBRIS
   B) COMMON FILL – CLEAN CLAY OR GRANULAR MATERIAL PLACED OVER APPROVED SUBGRADE AND COMPACTED TO 98% S.P.D.

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Rev.	wsp		EMERGENCY LANE ACCESS DETAIL	
Rev.				
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Rev. JUNE 2018 – RV	File No.: ED55.39469	Design:	Approved:	Drawing G–33
Date: APRIL 2009	Drawn: TLB	Scale NTS		

SECTION H LANDSCAPING

H.1 GENERAL

.1 When landscaping or planning is a condition of the approval of a development permit, all such landscaping and planting must be carried out, to the satisfaction of the Development Authority, within one (1) year of the occupancy or the commencement of operation of the proposed development.

.2 The minimum standard for the development of parks or green spaces is defined in the latest version of the "Parks & Green Space Policy."

H.2 STREET NAMES

.1 The landscaping plan must include up to three alternative names for each street. Street naming approval will be completed by Lac La Biche County Council. Lac La Biche County reserves the right to select or reject proposed names.

.2 Section B.4 details the drawing submission requirements.

H.3 TOPSOIL AND SEEDING

.1 All ditches, boulevards and disturbed areas must be topsoiled, fertilized and seeded to grass or sodded.

.2 The topsoil must have a depth of at least 50mm and must be free of rock, roots, weeds and other deleterious material.

.3 The grass seed mixture must be No. 1 certified grass seed mixture with zero tolerance on noxious weeds. Certificate of seed analysis is required to be supplied to the County.

.1 Creeping Red Fescue is not permitted for use in the County.

.4 The fertilizer and seed must be applied at a rate of 112kg and 65 kg per hectare respectively.

.5 Areas showing deterioration, bare spots or thin areas within the warranty period must be re-seeded or re-sodded at the Developer's expense.

.6 The topsoil must be removed from areas requiring levelling, filling, excavation or grading before work commences. The topsoil must be stockpiled and replaced following the completion of the work.

.7 Alternative erosion control measures for road ditches with grades steeper than 5%, outfall ditches and stormwater management facilities must be proposed in order to protect the topsoil. Reinforcing mats may be required to control erosion until vegetation is established.

H.4 TREES AND SHRUBS

.1 No trees or shrubs will be permitted within any road right-of-way including boulevards unless a Homeowners Association is in place that will take responsibility for the maintenance and replacement thereof.

.2 Trees and shrubs located within or near a pipeline or power line right-of-way must conform to the type, spacing, and offset required by the company operating the utility. Landscaping must be in accordance with all relevant Federal and Provincial legislation or acts and any regulations established by the Energy and Utilities Board.

.3 Coniferous trees and shrubs will be considered on landscape berms. Number and spacing must be approved by the Development Authority.

.4 A landscape plan must be prepared showing the species, location and spacing of the proposed trees and/or shrubs and submitted to the County for approval prior to installation. The Developer may be required to demonstrate the necessity of the landscape features.

.5 The Developer must be responsible for the replacement of unsuccessful trees or shrubs within the warranty period specified in the Development Agreement.

.6 No trees or shrubs or other similar obstructions to visibility which are more than 1.0m above road grade must be permitted within 30m of the intersection of two roads as required in the Land Use Bylaw.

.7 All plant materials included in landscaping plans must be tolerant to the climatic conditions of Lac La Biche County.

.8 Existing trees and shrubs that are to be retained within the development must be protected to the furthest extent of the drip line. Final grading of the site is not to impact the root zone by more than 0.2m (0.7 ft)

.9 Tree species included on the landscaping plans must meet the following specifications:

.1 Tree species at maturity must have an average spread of crown greater than 3.0m (9.8ft).

.2 Deciduous trees must be at least 60mm (2.4 in) calliper at time of planting.

.3 Coniferous trees must have a minimum spread of 2.5m (8.2 ft) at time of planting.

.4 Coniferous shrubs must have a minimum spread of 0.5m (1.6 ft) at time of planting.

.5 Deciduous shrubs must have a minimum height of 0.5m (1.6 ft) at time of planting.

H.5 FENCING

.1 Wherever possible, fencing must be designed to match or complement existing fencing on adjacent properties.

.2 Fencing must be designed to be maintenance free for a minimum of 15 years.

.3 Fencing must be located entirely within private property, including foundations.

.4 A landscape plan must be prepared by the Developer and submitted to the County showing the fence design including alignment, elevations, materials, foundations, coatings and dimensions. The plans must include installation details.

.5 In addition to other fencing requirements, the Developer must install fencing along Public Utility Lots and reserve (municipal and environmental) zoned lands.

.6 Fencing must comply with all setback and height requirements specified in the Lac La Biche County Land Use Bylaw.

H.6 LANDSCAPE BERMS

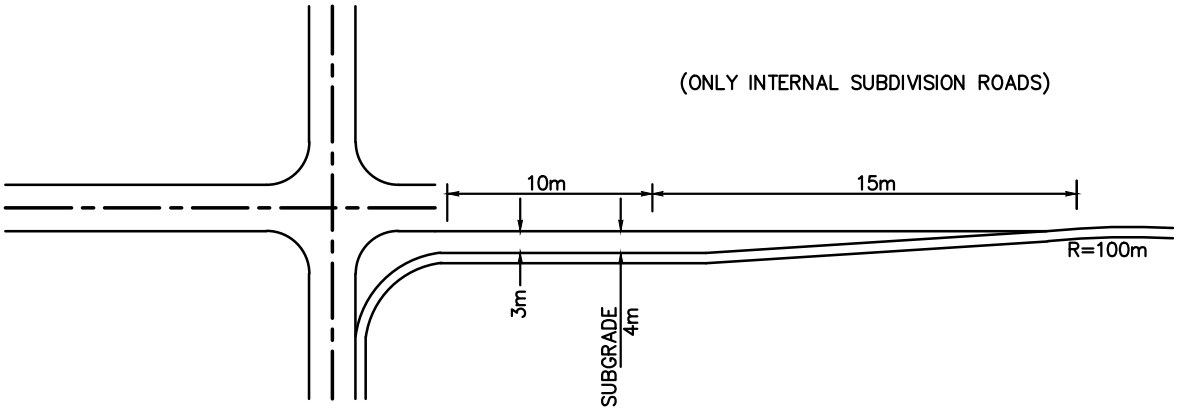
.1 A landscape plan must be prepared by the Developer showing the proposed berm design including alignment, elevation, dimensions and slopes. The plan must be approved by the County prior to construction.

.2 Berms required for noise attenuation purposes must be designed by a professional engineer or landscape architect. The Developer may be required to provide design information including projected traffic volumes and noise exposure.

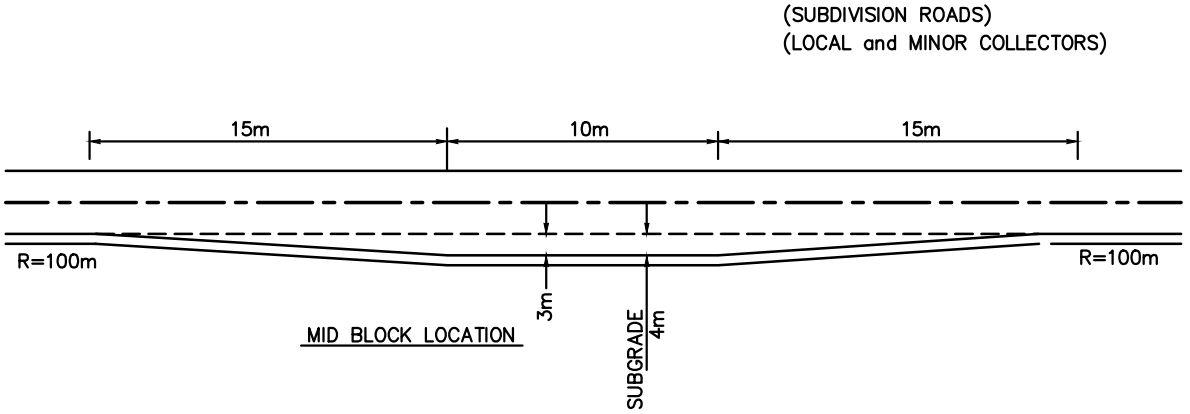
.3 Berm side slopes must not be steeper than 4H : 1V to facilitate maintenance.

.4 Berms must have a flat top not less than 1m wide.

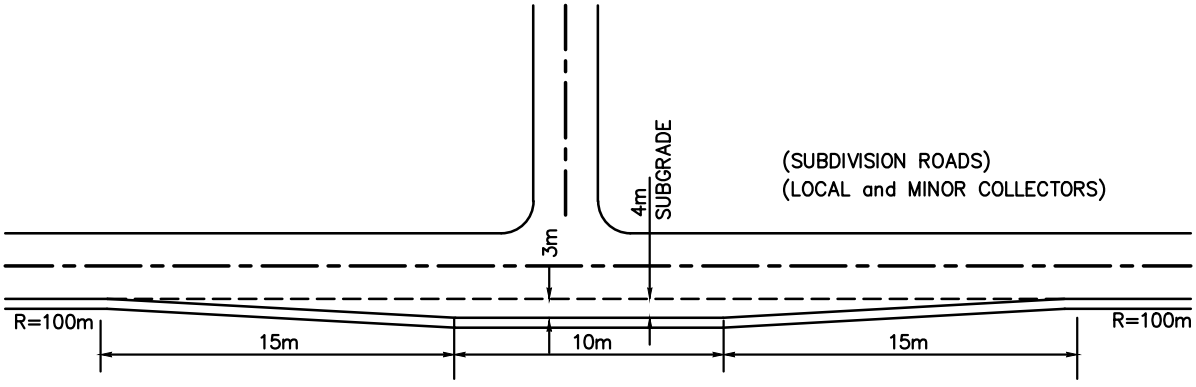
.5 All berms must be topsoiled and seeded according to Section H.1.



CORNER LOCATION



MID BLOCK LOCATION



TEE LOCATION

LAC LA BICHE COUNTY

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Rev.	wsp		TYPICAL MAILBOX PULLOUT LOCATIONS	
Rev.				
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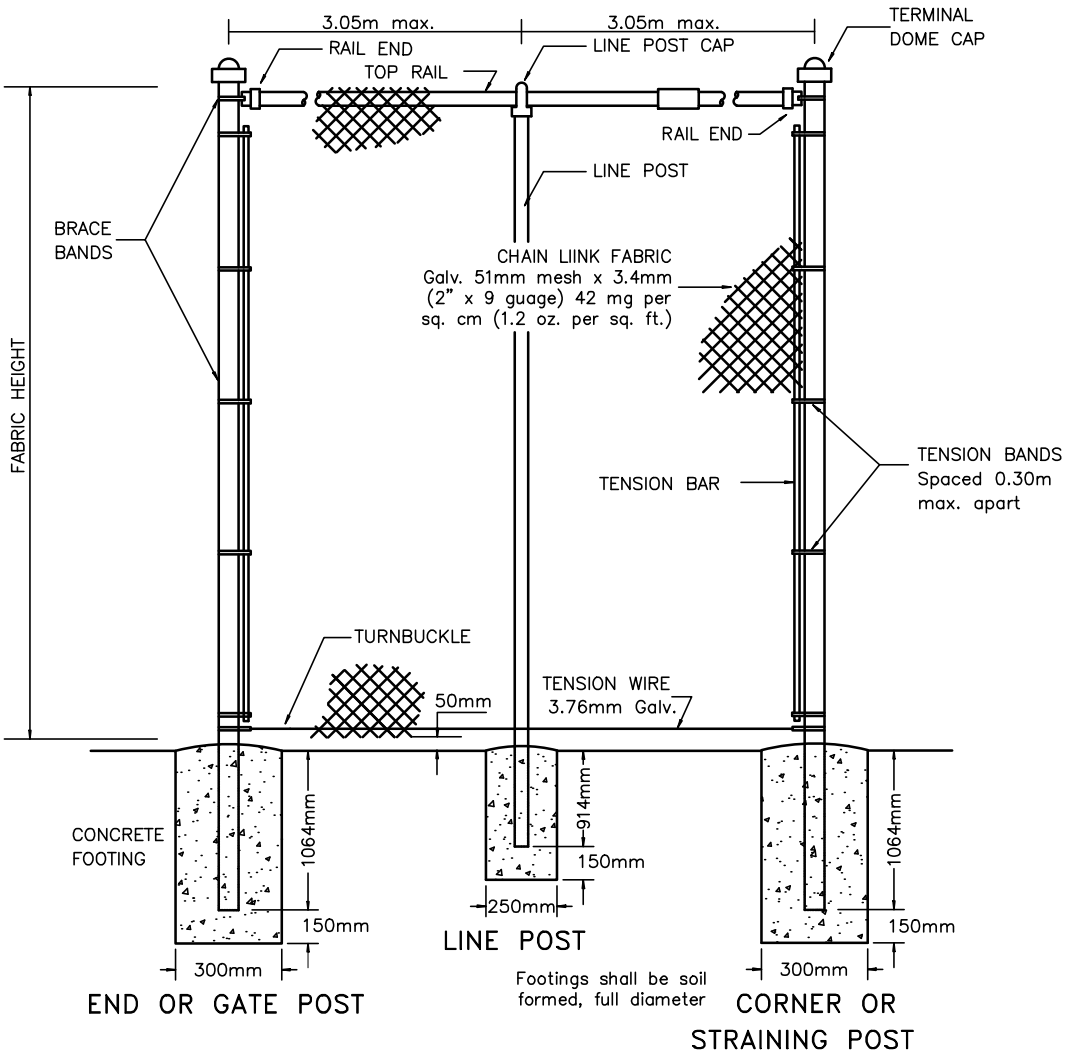

TOP RAIL: 33.4mm O.D. galvanized steel. Rails to be connected by slip–on sleeves.
LINE POSTS: 48.3mm O.D. galvanized steel. Spaced 3.05m max. apart. Straining posts shall occur at min. 152m.
GATE POST: 88.9mm O.D. galvanized steel for panels up to 3.05m (6.1m Double Swing Gate).
END OR CORNER POST: 88.9mm O.D. galvanized steel.
CONCRETE: 20 MPa (2900 P.S.I.) Strength in 28 days.
TIE WIRE: 3.55mm (9 guage) aluminum wire every 305mm for line posts, every 457mm for top rail.

NOTE: All pipes to be sufficient strength to support fabric weight and tension, and to support weight of gate.
All fittings to be designed and manufactured of materials having sufficient strength to perform the necessary function.

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Rev.			CHAIN LINK FENCE DETAIL	
Rev.				
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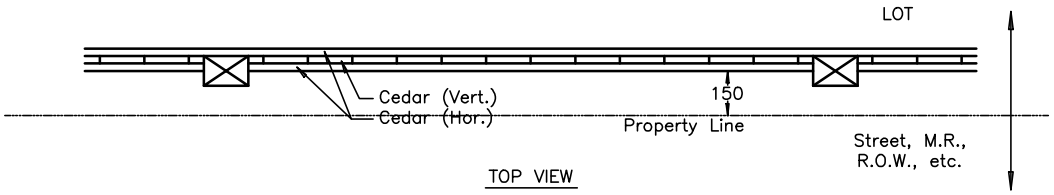
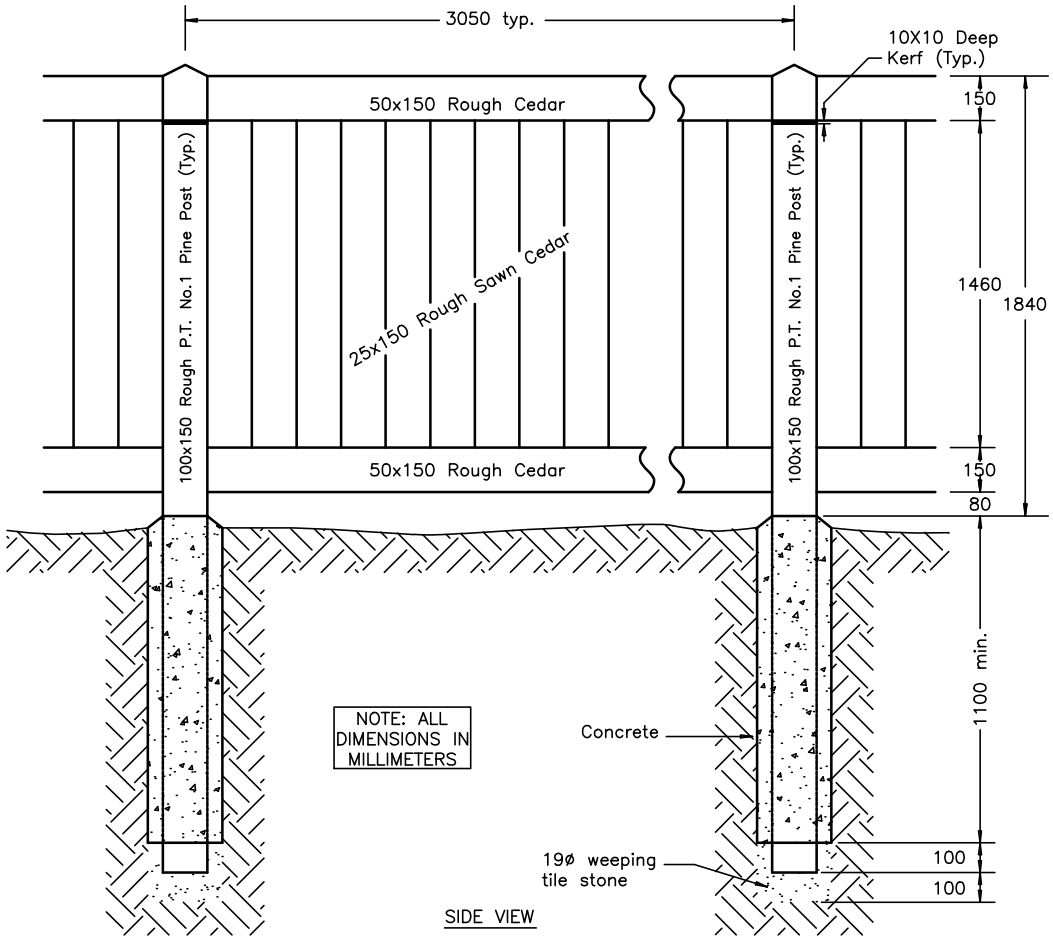
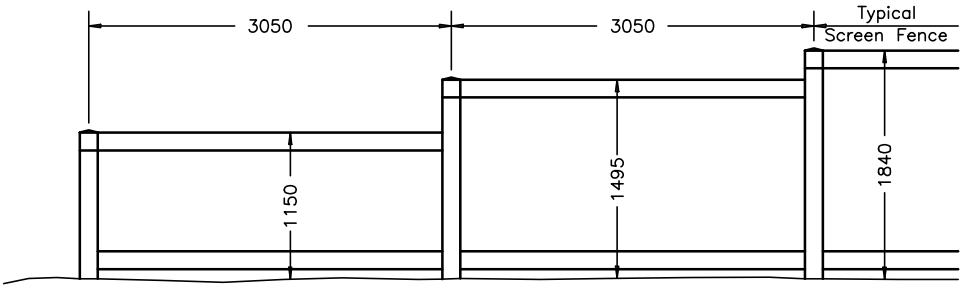


TOP VIEW



SIDE VIEW



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Rev.	wsp		WOOD SCREEN FENCE DETAIL	
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SECTION I STREET LIGHTING

I.1 STANDARDS AND GUIDELINES

.1 The street lighting design must be in accordance with the "Guide for the Design of Roadway Lighting" published by the Transportation Association of Canada (TAC) as well as applicable standards published by the Illuminating Engineering Society of North America (IES).

.2 Street lighting to be Dark Sky Friendly as defined by the International Dark-Sky Association.

.3 Street lighting for existing subdivisions, access roads and playgrounds must conform to Lac La Biche Policy No. PW-13.

.4 All roadway lighting systems must be installed in strict compliance with the Canadian Electrical Code.

.5 The Developer must be responsible for all arrangements with the owner of the local wire for necessary approvals and power connections.

I.2 ENGINEERING DRAWINGS & APPROVAL

.1 The Developer is responsible for the preparation and submission of design drawings prepared by a qualified professional engineer showing the layout, pole spacing, types and heights and luminaire wattages. The street lighting plan must include all surface features and utilities. The layout, products and materials are subject to approval by the County.

I.3 DESIGN AND OPERATIONS

.1 The Developer must be responsible for working with Fortis Alberta or the current supplier for the design, supply and installation of the street lighting system. The light standards chosen must be readily available from Fortis' regular inventory. The responsibility for energizing the street lighting system must be with the County. The operating cost of the Street lighting system must be the responsibility of the Developer until the Subdivision Area is seventy-five (75%) percent occupied. The Developer will pay these costs upon receipt of an invoice from the County. Upon the energizing of the streetlights, the Developer must provide Lac La Biche County with an irrevocable letter of credit as security for the ongoing maintenance and costs of energizing of the streetlights based on current rates. Lac La Biche County must release the letter of credit upon the expiration of 60 months from the date of energizing or if the Subdivision Area is seventy-five (75%) percent occupied, whichever occurs first.

I.4 SAFETY

.1 The lighting design must ensure the proper illumination of conflict areas such as intersections and crosswalks. The design must be prepared with public safety in mind.

I.5 ENERGY USAGE

.1 The street lighting design should be optimized to allow for the least possible energy consumption while still maintaining acceptable safety standards. Lac La Biche County encourages the use of the highest efficiency lamps available at the time of installation.

I.6 POLE LOCATIONS

.1 In some cases, the road and lot configuration will dictate the pole layout. Wherever possible, poles should be located at the projection of lot lines. Pole locations must not conflict with other utilities or approaches. The face of the posts must be 1 meter clear of the face curb or road shoulder. Spacing must be selected by the Developer and the County based on the optimum spacing/height/light distribution combination but must not exceed the minimum standards published by the TAC.

.2 Pole setbacks must be as outlined in the TAC guidelines. Where roadways are designated for widening within five years of pole installation, the pole setback must allow for side widening.

I.7 TYPE OF POLE

.1 Pole type, material and base to be approved by the County prior to purchase. A sample may be required for inspection.

.2 Breakaway poles must not be required for design speeds of less than 80km/hr. Yielding poles are recommended for all roadways with a design speed less than 80km/hr and a pole setback of less than 4m from the edge of the pavement.

.3 Steel poles must be galvanized and powder coated. Aluminum poles to be powder coated. Composite poles are to be pultrusion manufacture method.

.4 Pole types must be consistent with adjacent developments. All poles within a new development must be of the same type and height in order to obtain continuity.

.5 All poles must be resistant to all climatic and environmental conditions encountered within Lac La Biche County.

I.8 AESTHETICS

.1 The Developer must ensure that the street lighting design is compatible with the type of development and proposed buildings.

.2 The use of decorative poles must be subject to approval by the County. Proposed decorative poles and luminaires should share common optical systems and components as other decorative items found in existing developments within the County.

I.9 FOUNDATIONS

.1 Foundations must be designed based on the specific soil conditions on site. The foundations must be designed to withstand all loading, wind loading in particular.

I.10 LUMINAIRES

.1 Luminaires must be approved by the County prior to purchase. A sample may be required for inspection.

.2 All luminaires to be LED.

.3 All luminaires to be complete with IP66 Certified Sealsafe optical chamber.

.1 All luminaire optical systems to have a seal value R rating of greater than 600.

.2 All luminaires to be tool free type.

.3 All luminaires to be complete with a ¼ turn shutter system for lamp replacement.

I.11 COSTS

.1 Any capital contribution that the utility company may change for the installation of underground street lighting must be paid for by the Developer.

.2 The Town will pay monthly rental charges to the utility company providing street lighting, for the operation of street lights installed on streets, rights-of-way and parks after acceptance by the Town.

.3 The Town will accept street lights only after completion and acceptance of street, sidewalk and boulevard improvements.