MINIMUM DESIGN STANDARDS FOR DEVELOPMENT

Brazeau County

Revised January 2008

FOREWORD

This manual is intended to provide an information guide and to set standards governing design, preparation and submission of plans and specifications, and construction of municipal improvements within Brazeau County.

These standards were initially developed to address concerns regarding the fringe area around Drayton Valley and shall apply to all development within Brazeau County. Under no circumstances shall these standards supersede instructions of the Brazeau County Director of Public Works.

Plans and specifications involving the fringe area around Drayton Valley must also be submitted to the Town Engineer for review and recommendations.

This Manual may be purchased from Brazeau County. All requests for a copy of the manual should be directed to the Public Works department. Please allow up to seven days for copies to be generated and bound.

All users of this manual should be aware that development within Brazeau County is governed by the current issue of the Land use Bylaw which describes the administrative process to obtain Development Permits, agreements, Land Use Restricting, and Subdivisions.

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1.1.0 Definitions

Within these design standards, unless the context otherwise requires, the following words shall have the meaning hereinafter assigned to them.

.1 "Applicant" shall mean a person or entity who has applied for approval of a proposed subdivision of land or any other development within Brazeau County, whether as the owner or an agent for the owner of the land included therein.

.2 "The County" shall mean Brazeau County or any person or persons authorized by Brazeau County Director of Public Works and / or by the Brazeau County Manager to give approval to, accept, or inspect any portion of the applicant's submissions or work.

.3 "Municipal Engineer" shall mean the Brazeau County Director of Public Works or other persons authorized by the Director of Public Works or the County Manager to perform such duties.

.4 "Consulting Engineer" shall mean the Professional Engineering firm retained by the applicant to be responsible for the Design, Layout, Quality assurance, Submission of design and as-built drawings to the County, and insuring that all regulated requirements are satisfied by the development. The Consulting Engineer must be licensed to practice in the Province of Alberta.

.5 "Contractor" shall mean any person, persons, or corporation that undertakes the installation of Municipal Services.

.6 "Developer" shall mean the person or entity that has entered into a Development agreement with the County or any person or corporation that may undertake any work involving Municipal infrastructure or Services.

.7 "Developers Responsibilities" shall mean any specification or statement referring to the acts to be performed by the Developer. Retaining the services of others to perform work shall not absolve the Developer of any responsibilities under performance of these specifications or directions as issued by the County.

.8 "Municipal Improvement" is any alteration done to a Municipal service or facility to add to, alter, dismantle, or remove such service or facility.

1.2.0 GENERAL

1.2.1. Development Brief:

Development of new areas requires a subdivision of land in accordance with procedures and requirements set out in the Planning Act, General Municipal Plan, Land Use Bylaw, and Minimum Design Standards for Development. The County is to be kept informed regarding the proposed Development. To this end a Development brief submitted to the County Director of Planning and Development will insure that comments regarding expectations and process can be made early and surprises may be averted.

1.2.2. Developer's Engineer:

The Developer shall engage a Professional Engineer or Engineering firm to undertake all phases of Engineering, including but not limited to, conceptual design, detail design, general engineering, construction inspection, coordinating testing services, preparation of record drawings, and the submission of test results and drawings to the County. The Engineer shall conduct himself in a professional manner while meeting or exceeding all of the minimum standards required by all governing bodies which may involved with the project. Should the Engineer, in the course of his work, discover any discrepancies, omissions, typographical errors, or entries which may be no longer valid or legal in these standards, he shall report these to the County Director of Public Works.

1.2.3. Development Proposal:

Prior to any development taking place, the Developer shall submit a development proposal to the County. The proposal should include all pertinent information as to standards of construction, anticipated types of construction, requirements for water sewer and road capacity, and utility right of ways and easements relating to the project.

The Development proposal shall include drawings, at a scale of 1:1000, of the proposed development outlining the concepts of, lots, blocks, utilities, and street patterns. The following information should be included on one or more of the drawings:

1) Preliminary subdivision plan.
2) Lot grading plan.
3) Contours of existing land surface relative to geodetic elevation datum.
4) Location and size of Watermains.
5) Location and size of Sanitary Sewermains, lift stations, manhole, etc.
6) Location and size of Storm water management facilities.
7) Road widths (Curb face to curb face if applicable).
8) Impact of servicing requirements on existing facilities.
9) Franchise utility plans showing locations and easements.
10) Any other information the Developer considers pertinent to aid the County in assessing and considering the development proposal.

1.2.4 Overall Layout

.1 Overall Design

The overall design shall conform to The Master Water, Sewer, Drainage Plans, and Transportation concepts of the County and the Town of Drayton Valley where applicable, as well as the General Municipal Plan and Land Use Bylaw.

.2 Overall Development of the County

The proposed development shall be laid out and designed having regard for the overall development of the County and possible future expansion of abutting areas. Connections of proposed local improvements into existing infrastructure shall not create overloading. Should overloading occur the Developer may be required to upgrade, replace, or twin infrastructure outside of the development area or contribute to such upgrades.

The inclusion of oversize services to provide sufficient capacity for future developments shall be carried out at the expense of the Developer or as specified in the Development Agreement.

.3 Layout Concepts

The Concepts of layout such as lot size, widths of right of ways, park reserves, density, and zoning should be approved in principal by the County prior to submission of detailed plans, in order that any necessary or desirable revisions can be incorporated without requiring major changes.

.4 Curves on Roads

Roadway designs which incorporate curves should have right of way boundaries with the same curve radius as the road. Cut-corners at intersections should be cut back far enough to allow for road flaring as well as municipal services and utility installation.

.5 Right of Ways and Easements

Rights of Way and/or Easements shall be provided for all municipal infrastructure not located on streets, lanes, or utility lots, including franchise utilities, and back of lot drainage courses.

1.2.4. Municipal Services

.1 Servicing Regulations

The type and extent of servicing shall be in accordance with the Development Agreement and the “Approved” plans, specification and regulations for each municipal improvement.

.2 Service Connections

Water, Sanitary sewer and Storm sewer services shall be installed to the property line unless the lot has a front gas easement, in which case the services shall extend to the back of the gas easement. All curb stops shall be placed on public property 0.3 to 0.5 metres from the property line.

.3 Canada Post Mailboxes

The Location of Canada Post’s mailboxes shall be co-ordinated with Canada Post. The design of postal box locations must be as per Drawing Nos. 8.0 and 8.1 and must be approved by the County prior to their installation.

1.2.5. Existing Improvements

.1 Connections to Existing Facilities

The Developer shall file a request for connection of existing facilities with the County, and the Town of Drayton Valley if applicable, at least 48 hours prior to starting work on the connection. In the event that existing services are to be suspended for a period, the Developer must notify all affected customers. Should the suspension of services last a significant length of time, the Developer may be required to provide temporary services. The Developer must have all the material, equipment, and labour on hand to complete the connection in the shortest possible time.

.2 Disruption of Existing Services

Any of the services, installed by the Developer, shall be installed in a manner that minimizes interference with existing services. No disruption of services is preferred. Any additional cost incurred by the County or the Town due to service installation shall be the sole responsibility of the Developer.

.3 Temporary Road Closure

In the event that a road must be fully or partially closed during the course of development, the Developer must provide all detours, signs, lights, flagmen, barricades, etc. required for the safe and orderly passage of traffic. The County must be notified at least 48 hours prior to any closure.

The developer must enter into a road use agreement with the County before any detour routes may be used.

.4 Road Crossings

Any existing facilities disrupted during construction shall be returned, as a minimum requirement, to original condition. The Developer shall warrantee all excavated crossings of roadways or lanes, against settlement for a minimum of two years and within that period must repair the settled areas within 48 hours of being requested to do so by the County.

.5 Standards

The Standards outlined herein are intended to be the minimum standards for development within the County. Under no circumstances shall theses standards be used as a substitute for good engineering practices. Where sound engineering practice requires a higher standard, the higher standard shall prevail. It shall be the Developers responsibility to develop in accordance with standards, acceptable to the County, and which incorporate good engineering and construction methods and practices. If a relevant governing body or approval agency requires a standard exceeding the County's minimum standard, the higher standard shall prevail. Generally, no departure from these standards shall be permitted without written approval from the County Director of Public Works. (see section 1.3.2.3).

.6 Materials

All materials used for development must be tested to confirm compliance with the most recent standard of either, CSA, AWWA, ASTM, or ULC.

1.3.0 General Conditions

1.3.1 Scope

.1 These design standards shall apply to the design and installation of municipal services within Brazeau County.

.2 The Standard Drawings as referred to in various sections shall form an integral part of these design standards.

1.3.2 Design Standards

.1 The following design standards shall apply to all or any services:

Section 1: General Conditions and Procedures
Section 2: Preparation of Engineering Drawings
Section 3: Water Distribution System
Section 4: Sanitary Sewage System
Section 5: Storm Drainage System
Section 6: Sewer and Water Service Connections
Section 7: Roads and Streets
Section 8: Lot Grading and landscaping
Section 9: Franchise Utilities
Section 10: Manufactured Home Subdivisions
Section 11: Recreation Vehicle Park
Section 12: Low Pressure Sewer Systems
Section 13: Design of Safe Accessible Pedestrian Environments.

.2 All Services shall be designed and installed as detailed in the above mentioned design standards and according to procedure as set out in this section.

.3 No departure from these design standards shall be permitted except with written approval of the County Director of Public Works. The Director of Public Works may give verbal approval to changes that he considers to be of minor significance. The Developer shall issue a change order to the County for approval of such changes before they are constructed.

1.4.0 Procedure

1.4.1 Engineering Design

.1 The Applicant and/or Developer must retain the services of a Consulting Engineering Firm who shall be responsible for the design, preparation of drawings and specifications, quality assurance, and providing record drawings, for all services as required by the County and in accordance with the County's Minimum Design Standards for Development.

.2 The Design Drawings must show all existing and proposed services. It shall be the Consulting Engineer's responsibility to coordinate works with the utility companies.

.3 The Consulting Engineer must provide the County with detailed calculations for ULC compliant fire and domestic water flow, Sanitary Sewage flow, Storm Water flow and Storage Requirements, and roadway design information including road classification and design speed. This information shall be part of or attached to the design drawings and must be included with the record drawings.

1.4.2 Submission of Engineering Drawings

.1 Upon completion of the Design Drawings, the Consulting Engineer shall submit to the County, together with or included in two sets of plans and specifications for the proposed project, the following:

a) Calculations of sewer pipe capacity, flow velocity, expected usage and reserve capacity.

b) Calculations of Storm water run off and storage requirements.

c) Calculations of Water main capacity, usage, fire flows, flow velocity, reserve capacity and distribution analysis as specified in Section 3.

d) A print of a registerable survey plan of the development. (If not already provided by the Applicant).

.2 All proposed streets shall be named on the drawings. Street names must first be approved by the County.

.3 The Consulting Engineer shall bring to the attention of the Applicant and the County, the need for any rights-of way outside of the development that the applicant may have to acquire.

.4 The Consulting Engineer shall bring to the attention of applicant and the County the need for any resource pipeline Crossing Agreements which the applicant may have to acquire.

1.4.3 Preliminary Design Review

.1 All design drawings, specifications and relevant data shall be reviewed by the County for a minimum of seven days. Any revision requested by the County shall be incorporated into subsequent drawings and specifications.

1.4.4 Final Design Review

.1 Upon Completion of all revisions, the Consulting Engineer shall submit four sets of Contract Drawings to the County for review. The County's review of the Contract Drawings is only for general compliance with the County's Development Standards as detailed in this document. Review certification does not, in any manner, imply approval of the technical aspects of the design.

.2 Upon Completion of the design review the County Director of Public Works shall certify the drawings and return one set to the Consulting Engineer.

.3 No work shall proceed on any development until the County has certified the Contract Drawings and Specifications and the Development Agreement has been executed.

1.4.5 Right of Way Documents

.1 Where easement or right-of way documents are deemed necessary, they shall be prepared and registered at Land Titles by a registered Land Surveyor at the Applicant's expense.

1.4.6 Oil and Gas Pipeline Crossing Agreements

.1 Where oil and gas crossing agreements are deemed necessary, they shall be obtained at the Applicant's expense.

.2 It is the responsibility of the Applicant to do a complete title search and to search through EUB (Alberta Energy and Utilities Board) for the existence of any pipelines in use or abandon.

1.4.7 Construction Approval

.1 Upon receipt of Certified Contract Drawings and Specifications, the Applicant may proceed to install Municipal Services Subject to:

a) Satisfactory execution of a Brazeau County Development Agreement or a Development Permit.

b) Subdivision Approval if Applicable.

c) Obtaining appropriate Municipal, Provincial, and Federal permits. (e.g. Alberta Environment Permit to construct, Water Resources Permit to discharge, Etc)

.2 A Copy of all approved drawings and specifications shall be present at the site during construction.

.3 Underground services shall not be permitted to operate as part of the Municipal Services until the services have been inspected, tested and approved in writing by the County. This is generally upon receipt of a Construction Completion Certificate from the County. (See Section 1.4.12).

1.4.8 Engineering Supervision

.1 The Consulting Engineer shall be responsible for the layout, inspection, and approval of materials and workmanship, on behalf of the Developer.

.2 The Consulting Engineer may be required to maintain records of nearby Municipal Services which may not be part of the Development.

.3 In Addition to supervision carried out by the Consulting Engineer, the County may periodically inspect the work and assist in coordinating with other municipal works. The County will bring to the attention of the Developer and/or Consulting Engineer, the use of any unacceptable

material, practice, or workmanship. If remedial action is required the County may order the work to cease.

.4 Should the Consulting Engineer wish to make any changes to an approved design prior to or during construction, the change must be reviewed by the County. If approval is granted the Contract, drawings and specifications must be immediately revised to reflect the change.

1.4.9 Survey Control System

.1 The Developer shall undertake to preserve all existing and new survey markers and monuments. Any survey pins or monuments lost during construction shall be replaced by a registered Land Surveyor, to the satisfaction of the Director of Surveys, at the Developer's expense.

1.4.10 Testing

.1 It shall be the responsibility of the Consulting Engineer ensure that all required testing is completed throughout the project. The County shall be notified 48 hours in advance of any, pressure and/or disinfection tests being conducted.

.2 All test results are to be submitted to the County.

1.4.11 As-Built Drawings

.1 Within two months of completion of construction, the Consulting Engineer shall deliver as-built drawings to the County in both Paper/Mylar and digital format compatible with the County's current version of AutoCAD.

1.4.12 Municipal Acceptance

.1 Upon satisfactory completion of the project, after all deficiencies have been corrected, and at the Developer's request, the County will issue a Construction Completion Certificate notifying:

a) Acceptance of the work by the County.

b) Commencement date of the maintenance period.

.2 The Developer shall be responsible for any defect, fault, oversight, or deficiency in material or workmanship for a period of one to two years after issuance of the Construction Completion Certificate.

.3 Upon request of the Developer, after completion of the warranty period, after a final inspection, and after deficiencies have been corrected, a Final Acceptance Certificate will be issued by the County.

PART 1 – DESIGN DRAWINGS

1.1.0 Scope

.1 The following specification shall govern the preparation of Engineering Drawings for all Municipal Services.

1.2.0 Drawing Size, Material and Basic Layout

.1 Standard “D” (22” X 34”) size drawings will be used.

.2 Originals shall be prepared in ink on a mylar base unless the original is provided to the County in AutoCAD format (along with pen tables and all external references), in which case bond paper may be substituted for mylar.

.3 Plan Profile sheets shall have the profile at the bottom of the sheet with the title block below the profile.

1.3.0 Scales

.1

Plan	Horizontal	Vertical
Overall Plan	1:1000	N/A
Plan Profile	1:500	1:50
Cross Section	1:100	1:50

1.4.0 Drawing Technique

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

a) Care to insure a balanced distribution of detail throughout the drawing.

b) The name of the Developer, Consulting Engineer, date, revision, and engineer’s stamp shall appear on every drawing.

c) Letters and figures shall be clearly legible, 2mm size or larger.

d) Lines shall be drawn in weights proportional to their importance. New construction lines should be heavier than existing features.

e) Dimensioning shall be such that it will not be misinterpreted. Record drawings in particular should be dimensioned to lot lines when ever possible. The use of stations and offsets is acceptable in some cases provided that property lines and major features also have stations applied to them. All drawings shall be in SI (Metric units) except for architectural building drawings which may be in Imperial units.

f) All computer generated drawings and pen tables shall be submitted to the County in AutoCAD format compatible with the County's current Version.

1.5.0 General Requirements for all Services

.1 Elevations shall be relative to Alberta Survey Control system. The reference to ASCM (Alberta Survey Control Monument) and elevation shall be shown on the design drawings.

.2 Where there is more than one profile, clearly identify each.

.3 Adjacent lot numbers, plan numbers, street names, subdivided parcels, and pipelines shall be show on the drawings along with a north arrow, which should be orientated so that it is generally toward the top of the page whenever practical.

1.6.0 Overall Plans

The Following overall plans shall form part of the whole drawing set.

1.6.1 Cover Sheet

The Cover sheet will show the name and nature of the proposed development, zoning, stage and year of development, name of developer, and name of Consulting Engineer.

1.6.2 Index Plan

The index plan will be prepared at a scale of 1:1000 or other appropriate scale, which fits the sheet and shows the development, the relation of the development to other features, and relationship of the plan profile drawing numbers to the overall plan.

1.6.3 Road, Sidewalk and Walkway plan

This plan drawn at a scale of 1:1000 or other appropriate scale will indicate road widths, sidewalk widths, drainage patterns, catch basins, drainage ditches, water retention, and swales.

1.6.4 Lot Grading plan

An overall plan drawn to a scale of 1:1000 and will indicate the original contours, the proposed finished lot elevations at all corners and other points if drainage is split, the proposed street or center of road elevation, drainage ditch and swale elevations, the proposed building floor elevation, sewer service elevations, catchbasins, light standards, transformers, mailboxes, and other potential obstructions.

Individual lot grading plans in 210mm X 280mm (8 ½" X 11") format shall be prepared for each lot with all the pertinent grading information. (See Standard Drawing No. 8.2.0 for required format).

1.6.5 Landscaping Plan

The Landscaping plan shall be drawn to a scale of 1:1000 and shall utilize the Road, Sidewalk, and Walkway plan as a base. This plan shall identify areas to be seeded or sodded, location and name of trees and shrubs, location of planting beds, and any park furniture or playground equipment to be installed.

1.6.6 Sewer and Water overall Plan

A plan drawn at a scale of 1:1000 showing alignment and location of mains, a chart of all calculations for peak flows and velocities (Including domestic and fire usage for Watermains and Storm runoff conditions for Storm water), the size of mains or channels, direction of flows, locations of appurtenances. Drayton Valley fringe area manholes, hydrants, and water valves shall be numbered to conform with the Town's numbering system.

1.6.7 Power, Gas, Telephone, and Cable

A composite of development plans and the individual utility company plans drawn to a scale of 1:1000 and will indicate all utility alignments and appurtenances.

1.7.0 Detailed Plan Profile

.1 Generally all underground utilities and surface improvements will be shown on the Plan Profile drawings at a scale of 1:500 horizontal and 1:50 vertical.

.2 The Following information shall be included on the Plan Profile Drawings.

1.7.1 Water

.1 Show the location and size of exiting mains, the location and size and flow capacity of proposed mains, the locations of valves, the locations of fire hydrants, the location of tees and bends, etc.

.2 Show the offsets of the main from property line.

.3 Indicate where connections are to be made with existing mains and where future connections are expected.

.4 Indicate the size, material, class of pipe, DR value, and class of bedding.

.5 A profile of the main along with invert elevations at grade changes.

1.7.2 Sanitary Sewer and Storm Sewer

.1 The size, material, class of pipe, class of bedding, grade, length, and flow capacity marked on each segment of main.

.2 The manhole invert elevations of all inlets and outlet.

.4 The location and size of Manholes, cleanouts, catchbasins and other appurtenances.

1.7.3 Requirements for Roads

.1 The location of 0+000 centre line station must be shown as it relates to property lines.

.2 Indicate all the road widths and property line offsets.

.3 Stations of all BC, EC, TS, SC, CS, ST, Curb Return, Low point, and High point locations. Curve information is to be provided will be the Delta angle, Radius, Length of curve, Tangent length, Length of spiral, the spiral parameter.

.4 Road grades are to be shown on the plan and profile along with vertical curve information including the following:

a) The station and elevation of BVC, EVC, PVI, and High Point or Low Point.

b) The “K” value of the vertical curve.

c) The site distance and design speed if applicable.

.5 Road profiles shall show the centreline finished grade elevations.

.6 The profile shall be shown at true station length and should be directly under the plan so that a vertical line would cross the same point in the plan and in the profile when ever possible.

.7 Typical cross sections shall be shown on each plan along with specifications for materials shown on the plan.

Part 2 – As-Built Drawings

2.1.0 Scope

.1 This procedure pertains to “As-Built” or “Record” drawings and specifications.

2.1.1 General

.1 The as-built drawings shall clearly and accurately show all installations and/or construction on the site as related to property lines.

.2 Each drawing must contain the following information:

a) The date of the drawing revision and revision number.

b) Name of the developer.

c) The Engineer's stamp.

.3 The as-built drawings and specifications are to be submitted to the County, within two months of project completion, in the same format as the contract drawings and specifications.

.4 As-Built drawings shall include a plan drawn at a scale of 1:1000 showing alignment and location of mains, a chart of all calculations of peak flows and velocities as constructed, (Including domestic and fire usage for Watermains and Storm runoff conditions for Storm water), the size of mains or channels, direction of flows, locations of appurtenances. Drayton Valley fringe area manholes, hydrants, and water valves shall be numbered to conform with the Town's numbering system.

2.2.1 Sanitary Sewer and Storm Sewer

.1 The size, material, class of pipe, and class of bedding marked on each segment of main.

.2 The profile shall indicate the length and grade between manholes.

.3 The manhole invert elevations of all inlets and outlet.

.4 The location and size of Manholes, cleanouts, catchbasins and other appurtenances.

2.2.2 Water

.1 Show the location and size of exiting mains, the location and size of mains, the locations of valves, the locations of fire hydrants, flow capacity, the location of tees and bends, etc. All locations should be related to property lines.

.2 Show the offsets of the main from property line.

.3 Indicate where connections were made with existing mains and where future connections are expected.

.4 Indicate the size, material, class of pipe, DR or schedule value, and class of bedding.

.5 A profile of the main along with invert elevations at grade changes.

2.2.3 Requirements for Roads

.1 The location and geodetic elevation and grade of curbs, sidewalks, and centreline of road in relation to property lines.

.2 A Road Cross section and indicate on the plan where there is structural deviation from the typical cross section.

2.2.4 Water and Sanitary Sewer Service Connections

.1 A table on each plan profile drawing shall be prepared giving the following information with respect to the service connection.

a) Lot, Block and plan number

b) Distance of service connection to main line from downstream manhole.

c) Invert elevation of sewer service and water service at property line.

.2 The plan shall clearly show the service distance from a lot corner for each serviced lot.

2.2.5 Individual lot plans

.1 Individual lot plans, as shown in Standard Drawing Number 8.20, shall be submitted for each developed lot. The plans shall show sewer and water service information and elevations, lot grades at development (or proposed development) and grades at all corners of the lot, drainage direction of flow, and gradients. The lot plan shall be in 210mm X 280mm (8 ½" X 11") format and an electronic copy must be included along with other record drawings.

3.1.0 Design Requirements

.1 The minimum size of distribution main shall be 200mm Ø for domestic requirements and 250mm Ø for commercial and industrial applications. All main line proposed sizing must be accompanied by calculations proving that the size is sufficient under all the most extreme circumstances. The County may require over sizing of mains as per the Municipal master plan.

.2 For calculation purposes all Watermains will be assigned a "C" value of 125 in the Hazen Williams formula. The maximum desired peak flow velocity is 3.0 metres per second.

.3 Per Capita consumption shall be:

a)	Average daily demand	360 litres per person
b)	Maximum daily demand	2.5 X Average daily demand
c)	Peek hourly demand	4.0 X Average daily demand

.4 The design shall be the ultimate for the area under consideration. (See Section 4.1.1 for population densities).

.5 An analysis shall be made for peak hourly demand and mains shall be sized such that there will be a minimum residual pressure of 275 kPa. (Approx 40 P.S.I.) at all locations along the system, at ground elevation + 1.5 metres.

.6 An analysis must also be made for peak hourly demand plus Fire Flow. The residual pressure at any fire hydrant outlet or sprinkler head shall not be less than 140 kPa. (Approx. 20 P.S.I.).

.7 Fire flow requirements shall be in accordance with guidelines listed in the latest edition Underwriters Laboratories of Canada (ULC).

a) Current County guidelines are:

	litres/sec.	IGPM
Single Family Residential	100	1,300
Multi Family Residential	180	2,400
School / Commercial / Industrial	270	3,500

3.2.0 Watermains

3.2.1 Watermain Material

.1 Pipe for Watermains shall be designated for "potable water" and must conform with the following minimum standards:

a) AWWA C900 PVC Class 1035 (150) DR 18.0 for Watermains up to 300mm Ø.

b) AWWA C907 for Fittings up to 200mm Ø.

c) AWWA C905 For all PVC fittings 250mm Ø to 1200mm Ø and Watermains over 300mm Ø and up to and including 1200mm Ø.

d) Cast Iron Crosses, Bends, or Tees will not be accepted.

e) All underground iron or steel appurtenances or fittings shall be cathodically protected in accordance with ASTM B418 Type II.

3.2.2 Watermain location

.1 Mains shall be installed to provide a minimum depth of 3.0 metres from invert to final grade or a minimum of 2.5 metres cover to the top of pipe.

.2 Water mains shall installed in looped configurations connected at both ends. No segment of single connection water main shall be more than 120 metres long or service more than 20 units.

.3 Mains shall be installed within the road right-of way and shall not be less than 3.0 metres from a property line or utility easement.

.4 A minimum of 3.0 metres separation shall be maintained between Watermains and Sewermains.

.5 The minimum requirement for pipe bedding shall be class “B”.

3.3.0 Hydrants

3.3.1 Hydrant Material

.1 Hydrants shall be Canada Valve – Century Series currently manufactured by Mueller Canada.

.2 Hydrants shall conform to AWWA C502, and shall include the following supplementary requirements:

a) Four section breakaway flange.
b) Stainless steel trim (nuts and bolts) SS 304 minimum.
c) Compression type shut off.
d) Design working pressure of 1035 kPa.
e) Two 65mm (2 ½”) hose nozzles with Alberta Mutual Aid Fire Thread.
f) One pumper nozzle with 146mm (5.75”) O.D. AWWA pumper outlet complete with 100mm (4”) Storz quick-connect fitting installed.
g) Number 6 operating nut with 3 curved sides.
h) Self draining hydrant.
i) A gate valve is to be provided on each hydrant lead.
j) All hydrant barrels are to be painted Chrome Yellow
k) Tops and nozzle caps shall be painted in accordance with the NFPA colour coding system as outlined in Table 3.2.

3.3.2 Hydrant Location and Installation

.1 The maximum allowable spacing between fire hydrants shall be 150 metres in single family residential areas, 120 metres in multiple family residential areas, and 90 metres in school / industrial / commercial areas.

.2 Hydrants are to be located such that the distance to any building shall not be greater than 75 metres and no portion of a structure being served by the fire hydrant is more than 90 metres from a fire hydrant.

.3 Hydrants shall be installed at projected property lines except at intersections where they may be installed within the curb returns.

.4 Hydrants shall be located to conform with curb and sidewalk design and shall be located as follows:

a) More than 2.0 metres from the edge of road or face of curb.
b) No more than 0.75 metres from back of sidewalk.
c) More than 0.3 metres from back of sidewalk or curb.

.5 Additional hydrants will be installed at School / Commercial / industrial properties to meet the minimum fire flow requirements or as requested by local fire services.

.6 All hydrants shall have a minimum of 150mm Ø lead. In high value (School / Commercial / Industrial) areas the maximum length of a 150mm Ø lead will be 7.5 metres.

.7 Hydrants shall be installed in accordance with Standard Drawing Number 3.12 with the following requirements.

a) The Ground flange shall be no less than 100mm and no more than 200mm above the final grade.
b) A minimum of 0.5 M^3 of washed or screened rock filled to 150mm above the drain hole covered with a 6mm polyethylene barrier.
c) Cathodic protection in the form of a 5.5 Kg. sacrificial zinc anode shall be attached to the hydrant by approved connection.
d) Nozzle caps shall be painted in accordance with NFPA colour coding as outlined in table 3.2.
e) Drayton Valley fringe area hydrants shall have a number assigned to and painted on them in 100mm high block lettering.
f) Newly constructed fire hydrants shall have an “Out of Service” sign placed on them until they are put into service.

.8 Flow testing of hydrants may be required prior to issuance of a Construction Completion Certificate.

3.4.0 Valves

3.4.1 Valve Materials

.1 All main line valves shall be Gate Valves conforming to specification AWWA C509, latest edition thereof, and shall include the following supplementary requirements.

a) 51mm square operating nut.

b) Bronze or SS 304 non-rising stems.

c) “O”-ring stem seal.

d) To open turn counter-clockwise.

e) External epoxy coating.

f) Shall be resilient seated wedge type.

g) Stainless Steel “304” nuts and bolts.

3.4.2 Valve Boxes

.1 Valve boxes shall be two section cast iron coated, with internal operating rod and rock nut. Plastic valve boxes or valve box tops will not be accepted.

.2 Valve boxes shall be of sufficient length to allow for raising or lowering the top box 300mm from the final constructed grade.

3.4.3 Valve – Location

.1 Valves on distribution mains shall be installed as follows.

a) At the projection of property lines at mid-block.

At the projection of property lines at intersections.

.1 Distribution main valves shall be located such that during the closure.

a) Not more than one fire Hydrant is taken out of service when closing two adjacent valves.
b) Not more than three valves are required to shut down an area.
c) Not more than one standard block or 20 units is taken out of service during closure.
d) Valves shall be installed in accordance with Standard Drawing No. 3.13.

3.5.0 Trenching and Backfilling

.1 Trenching and backfilling shall be done in accordance with Occupational Health and Safety Guidelines.

.2 The minimum trench width shall be the outside diameter of the pipe plus 450mm.

.3 The minimum class of bedding shall be class “B” as per Standard Drawing 3.10.

.4 Backfilling shall be carried out with select native material in lifts not exceeding 300mm compacted to minimum of 98% standard proctor density.

.5 When backfilling areas where immediate surface repairs are required, granular material placed in 150mm lifts and compacted to a minimum of 95% standard proctor density shall be used.

3.6.0 Thrust Blocks

.1 Thrust blocks are to be installed in accordance with Standard Drawing No. 3.15.

3.7.0 Disinfection

.1 All Watermains shall be disinfected in accordance to AWWA C651, latest edition thereof.

.2 The County shall be notified at least 48 hours prior to disinfection of the watermain and may direct the methods or location of sampling.

.3 The minimum residual chlorine after a 24 hour test shall be 25 mg/l.

.4 The line shall be flushed after disinfection and the residual chlorine must be neutralized prior to discharge.

.5 The test results shall be reviewed and approved by the county prior to the waterline being put into service.

3.7.1 Testing

.1 The Developer shall employ an approved material testing firm to complete the tests as outlined in Table 7.2. One copy of the results shall be submitted to the County soon as they are available.

.2 All Watermains shall be tested in accordance with AWWA C603, latest revision thereof. Hydrostatic test pressure shall be a minimum of 1035 kPa. (150 P.S.I.) at the lowest point in the system. A Correction for the elevation of the test gauge must be applied. Tests shall be conducted for a minimum of two hours and not more than four hours. Makeup water must not exceed the amounts shown in Table 3.1.

TABLE 3.1 Maximum allowable leakage (Litres/100 joints/hour) for PVC Pipe

	Test Pressure								
Pipe Diameter	345	515	690	860	1035	1380	1550	1724	kPa.
(mm) Nominal	(50)	(75)	(100)	(125)	(150)	(200)	(225)	(250)	(PSI)
100	1.46	1.77	2.00	2.28	2.46	2.90	3.07	3.28	
150	2.17	2.65	30.7	3.43	3.76	4.34	4.60	4.82	
200	2.90	3.54	4.09	4.57	5.02	5.79	6.14	6.46	
250	3.62	4.42	5.12	5.71	6.27	7.34	7.67	8.10	
300	4.34	5.30	6.14	6.86	7.25	8.69	9.20	9.7	
350	5.07	6.19	7.16	8.00	8.77	10.13	10.74		
400	5.79	7.07	8.19	9.14	10.03	11.58	12.27		
450	6.51	7.96	9.21	10.28	11.28	13.03	13.80		

Allowable leakage calculation is based on the following formula:

a) PVC pipe $L = \frac{ND(P^{0.5})}{128,320}$

P- Test Pressure in kPa. (1.0 PSI = 6.9 kPa.)
N- Number of Joints
D- Nomimal pipe diameter
L- Allowable leakage in litres per hour

Table 3.2

National Fire Protection Association (NFPA) Recommended Practice for Colour Coding Hydrants		
Barrel		Chrome Yellow
Tops and Nozzle Caps-		
Class AA	>90 l / sec. (>1,200 IGPM)	Light Blue
Class A	60 to 90 l / sec. (800 – 1,200 IGPM)	Green
Class B	30 to 60 l / sec. (400 – 800 IGPM)	Orange
Class C	<30 l / sec. (<400 IGPM)	Red

End of section 3

4.1.0 Design Factors

.1 The sanitary sewage system shall be of sufficient capacity to carry peak flows plus infiltration. The following factors shall be used in design of sanitary sewage systems:

a) Residential

Population	R1 – 90 people / hectare R2 – 105 people / hectare R3 – 230 people / hectare R4 – 250 people / hectare
Average Flow	360 litres / person / day
Peaking Factor (Harmon's formula)	$\frac{1+14}{4+P^{0.5}}$

Where P is the population in Thousands.

Infiltration allowance	0.28 litres / hectare / second
Manholes in low areas	0.4 litres / second

b) Commercial, Industrial And Institutional

Average Sewage Flow	Commercial – 40 m^3 / hectare / day Industrial – 20 m^3 / hectare / day
Peak Flow	3.5 X Average Flow.
Infiltration	0.28 litres / hectare / second

.2 The pipe flow design shall conform to the following:

a) Sizing shall be determined by utilizing "Manning's Formula" with an "n" value of 0.13 or .012 for PVC pipe.

b) Minimum pipe grades shall be as determined by Alberta Environment.

c) The minimum flow velocity shall be 0.6 metres per second.

d) The maximum flow velocity shall be 3.0 metres per second.

e) Sewers shall be designed so that full flow rate does not exceed 80% of the pipe's diameter. This is typically represented by using a full flow rate of 86% of the pipe hydraulic capacity for circular pipe.

f) Sewer mains may have to be oversized to accommodate future development in accordance with the County's area structure plan.

g) There shall be no roof drain or weeping tile connections to sanitary sewers.

4.2.0 Sanitary Sewer Mains – Materials

.1 Materials used to construct Sanitary Sewermains shall be as follows:

a) The minimum size for sanitary sewer mains shall be 200mm Ø for residential and 250mm Ø commercial / industrial installations.

b) All sanitary sewers and fittings up to 600mm Ø shall be PVC CSA 182.2 and ASTM D3034 with a minimum wall thickness ratio of DR 35.

.2 Manhole materials shall conform to the following:

a) All manhole sections shall conform to CSA A257.4 and ASTM C478, the latest edition thereof.

b) Shall be a minimum of 1200mm Ø for pipe up to 900mm Ø. For pipe larger than 900mm Ø manholes may be perched and should be a minimum of 600mm larger than the Sewermain.

c) Manhole frames and covers shall be Norwood Foundry NF 80 for normal applications and NF 90 with gasket in sag areas.

d) Manhole steps shall be standard safety type, hot dipped galvanized or extruded aluminium.

e) Manholes with a rim to invert depth greater than 6.0 metres shall have a safety platform installed.

f) Refer to standard drawing Numbers 4.11, 4.12 and 4.13.

.3 Concrete used for manholes and appurtenances shall conform to the following:

a) Cement used shall be type 50.

b) Minimum 28 day compressive strength of 25 Mpa.

c) Maximum slump of 75mm

d) Air entrainment of 5% to 8%.

4.3.0 Sewermain Installation and Location

.1 Wherever possible sanitary Sewermains shall be installed with a minimum depth of 2.7 metres from finished grade to invert of pipe. Installations with less than 2.1 metres of cover to overt of pipe shall require insulation with Dow HI – 40 rigid Styrofoam insulation or approved equal product.

.2 Mains shall be installed provide adequate service depth at the property line which in turn will affect the final floor elevation and lot grading plans.

.3 Mains shall be located within the road right-of-way in accordance with the Roadway Cross Section Standard Drawing Numbers 7.129 to 7.134.

.4 Pipe bedding shall be a minimum Class “B” in accordance with Standard Drawing Number 3.10

4.4.0 Manhole Installation and location

.1 Manholes shall be placed at the end of each line, change in pipe size, change in grade, or change in alignment.

.2 The maximum distance between manholes shall not exceed 120 metres.

.3 Inverts in manholes at direction changes of 90° or greater shall have a minimum of 25mm drop across the manhole.

.4 Manholes shall be installed in accordance with standard drawings “4.10” “4.11” and “4.13”.

.5 All manhole joints shall be sealed with approved gaskets or sealants and shall be water tight.

4.5.0 Curved Sewers

.1 Curved sewers will be permitted under the following conditions.

a) The Sewer will be laid in a simple curve radius equal to or greater than the pipe manufacturers recommendations.

b) Manholes shall be located at the beginning and end of each curve and at intervals of 90 metres or less through the curve.

c) The main shall run parallel to the road right-of-way.

d) The minimum grade for curved sewers shall be at least 50% greater than the minimum grade for straight sewers.

4.6.0 Trenching and Backfilling

.1 Trenching and backfilling shall be in accordance with Occupational Health and Safety Guidelines.

.2 Trench width shall be adequate to properly compact the pipe bedding without causing abrasions or any other damage to the pipe.

4.7.0 Inspection and Testing

.1 The developer shall employ a material testing firm, licensed to operate in Alberta, to complete the test as outlined in Table 7.2. One copy of the results shall be submitted to the County as soon as they are available.

.2 Prior to requesting a completion inspection the sewermains shall be tested as follows:

a) Leakage test

The County may require any or all sections of installed Sewermain to be tested for infiltration, and / or exfiltration.

Infiltration tests shall be conducted by isolating a section of Sewermain with plugs specifically designed to block sewermains and measuring the flow at the lower end of the section being tested.

Exfiltration tests shall be performed by isolating a section of the system as above and applying a minimum of 2 metres of static head pressure to the highest point being tested.

b) Closed Circuit Television Inspection

All installed sanitary sewers shall be inspected with closed circuit television and a recording of the inspection along with a written report must be issued to the County prior to a request for a construction completion inspection.

5.1.0 Design Factors

.1 Storm Sewers shall be designed as separate system and shall be of sufficient capacity to accommodate the runoff from the ultimate development for which the area is zoned. Sewer design will consider both minor and major drainage systems.

.2 Minor systems comprise of piping, manholes, catch basins, and outfall structures. The Minor system shall convey runoff from snow melt and rainfall events without sustaining any surface ponding or excessive flows for events up to and including a 1 in 5 year return period. The County may require a 1 in 10 year return period for high value commercial areas.

.3 Major systems shall accommodate and store runoff from events up to and including a 1 in 100 year return period while discharging at a maximum rate of the calculated predevelopment run off. The major system shall be designed so that no significant property damage will occur during a 1 in 100 year event. The applicant shall take into consideration and minimize the cost of operating the stormwater retention system.

.4 No effluent other than runoff water shall be permitted to enter a storm sewer. The connection of residential roof drains or drainage sumps to a storm sewer shall not be permitted.

.5 Any commercial or industrial building that utilizes roof storage as part of the storm water retention system may be able to connect to a storm sewer if prior approval is received from the County .

.6 The use of computer simulated methods is recommended for all final analysis and design details. The rational method may be used for design of minor storm drainage systems with a catchment area of 65 ha. or less.

a) The rational method is expressed as:

$$Q = \frac{CIA}{360}$$

where Q = discharge in m^3/s
C = runoff coefficient
I = average rainfall intensity in mm/hr.
A = drainage area in hectares

b) The rainfall intensity shall be as shown in Table 5.1

c) The runoff coefficient shall be in accordance with table 5.2

d) All developments shall apply a maximum time of concentration of 10 minutes. Any request to use a time of concentration greater than 10 minutes must be requested and justified by the Engineer and must be approved by the County.

.7 For piped systems the maximum flow velocity shall be 3.0 m/s and the minimum velocity shall be 0.6 m/s.

.8 Pipe sizing shall be determined by utilizing “Manning’s Formula” with an “n” value of 0.012 for smooth walled plastic pipe and 0.013 for all other smooth walled pipe.

.9 All sewers shall be designed to convey the design flow when the pipe is flowing full. Where the pipe size changes through a manhole the crowns of the pipes shall match.

.10 Open channels with a grade greater than 1.5% must utilize erosion control.

.11 Storm water retention facilities shall be designed to minimize impact on aquifers. In particular wet ponds shall be constructed as to prevent stored water from entering an aquifer.

.12 Detention system emergency overflow shall be designed to only become active during rainfall events of a 100 year return period or greater.

.13 The maximum water level fluctuation for detention ponds in residential areas during a 100 year storm event shall be 2.0 metres. The pond level shall return to normal within 72 hours of a 100 year storm event. All inhabitable building space, including basements shall be constructed above the 100 year flood level.

.14 Minor storm systems shall consider the effects of the detention pond. The hydraulic gradient shall be calculated from the maximum pond level during a 5 year storm event.

.15 A wet detention pond overflow shall be provided to so that maximum pond levels are not exceeded and shall be designed to ensure:

a. The lowest basement on a lot adjacent to the pond is a minimum of 300 mm above the 1:100 year water level.

b. The lowest manhole invert shall be at or above normal water level.

c. The pipe overt of the lowest manhole immediately upstream of the pond shall be above the 1:5 year maximum level.

d. A minimum of 6 metres of horizontal distance is maintained for any basement wall or foundation to the 1:100 year high water mark.

e. The inlet of the pond must be above normal water level or below the ice level.

f. Wet ponds are to have a minimum surface area of 2 hectares and a minimum depth of 2 metres.

g. Pond bottom and side slopes shall be constructed of impervious materials.

h. No dead bay areas will be permitted.

i. Shoreline improvements and erosion protection must be reviewed and approved by the County.

j. Any property below the 1:100 year flood level shall become the property of the County.

k. The design of a wet pond will incorporate a semi-annual turn over at average annual precipitation.

l. Wet ponds shall be constructed as shown on standard drawing 5.40.

m. Inlets and outlets which are not submerged will require fencing along the shoreline for a minimum of 5 metres each way from the centerline of pipe.

n. The pond shall be sterilized at the time of construction to prevent weed growth.

o. A silt trap shall be provided at the pond inlet.

.16 Dry ponds shall have:

a. A depth not exceed 1.5 metres of water depth during a 1:100 year storm event.

b. A flow bypass for minor events.

c. A minimum bottom slope of 1% in all directions to the outlet.

d. A French drain or weeping tile where bottom slopes are less than 2%.

e. Side slopes of 7:1 or flatter.

f. Length, width and depth dimensions acceptable to the County.

g. Bottom and side slopes are to be seeded with grass or sodded.

h. All safety issues addressed (particularly during operation).

i. Geometry in accordance with standard drawing 5.41.

.17 Underground storage tanks shall be considered only if there is no other viable option.

.18 Proposals which rely on third party implementation of water retention will not be accepted.

.19 All plans, specifications and calculations must be submitted to the County for approval prior to any construction taking place.

5.2.0 Storm Sewermains – Materials

.1 Sewermains

a. The minimum size of storm sewermains shall be 300 mm Ø.

b. Pipe for storm sewermain shall be:

Reinforced sulphate resistant concrete pipe conforming to ASTM C76.
PVC pipe conforming to ASTM F794, minimum wall thickness DR 35.
PVC Ultra-Rib pipe conforming to ASTM D3034, minimum wall thickness DR 35.

c. Pipe joints shall be rubber ring conforming to CSA A257.3 and/or ASTM C443 for concrete pipe and ASTM 03212 for PVC pipe.

.2 Manholes

a. Refer to section 4.2.0.2 and standard drawings 4.10, 4.11 and 4.12.

.3 Catchbasins

a. Catchbasin barrels with precast base and precast top slab shall conform to the following:

i) Minimum of 900 mm Ø ID pipe barrel conforming to ASTM C478 (standard drawing 4.13).

ii) Catchbasin manholes shall be installed in accordance with standard drawing 4.14.

iii) Catchbasin manholes shall be used in place of catchbasins when the lead length exceeds 30 metres in length.

iv) Catchbasins are to have 500 mm deep sumps.

b. Catchbasin frames and covers shall be designed to have sufficient flow capacity and shall be equal to the following types by Norwood Foundry:

i) F33 or K7 or DK7 or K2 for rolled curb where additional capacity is required.

ii) F36 for straight face curb and gutter or F51 or F51 with side inlet for straight face curb where additional capacity is required.

iii) F38 for lanes or swales.

iv) F39 for landscaped areas.

c. Catchbasin leads shall:

i) Be concrete pipe conforming to ASTM C14 – Class 3 or approved PVC pipe.

ii) Have a minimum diameter of 250mm.

5.3.0 Storm sewer installation and location

.1 Mains shall be installed to provide a 1.75 metre minimum depth of cover from finished grade to the overt of pipe.

.2 Mains shall be located within a public right of way in accordance with standard drawings 7.129 to 7.134.

.3 Pipe bedding shall be a minimum of class II as per standard drawing 3.10.

5.4.0 Manhole installation and location

.1 Refer to section 4.4.0 (Sanitary Sewer).

.2 Manhole spacing on storm sewers greater than 750 mm Ø may exceed 120 metres if approved by the County.

.3 Benching in manholes shall be provided to minimize hydraulic losses. The downstream invert of a manhole shall be a minimum of 10 mm lower than the lowest upstream invert. At a change of direction of 45° or more the drop shall be a minimum of 25 mm.

.4 Perched manholes may be utilized on mains 900 mm Ø or larger.

5.5.0 Curved Sewers

.1 Refer to Section 4.5.0 (Sanitary Sewer).

5.6.0 Trenching and backfilling

.1 Refer to Section 4.5.0 (Sanitary Sewer).

5.7.0 Inspection and Testing

.1 Refer to Section 4.5.0 (Sanitary Sewer).

5.8.0 Detention Facilities

.1 Detention facilities with capacity to retain peak runoff for events up to the 100 year return period shall be designed as part of both major and minor systems and shall be satisfactory to Alberta Environment.

.2 All detention facilities must be placed entirely on County property.

5.9.0 Outfalls

.1 Outfall structures shall be placed at the end of all storm sewers discharging into open areas or receiving waters. The purpose of the outfall is to reduce velocities and prevent erosion. All outfall structures must receive approval from Alberta Environment, Water Resources, and Forestry. It is the responsibility of the developer to obtain the necessary approvals, and permits.

.2 Overts of Outfall pipes must be at least 150 mm above the 5 year flood level. Inverts must be above winter ice level.

.3 If the downstream channel is relatively flat the apron shall be a minimum of 150 mm above the channel bottom to prevent the collection of debris on the apron.

.4 Rip-rap and a filter layer are required downstream where the ground is exposed or receiving waters are shallow.

.5 Weeping tile shall be placed behind and under the structure.

.6 Grills shall be placed over outlets to prevent access.

.7 Railings shall be placed along the headwall and wing walls of the structure.

5.10.0 Receiving Waters

.1 Measures shall be incorporated in new developments to prevent any increase in downstream erosion.

.2 The developer shall be responsible for new or additional erosion in the receiving water channel. This may occur despite the use of peak runoff containment.

.3 The preservation of watercourse aesthetics and wildlife habitat shall be considered in erosion and bank stability work.

5.11.0 Culverts and Bridges

.1 Culvert and Bridge design should consider the backwater effects over a range of flows. The design of a hydraulic structure requires assessment of both its nominal flow and performance during a 100 year flood event.

5.12.0 Surface Drainage

.1 Drainage ditches or swales shall be constructed completely before any lot development is started. Swales between adjacent lots must be contained within County property or drainage easements.

5.13.0 Major Drainage System Analysis

.1 The major drainage system shall be assessed with respect to the 1 in 100 year return period event. Consideration of the impact of possible future development should also be considered.

.2 The grading of streets and the layout of the major drainage system shall be assessed relative to the following guidelines during a 100 year event.

a. No building shall be inundated at ground level.

b. Continuity of overland flow routes between developments shall be maintained.

c. Arterial roads should have at least two lanes which are not inundated parallel with the direction of flow. Where a major system crosses an arterial road the depth of flow should be less than 0.05 metres.

d. Collector roads should have at least one lane which is not inundated parallel with the direction of flow. Where a major system crosses a collector road the depth of flow should be less than 0.100 metres,

e. Local roads should have a depth of water no more than 0.050 metres above the crown of the road. Where a major system crosses a local road the depth of flow should be less than 0.150 metres.

f. The depth of flow over curbs and sidewalks should be less than 0.50 metres.

g. Flow velocity and depth in the major drainage system shall not exceed the values outlined in table 5.5.

.3 The grading of lots shall meet the following requirements:

a. The minimum slope in the back and front yards shall be 2%.

b. Structures should have a minimum of 5% slope away from the building for three metres in all directions.

c. If the back yard slopes toward the building, provision must be made to keep the runoff at least 3 metres from the building and direct it to the street.

d. Lot grading shall never direct drainage on to adjacent lots.

Table 5.1
Rainfall Intensity and Frequency Design Criteria for Brazeau County

IDF Intensity (mm/hr)Time		Return Frequency					
Minutes	**Hours**	**2-Yr**	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
1		120	182	223	275	313	351
2		97.2	147	179	221	251	282
3		82.9	125	152	187	213	239
4		72.9	109	134	164	187	209
5		65.5	98.2	120	147	167	187
6		59.8	89.5	109	134	152	171
7		55.2	82.5	101	123	140	157
8		51.4	76.7	93.5	115	130	146
9		48.2	71.9	87.6	107	122	137
10	*Initial time*	45.5	67.8	82.5	101	115	129
11		43.1	64.2	78.1	95.8	109	122
12		41.0	61.0	74.3	91.0	103	122
13		39.2	58.3	70.9	86.9	98.7	110
14		37.5	55.8	67.9	83.1	94.5	106
15	*0.25*	36.0	53.6	65.1	79.8	90.6	101
16		34.7	51.5	62.7	76.8	87.2	97.6
17		33.5	49.7	60.4	74.0	84.1	94.0
18		32.4	48.0	58.4	71.5	81.2	90.8
19		31.3	46.5	56.5	69.2	78.6	87.9
20		30.4	45.1	54.8	67.0	76.1	85.2
21		29.5	43.7	53.2	65.1	73.9	82.6
22		28.7	42.5	51.7	63.2	71.8	80.3
23		27.9	41.4	50.3	61.5	69.8	78.1
24		27.2	40.3	49.0	59.9	68.0	76.1
25		26.6	39.3	47.8	58.4	66.3	74.2
26		25.9	38.4	46.6	57.0	64.7	72.4
27		25.3	37.5	45.5	55.7	63.2	70.7
28		24.8	36.7	44.5	54.4	61.8	69.1
29		24.3	35.9	43.6	53.3	60.5	67.6
30	*0.5*	23.8	35.1	42.6	52.1	59.2	66.2
31		23.3	34.4	41.8	51.1	58.0	64.8
32		22.8	33.7	41.0	50.1	56.8	63.5
33		22.4	33.1	40.2	49.1	55.7	62.3
34		22.0	32.5	39.4	48.2	54.7	61.2
35		21.6	31.9	38.7	47.3	53.7	60.6
36		21.2	31.3	38.0	46.5	52.8	59.0
37		20.9	30.8	37.4	24.7	51.8	58.0
38		20.5	30.3	36.8	44.9	51.0	57.0
39		20.2	29.8	36.2	44.2	50.1	56.1
40		19.9	29.3	35.6	43.5	49.3	55.2
41		19.6	28.9	35.0	42.8	48.6	54.3
42		19.3	28.4	34.5	42.2	47.8	53.5
43		19.0	28.0	34.0	41.5	47.1	52.7
44		18.7	27.6	33.5	40.9	46.4	51.9
45	*0.75*	18.5	27.2	33.0	40.3	45.8	51.2
46		18.2	26.9	32.6	39.8	45.1	50.5
47		18.0	26.5	32.1	39.2	44.5	49.8
48		17.7	26.1	31.7	38.7	43.9	49.1
49		17.5	25.8	31.3	38.2	43.4	48.4
50		17.3	25.5	30.9	37.7	42.8	47.8

Table 5.1 – (Continued)
Rainfall Intensity and Frequency Design Criteria for Brazeau County

IDF Intensity (mm/hr)Time		Return Frequency					
Minutes	**Hours**	**2-Yr**	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
51		17.1	25.2	30.5	37.2	42.3	47.2
52		16.9	24.8	30.1	36.8	41.7	46.6
53		16.7	24.6	29.8	36.3	41.2	46.1
54		16.5	24.3	29.4	35.9	40.7	45.5
55		16.3	24.0	29.1	35.5	40.3	45.0
56		16.1	23.7	28.7	35.1	39.8	44.5
57		15.9	23.4	28.4	34.7	39.3	44.0
58		15.8	23.2	28.1	34.3	38.9	43.5
59		15.6	22.9	27.8	33.9	38.5	43.0
60	*1.00*	15.4	22.7	27.5	33.6	38.1	42.5
61		15.3	22.4	27.2	33.2	37.7	42.1
62		15.1	22.2	26.9	32.9	37.3	41.6
63		15.0	22.0	26.6	32.5	36.9	41.2
64		14.8	21.8	26.4	32.2	36.5	40.8
65		14.7	21.6	26.1	31.9	36.2	40.4
66		14.5	21.3	25.9	31.6	35.8	40.0
67		14.4	21.1	25.6	31.3	35.5	39.6
68		14.3	20.9	25.4	31.0	35.1	39.2
69		14.1	20.8	25.1	30.7	34.8	38.9
70		14.0	20.6	24.9	30.4	34.5	38.5
71		13.9	20.4	24.7	30.1	34.2	38.2
72		13.7	20.2	24.5	29.8	33.8	37.8
73		13.6	20.0	24.2	29.6	33.5	37.5
74		13.5	19.8	24.0	29.3	33.2	37.1
75	*1.25*	13.4	19.7	23.8	29.1	33.0	36.8
76		13.3	19.5	23.6	28.8	32.7	36.5
77		13.2	19.3	23.4	28.6	32.4	36.2
78		13.1	19.2	23.2	28.3	32.1	35.9
79		13.0	19.0	23.0	28.1	31.9	35.6
80		12.9	18.9	22.9	27.9	31.6	35.3
81		12.8	18.7	22.7	27.7	31.4	35.0
82		12.7	18.6	22.5	27.4	31.1	34.8
83		12.6	18.4	22.3	27.2	30.9	34.5
84		12.5	18.3	22.1	27.0	30.6	34.2
85		12.4	18.2	22.0	26.8	30.4	34.0
86		12.3	18.0	21.8	26.6	30.2	33.7
87		12.2	17.9	21.7	26.4	29.9	33.4
88		12.1	17.8	21.5	26.2	29.7	33.2
89		12.0	17.6	21.3	26.0	29.5	33.0
90	*1.5*	11.9	17.5	21.4	25.8	29.3	32.7
120	*2*	9.94	14.5	17.6	21.4	24.3	27.1
180	*3*	7.67	11.2	13.5	16.5	18.6	20.8
240	*4*	6.37	9.28	11.2	13.6	15.4	17.2
300	*5*	5.52	8.03	9.69	11.8	13.3	14.9
360	*6*	4.91	7.13	8.66	10.5	11.8	13.2
420	*7*	4.45	6.45	7.77	9.45	10.7	11.9
480	*8*	4.08	5.91	7.12	8.66	9.79	10.9
540	*9*	3.78	5.47	6.60	8.01	9.06	10.1
600	*10*	3.53	5.11	6.16	7.48	8.45	9.43
660	*11*	3.32	4.80	5.78	7.02	7.94	8.85

Table 5.1 – (Continued)
Rainfall Intensity and Frequency Design Criteria for Brazeau County

IDF Intensity (mm/hr)Time		Return Frequency					
Minutes	**Hours**	**2-Yr**	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
720	*12*	3.14	4.54	5.46	6.63	7.50	8.36
780	*13*	2.98	4.31	5.18	6.29	7.11	7.93
840	*14*	2.84	4.10	4.94	5.99	6.77	7.55
900	*15*	2.72	3.92	4.72	5.73	6.47	7.21
960	*16*	2.61	3.76	4.52	5.49	6.20	6.91
1020	*17*	2.51	3.62	4.35	5.27	5.96	6.64
1080	*18*	2.42	3.48	4.19	5.08	5.74	6.40
1140	*19*	2.34	3.36	4.04	4.90	5.54	6.17
1200	*20*	2.26	3.25	3.91	4.74	5.35	5.97
1260	*21*	2.19	3.15	3.79	4.59	5.19	5.78
1320	*22*	2.12	3.06	3.67	4.45	5.03	5.60
1380	*23*	2.06	2.97	3.57	4.32	4.88	5.44
1440	*24*	2.01	2.89	3.47	4.20	4.75	5.29

Notes:

1. Based on AES Data at Edmonton Municipal Airport.
2. Maximum initial time of concentration is 10 minutes.

Table 5.2
Recommended Minimum Runoff Coefficients

Land use or Surface Characteristics	Return Event Return Period					
	2-Yr	**5-Yr**	**10-Yr**	**25-Yr**	**50-Yr**	**100-Yr**
Residential	0.40	0.40	0.43	0.45	0.50	0.60
Apartments[2]	0.70	0.70	0.73	0.75	0.77	0.80
Commercial[2]	0.85	0.85	0.85	0.87	0.89	0.90
Neighbourhood Commercial[2]	0.65	0.65	0.65	0.70	0.75	0.80
Light Industrial[3]	0.60	0.60	0.65	0.67	0.69	0.70
Lawns, Parks and Playgrounds	0.20	0.20	0.20	0.24	0.27	0.30
Undeveloped Land (Farmland)	0.10	0.10	0.15	0.17	0.18	0.20
Paved Streets	0.90	0.90	0.90	0.92	0.94	0.95
Gravel Streets	0.30	0.30	0.35	0.45	0.55	0.65

Notes:

1. Values are recommended minimum for use in the Rational Method.

2. Where specific surfaces characteristics are known, the runoff coefficient is to be based on the surface characteristics of the ultimate development.

3. Runoff coefficients for industrial land use must be estimated based on the ultimate land use condition.

Table 5.3

Design Storm Hyetographs

1 Hour Design Storm			12 Hour Design Storm		
Period Ending (Minutes)	Cumulative Rain (%)	Discrete Rainfall (%)	Period Ending (Hours)	Cumulative Rain (%)	Discrete Rainfall (%)
0	0	0	0	0	0
5	12	12	1	15	15
10	32	20	2	34	19
15	54	22	3	51	17
20	74	20	4	66	15
25	85	11	5	83	17
30	90	5	6	90	7
35	95	5	7	96	6
40	98	3	8	98	2
45	99	1	9	100	2
50	100	1	10	100	0
55	100	0	11	100	0
60	100	0	12	100	0

Notes:

1. Data from Atmospheric Environment Services of Environment Canada.
2. Design storms are the 30% distributions for the Prairie Provinces.

Table 5.4

Catchbasin Capacities (litres/second)

Catch Basin	Flow Condition	
	Continuous Slope	Sag condition
F33	20	38
F38 & F39	20	38
F-51Base and Curb Inlet	40	80

Note:

1. Catch Basin capacities can be considered to be double the ones shown above for assessing a 100 year storm event.

Table 5.5

Permissible Depths For Submerged objects

Water Velocity (metres/second)	Permissible depth (Metres)
0.5	0.80
1.0	0.80
2.0	0.21
3.0	0.09

Note:

1. Based on a 20 kg. child and a concrete lined channel. A larger person may be able to withstand deeper flows.

End of Section 5

6.1.0 Service Connections – Minimum Requirements

.1 The minimum size of service connections to any single family dwelling shall be as follows:

Sanitary Sewer	100 mm Ø.
Water Service	25 mm Ø

.2 The minimum grade for sewer services < 150 mm Ø shall be 2% and 1% for services 150 mm Ø and larger.

.3 Connection to the main sewer line shall be by means of a Tee or approved Saddle and the connection shall be made in the top quadrant of the pipe.

.4 Where bends are utilized, they shall be long radius or shall be a combination of 22½° bends and straight pipe.

.5 Water Services 50 mm Ø and less shall be tapped into the main at the 2 O'clock to 3 O'clock position.

.6 Watermains shall be tapped under pressure.

.7 All water services shall utilize service clamps.

.8 Where service line pressure exceeds 625 Kpa. (90 PSI), it shall be the responsibility of the developer to install an approved pressure reducing valve before the water meter. The maintenance of the pressure reducing valve shall be the responsibility of the property owner.

.9 Water Service connections larger than 50 mm Ø shall be connected to the main by means of a moulded Tee.

6.2.0 Sanitary Sewer Service – Materials

.1 Service pipe shall be:

a. PVC SDR 35 conforming to CSA B 182.1, or the material as the sewer main.

b. Couplings shall be either, in line tees, or saddles c/w gasket and stainless steel straps, bolts and nuts.

2. Water Service Fittings:

a. Copper pipe Type K soft copper or HDPE DR 11.0 for sizes up to 50mm Ø. Larger services shall be of the same material as the water main.

b. Corporation Cocks shall be compression type, Ford or approved equal, AWWA thread.

c. Curb stops shall be Ford or approved equal, ball valve without a drain. Curb stops 38 mm Ø and larger shall be ball bearing type.

d. Service Boxes shall be epoxy coated extension type for maximum extension of 3.5 metres c/w stainless steel operating rod, brass clevis and key.

6.3.0 Service Connections – Installation Requirements

.1 Where the water service is 50 mm Ø or smaller in size, the water and sanitary services shall be installed in a common trench.

.2 The services shall be installed so that when facing the lot the water service is on the right of the sanitary service.

.3 The minimum depth of cover over sanitary and water services at the property line shall be 2.5 metres and shall be in accordance with Standard detail drawings 6.20 to 6.23.

.4 Where sewer services are required to be connected to mains in excess of 4.5 metres deep, risers shall be installed to within 3.6 metres of the finished surface in accordance with Standard detail drawing 6.23.

.5 Corporation stops and curb stops shall be installed in accordance with Standard detail drawing 6.22.

.6 Where copper services are installed there is to be a horizontal bend near the corporation stop. Vertical “Goose Necks” are not permitted. The service shall be snaked along the trench to allow for thermal contraction.

.7 Curb stops shall be installed near property line or easements and the water service shall extend to property line or easement as shown on Standard detail drawings 6.20 to 6.23 and 7.129 to 7.134.

.8 Sewer services shall extend to the property line or easement and shall be properly capped, as shown on Standard detail drawing 6.23.

.9 All services shall be laid on 75 mm of granular bedding and shall have 300 mm of granular cover.

.10 Blue/Green painted stakes 50 mm X 100 mm in size shall be placed at the end of each service connection and shall extend a minimum of 500 mm above the ground.

.11 The developer shall employ a CSA approved material testing firm to complete the testing as outlined in Table 7.2. One copy of the results shall be immediately forwarded to the County for review.

End of Section 6

7.1.0 GEOMETRIC DESIGN STANDRDS

.1 The following design standards shall be utilized for all development within Brazeau County. All specifications shall be pre-approved by the Department of Pubic Works prior to being utilized.

.2 Development specifications not establish in this manual shall be found in the latest documents published by Alberta Transportation or the Transportation Association of Canada (TAC).

.3 Street cross-sections shall be as defined by Tables 7.1A, 7.1B, 7.1C and 7.1D, and the following Standard Cross-Sections:

Standard Drawings No. 7.010 through 7.45.

.4 Concrete curb and gutter shall be constructed on designated streets in accordance with Std. Dwg. No.'s 7.22.to 7.29.

.5 Separate sidewalks shall be 1.5 m wide and shall be constructed in accordance with Std. Dwg. No. 7.21. Monolithic curb, gutter and sidewalks shall have a 1.5 m sidewalk width in accordance with Standard Drawings 7.25 and 7.26. Sidewalks shall be clear of all obstructions including surface utilities. Sidewalk locations shall be in accordance with Standard Roadway Drawings 7.130 through 7.134. Wider sidewalks may be required in areas of high pedestrian activity, as determined by the County Director of Public Works.

.6 Rear lanes (alleys) shall have a surfaced width of 5.6 m within a 6.0 m right-of-way. Where rear lane traffic activity is expected to be high, such as for certain commercial developments, a wider surfaced width and right-of-way may be required as determined by the County Director of Public Works.

.7 All driveways shall be constructed to give a minimum of 1.8 m clearance from any structure, e.g. hydrants, light standards, service pedestals and shall be constructed in accordance with Std. Dwg. No.s 7.25 and 7.26.

.8 Paraplegic Ramps shall be constructed in accordance with Standard Drawing No. 7.20.

7.2 QUALITY CONTROL TESTING

Please refer to Table 7.2 Testing Frequency for minimum quality control testing requirements.

7.3 VERTICAL ALIGNMENT

.1 Minimum gutter grades around all curves and along all tangents shall not be less than 0.5%. Minimum gutter grades on curb returns shall be 0.6%.

.2 Maximum gutter grades shall not exceed those defined by Tables 7.1A and 7.1D.

.3 All roadways shall be crowned at a rate shown on the applicable standard drawings or Cross-Sections. The standard crown rate is 2.0% to 3.0%.

.4 All vertical curves shall be designed to meet or exceed the following minimum design requirements:

K Values			
Design Speed (km/h)	Crest	Sag	Minimum Length (m)
50	10	12	65
60	15	20	85
70	25	25	110

K = L/A
L = length of vertical curve in metres
A = Algebraic difference in grades percent

.5 The maximum superelevation shall be in accordance with Tables 7.1A, 7.1C and 7.1D.

.6 Rear lane (alleys) shall have a minimum longitudinal grade of 0.6%. If gravel-surfaced, the lane shall be cross sloped to one side at 3.0%. If paved, the lane shall have a centre swale and cross slopes of 2.5%.

7.4 HORIZONTAL ALIGNMENT

7.4.1 General

.1 All horizontal curves shall be designed to meet the minimum design requirements found on Table 7.1B, 7.1C and 7.1D.

.2 Minimum edge of pavement radius for cul-de-sacs is 11 metres in residential areas and 14 metres in industrial areas.

3 Maximum cul-de-sac length shall be 100 metres.

7.4.2 Curb Returns

.1 Curb returns at residential local street intersections shall be constructed to a minimum radius of 7.5 m.

.2 Curb returns at residential collector street intersections shall be constructed to a radius of 12.5 metres.

.3 In industrial/commercial areas the radius should be 15 metres to accommodate truck turning movements.

.4 For arterial street intersections the curb returns shall be designed in consideration of the type and volume of the turning traffic. Two and three centred curves with or without islands may be required.

.5 Paraplegic Ramps are required at all intersections which have sidewalks.

7.5 PAVEMENT STRUCTURE

.1 All roadways other than rear lanes (alleys) shall be paved with hot mix asphalt. A geotechnical report with recommended pavement designs shall be conducted by a Professional Engineer employed by a recognized engineering firm, and submitted to the County Director of Public Works for review.

.2 Paved roadways shall be designed in accordance with the latest edition of Asphalt Institute method of pavement design using minimum design loadings of 8165 kg (18,000 pound) axle loads for local streets and 10,886 kg (24,000 pound) axle loads for collector streets. All industrial/commercial roads shall be designed using a minimum design loading of 10,886 kg (24,000 pound) axle loads.

.3 The design parameters such as traffic count, percentage of trucks, California Bearing Ratio (CBR), etc., are to be outlined to the County Director of Public Works. The County reserves the right to request the Developer to engage a geotechnical engineering agency to carry out CBR tests on the subgrade prior to paving to confirm adequacy of design.

.4 The following are the minimum pavement structure requirements. An independent pavement design, as outlined in 7.4.1 and 7.4.2, is required for all developments. Additional pavement structure strengths and/or materials may be required in areas with poor subgrade materials pending the results of the geotechnical investigation.

Street	Residential Land Use	Industrial/Commercial Land Use
Local	150 mm Subgrade Prep. to 100% SPD 300 mm Aggregate Base Course 75 to 100 mm Asphaltic Concrete Surface Note: 2 lifts - 40 mm / 35 mm final* (Light Duty)	150 mm Subgrade Prep. to 100% SPD 380 mm Aggregate Base Course 100 mm Asphaltic Concrete Surface (Heavy Duty)
Collector	150 mm Subgrade Prep. to 100% SPD 380 mm Aggregate Base Course 100 mm Asphaltic Concrete Surface (Heavy Duty)	300 mm Subgrade Prep. to 100% SPD 380 mm Aggregate Base Course 100 to 125mm Asphaltic Concrete Surface (Heavy Duty)
Arterial	300 mm Subgrade Prep. to 100% SPD 380 mm Aggregate Base Course 125 mm Asphaltic Concrete Surface (Heavy Duty)	300 mm Subgrade Prep. to 100% SPD 380m Aggregate Base Course 125 mm Asphaltic Concrete Surface (Heavy Duty)

* Note: The County may require that the final lift of Asphalt Concrete Pavement be placed in the second year of the maintenance period.

.5 Asphalt Concrete Pavement shall be placed in the following lift thickness:

Two or more lifts shall be required when placing asphalt concrete pavement. The lift thickness selection shall be determined by the Contractor except that:

(a) the minimum thickness of a top lift shall be 40 mm.
(b) the maximum thickness of any lift shall be 100 mm.
(c) the minimum thickness of all lifts shall be 35 mm or greater.

.5 Alternative pavement designs, such as soil cement base, may be approved by the County Director of Public Works. Approval of alternate pavement designs must be obtained in writing from the County Director of Public Works prior to submission of design drawings.

.6 Gravel surfacing is permitted on rear lanes (alleys). Aggregate base material shall be used to a minimum depth of 225 mm, 150mm placed during initial construction, and 75 mm placed during the second year of the maintenance period.

7.6 GRANULAR BASE

.1 Gradations to be within the limits specified below when tested in accordance with the latest edition of the Alberta Transportation Standard Specifications for Highway Construction and yield a smooth curve without sharp breaks when plotted on a semi-log gradation chart.

Designation		2	2	2
Class (mm)		20	25	50
Percent Passing Metric Sieve (CGSB 8-GP-2M) µm	50 000	--	--	100
	25 000	--	100	45-85
	20 000	100	82-97	--
	16 000	84-94	70-94	32-78
	10 000	63-86	52-79	--
	5 000	40-67	35-64	20-65
	1250	20-43	18-43	--
	630	14-34	12-34	--
	315	9-26	8-26	6-30
	160	5-18	5-18	--
	80	2-10	2-10	2-10
% Fracture by Weight	All + 5000	60+	60+	50+
Plastic Index (PI)		NP-6	NP-6	NP-6
L.A. Abrasion Loss Percent Max.		50	50	50

.2 60% of material 5 mm and larger shall have at least two freshly fractured faces.

.3 All granular materials should be compacted to 100% Standard Proctor Density.

7.7 ASPHALTIC CONCRETE PAVEMENT

7.7.1 General

Asphaltic concrete pavements shall consist of mineral aggregate, filler and asphaltic binder, and shall be laid and compacted to specified thickness and shall conform to the approved lines, grades and typical cross sections.

7.7.2 Minerals

.1 Aggregates in Mix

When tested by means of laboratory sieves, the combined aggregates in the mix shall meet the following gradation.

Designation		Light Duty	Heavy Duty
Class (mm)		12.5	12.5
Percent Passing Metric Sieve (CGSB 8-GP-2M) µm	12 500	100	100
	10 000	78-94	83-90
	5 000	53-80	55-70
	1250	33-55	26-48
	630	24-44	18-38
	315	16-32	12-30
	160	8-22	8-18
	80	4-10	2-6
% Fracture by Weight	All + 5000	70+	70+
Plastic Index (PI)		NP	NP
L.A. Abrasion Loss Percent Max.		40	40

.2 At least 70 percent of all aggregate retained above the 5 mm sieve shall have a minimum of two fractured surfaces faces.

.3 The percentage of the manufactured fines in the –5000 portion of the combined aggregate shall be a minimum of 75% for the Heavy Duty mixture and 50% for the Light Duty mixture.

.4 The asphalt binder shall be a premium grade of 150-200 (A) asphalt cement as described in the latest edition of the Alberta Transportation Standard Specifications for Highway Construction.

7.7.3 Mix Design Characteristics

.1 The asphalt mix design shall follow the Marshall method of mix design as stated in the latest edition of the Alberta Transportation Standard Specifications for Highway Construction.

The mix design shall be carried out by a recognized Professional Engineering Firm and shall be submitted to the County Director of Public Works for approval at least one week prior to commencement of work.

.2 The mix design shall conform to the following criteria:

Characteristic	Light Duty Mix	Heavy Duty Mix
No. of blows	50	75
Marshall Stability N (min)	4,500	6,700
Flow Value mm	2 to 4	1.5 to 3
Air Voids, % of total mix	3 to 4.5	3.5 to 4.5
% Voids in Mineral Aggregate	15 min	15 min
Asphalt Content, % of total mix	5 to 7	5 to 7
Retained Stability % (min)	75	75

7.7.4 Final Density Requirements

Immediately after the asphalt mixture has been spread, or as soon as the mixture temperature will permit, the surface shall be compacted. In general, compaction shall continue until all roller marks are eliminated and further compaction is not possible, or specified density is reached. The asphalt mixture shall be compacted to an average density of at least 97 percent and a minimum density of 95 percent at all locations, based on the Marshall density determined for each aggregate designation and source. The required density shall be attained through the full depth of each layer placed.

7.8 PRIME COATS AND TACK COATS

7.8.1 Description

Prime coats shall be the application of bituminous material to subgrade or previously prepared gravel base course prior to placing bituminous surfacing materials.

Tack coats shall be the application of bituminous material to a previously constructed paving surface of any type in preparation of placing bituminous surfacing materials, and against curb gutter faces, manholes, valves and other appurtenances in the street to be paved.

7.8.2 Prime Coat (Over Granular Base)

The bituminous material for priming the base course shall be liquid asphalt. The asphalt types may vary from M.C. 30 to M.C. 250; from SS-1 to a special emulsified primer (S.E.P.1) to suit the conditions of the base. The rate of application may vary from 0.50 to 1.50 L/m² based on the nature of the base materials. The rate should permit a good penetration of the base without ponding on the surface. Excess asphalt materials remaining 6 hours after application shall be absorbed and removed with sand blotter material. Temperature of application shall fall within the following limits:

Medium Curing Asphalt:
M.C. 30 – (51° C – 68° C)
M.C. 70 - (74° C – 88° C)
M.C. 250 - (100° C – 110° C)

Emulsified Asphalt:
SS-1 - (24° C – 54° C)

Special Emulsified Primer:
S.E.P.1 (15° C – 50° C)

7.8.3. Tack Coat (Over Asphalt Base)

The asphalt for the tack coat may vary from SS-1 to SS-1H; from R.C. 30 to R.C. 250 depending on conditions to suit the base. The SS emulsion shall be diluted by adding an equal amount of water prior to application. The rate of application shall be 0.25 to 0.90 L/m², based on the condition of the asphalt base. The rate shall ensure that a uniform coverage providing a good bond, after curing, is achieved. Temperatures of application shall fall within the following limits:

Rapid Curing Asphalts:	Emulsified Asphalt:
R.C. 30 -(51° C – 68° C)	SS-1 - (24° C – 54° C)
R.C. 70 - (74° C – 88° C)	SS1H - (24° C – 54° C)

7.9 CONCRETE FLATWORK

7.9.1 Description

Curb, gutter and sidewalk shall consist of concrete placed to conform to the approved lines, grades and typical cross sections.

7.9.2 Minerals

.1 Portland Cement

Portland cement shall conform to A.S.T.M. C150 or CSA Standard A5, latest revision thereof.

.2 Aggregates

Concrete aggregates shall conform to A.S.T.M. Specification C33, latest revision thereof.

.3 Air Entraining Agent

An air entraining agent conforming to A.S.T.M. C260 shall be added to all concrete in sufficient amounts to produce air entrainment between limits of 5.0% to 8%.

.4 Calcium Chloride

The use of calcium chloride will not be permitted except during cold weather conditions when a maximum of 2%, by weight of cement, will be allowed with Type 10 concrete.

.5 Curing Compound

Curing compound shall be a resin base impervious membrane and shall conform to A.S.T.M. C309 Type 1D - Type B. It shall be sufficiently free from permanent colour to result in no profound change in colour from that of natural concrete. The compound shall however contain a dye of colour strength sufficient to render the film distinctly visible on the concrete for a period of at least four (4) hours after application.

6. Fly Ash

The maximum fly ash content is 10% by mass of cement. No fly ash permitted after September 1st.

7.9.3 Mix Design

.1 The concrete for curb, gutter and sidewalk shall meet the following requirements:

Minimum Compressive Strength at 28 days	30 MPa
Maximum Size of Coarse Aggregate	20 mm
Slump	25 mm - 75 mm
Entrained Air Content	5 to 8%

.2 After September 30th, all concrete shall attain the specified 28 day strength in 7 days.

7.9.4 Placing of Concrete

.1 The subgrade shall be compacted to a minimum of 100% Standard Proctor Density under curbs, driveways, and swales in travelled areas and to 95% Standard Proctor Density under sidewalks.

.2 Concrete shall be placed and vibrated to form curbs, gutters and sidewalks in accordance with the Standard Drawings.

.3 The backfilling behind curb, gutter and sidewalk shall be carried out immediately after form removal and shall be compacted to a minimum of 95% Standard Proctor Density.

7.9.5 Concrete work in Cold Weather

When the mean average temperature is below 5°C, suitable means shall be provided for maintaining the concrete at a temperature of at least 10°C for seven days after placing of concrete.

7.10 TESTING AND INSPECTION

The Developer shall employ a CSA approved material testing firm to complete the tests as outlined in the Table 7.2. One copy of all test results shall be submitted to the County for their review.

7.11 TRAFFIC CONTROL DEVICES, STREET NAME SIGNS, RUAL ADDRESSING AND PAVEMENT MARKINGS

7.11.1 General

.1 Plans shall be provided to the County Director of Public Works which depict the locations and details of all traffic control devices (traffic signs and traffic signals), street name signs and pavement markings.

.2 All traffic control devices and pavement markings shall be designed and installed in accordance with the latest edition of “Uniform Traffic Control Devices for Canada” as issued and revised from time to time by the Transportation Association of Canada (formerly RTAC).

.3 Guide and information signing shall be designed and installed in accordance with the “Urban Guide and Information Sign Manual” as issued by the Alberta Government.

.4 Street signing and rural addressing requirement shall obtained by the applicable County Authority.

7.11.2 Materials

.1 All signs shall utilize reflective sheeting that meets or exceeds the minimum requirements specified in ASTM-D4956, performance requirements Type III, High Intensity Retroreflective Sheeting.

.2 All sign posts shall be 50 mm diameter galvanized schedule 40 steel post unless otherwise approved by the County Director of Public Works.

.3 Along arterial streets, and at arterial street intersections, pavement markings shall be of a "permanent" type, inlaid with the final asphaltic concrete surface course. Painted markings are acceptable elsewhere.

7.11.3 Installation

.1 All traffic control signs shall be mounted to provide 2.0 m vertical clearance to the lowest portion of the sign, unless otherwise approved by the County Director of Public Works.

.2 All signs shall be mounted to provide a minimum of 0.3 m of horizontal clearance from curb face.

7.12 STREET LIGHTING

7.12.1 General

.1 The following standards are applicable to all types of development within Brazeau County except for industrial developments. Standards for industrial development shall be determined by the County during the initial planning stages of the proposed development.

.2 All street lighting cables to light standards, shall be installed underground.

7.12.2 Design

.1 Street lighting posts with fixtures shall be steel posts comparable to the existing posts within the County for the several types of streets.

.2 The location and density of street lights shall be such to provide the following minimum lighting levels.

			Criteria	
		Illuminance	Uniformity	Maximum
Roadway		Average	Maximum	Max/Mm
Class	Area Class	(lux)	Avg/Mm Ratio	Ratio
Arterial	Downtown	22	3:1	6:1
	Commercial	17	3:1	6:1
	Residential	12	3:1	6:1
	Industrial	9	3:1	6:1

Roadway Class	Area Class	Illuminance Average (lux)	Criteria Uniformity Maximum Avg/Mm Ratio	Maximum Max/Mm Ratio
Collector	Downtown	17	3:1	6:1
	Commercial	13	3:1	6:1
	Residential	10	3:1	6:1
	Industrial	6	3:1	6:1
Local	Downtown	12	3:1	6:1
	Commercial	10	3:1	6:1
	Residential	6	6:1	12:1
	Industrial	6	6:1	12:1
Lane	Downtown	6	6:1	10:1
	Commercial	6	6:1	10:1
	Residential	4	6:1	12:1

.3 Street lighting fixtures shall be high-pressure sodium type.

.4 Street lighting designs shall be approved by the local electrical authority.

7.12.3 Location

.1 The Developer shall coordinate the location of streetlights to ensure that they do not interfere with the other utilities and driveways.

.2 Street lights in general shall be offset 2.5 metres from the projection of common property lines between two lots.

.3 Streetlights shall be offset from roadway and sidewalks in accordance with Table 7.1B, 7.1C and 7.1D.

.4 Streetlights shall be provided for each internal park area that does not abut onto a lighted street. A streetlight shall be located at the point where each walkway opens out onto the park area.

.5 All street light standards shall be painted in a manner comparable to the existing standards within the County.

7.12.4 Costs

.1 Any capital contribution that the utility company may charge for installation of underground street lighting shall be paid by the Developer.

.2 The Developer shall pay all charges to the utility company for the operation and maintenance of street lights installed in the subdivision until occupancy of 50% of the Subdivision Area has been reached. At that time, the County will assume payment of operation and maintenance charges to the utility company.

TABLE 7.1A
SUMMARY OF RECOMMENDED DESIGN STANDARDS FOR STREETS
URBAN

Classification	Design Speed[a] (km/h)	Right-of-Way Width (m)	Pavement Widths (m)	Travel Lanes[c]	Parking Lanes	Maximum Gradients (%)	Maximum Superelevation (m/m)
Undivided Arterial Divided Arterial (Dwg. No. T10 & T11)	60 - 70 60 - 90	30.0 40.0	14.8 20.3	4 - 3.7 m 4 - 3.7 m	outside lanes none	5 4	.04 - .06 .04 - .06
Major Residential Collector (Dwg. No. T4)	60	25	12.0	2 - 3.5 m	2 - 2.50 m	7	.025 - .04
Minor Residential Collector (Dwg. No. T3)	60	25	11.0	N/A	N/A	7	.025-.04
Local Residential (Dwg. No. T2)	60	25	11.0	N/A	N/A	8	.025
Local Industrial (Urban) Local Industrial (Rural) (Dwg. No. T5 & T6)	60 60	20.0[d] 30.0	11.5 11.0	N/A N/A	Optional Optional	6 6	.025 .025
Urban Industrial Collector Rural Industrial Collector (Dwg. No. T7 & T8)	60 – 70 60 - 70	23 30	13.0 12.5	N/A N/A	Optional Optional	6 6	.025 .025
Downtown Commercial (Dwg. No. T9)	60 - 70	20.12	13.0	3.5 m	2 – 3.0 m	6	.025

Notes: a. Posted speed to be 10 km/h less than design speed.
b. Land for noise attenuation will be in addition to the road right-of-way requirement.
c. Additional travel lane width may be required to accommodate cyclists, e.g. on arterials the outside lanes are 4.2 m wide.
d. Additional right-of-way required where rural roadway cross section is used.
e. Narrower R.O.W. may be allowed for short cul-de-sacs or restricted access areas.

Note: All specifications shall be pre-approved by the Department of Pubic Works prior to being utilized.

TABLE 7.1B
SUMMARY OF RECOMMENDED DESIGN STANDARDS FOR STREETS
URBAN

Classification	Minimum Radius of Curvature (m)	Minimum Intersection Spacing (m)	Minimum Corner Cuts at Intersections	Sidewalks	Lighting Poles and Other Obstructions	Parking	Access
Undivided Arterial Divided Arterial (Dwg. No. T10 & T11)	190 (70 kph max) 190 (70 kph max)	150 200	30 m Radius	Separate, 1 or 2 sides Separate, 1 or 2 sides	2.5 m min. from face of curb or behind sidewalk 2.5 m min. from face of curb or behind sidewalk	Restricted Prohibited	Restricted[a] Restricted[a]
Minor and Major Residential Collectors (Dwg. No. T3 & T4)	150 (60 kph max)	60	10-15 m	Separate or Mono, both sides	2.0 m min. from face of curb	Permitted	Permitted[b]
Local Residential (Dwg. No. T2)	90 (50 kph max)	60	6-10 m	Mono, both sides	2.2 m min. from face of curb	Permitted	Permitted
Local Industrial (Urban)	90 (50 kph max)	60	10	Optional	1.65 m min. from face of curb	Optional	Permitted
Urban Industrial Collector	150 (60 kph max)	60	10 m	Optional	2.25 m min. from face of curb.	Optional	Some Restriction
Downtown Commercial (Dwg. No. T9)	150 (60 kph max)	60	15 m	Optional	2.0 m min. from face of curb	Optional	Some Restrictions

Notes: a. Prohibited for residential land uses.
b. Rear lane (alley) access preferred.
Note: All specifications shall be pre-approved by the Department of Pubic Works prior to being utilized.

TABLE 7.1C
SUMMARY OF RECOMMENDED DESIGN STANDARDS FOR STREETS
RURAL

Classification	Design Speed[a] (km/h)	Right-of-Way Width (m)	Pavement Widths[h] (m)	Travel Lanes[c]	Parking Lanes	Maximum Gradients (%)	Maximum Superelevation (m/m)
Arterial Road (Fig. 9)	90	40.0[b]	9.0	2 - 3.5 m	N/A	6	.06
Collector Road (Fig. 10)	90	30	8.0	2 - 3.5 m	N/A	6	.06
Local Road 2 (Fig. 13)	90	30	8.0	2 - 3.5 m	N/A	7	.08
Local Road 1 (Fig. 14)	90	30	7.0	N/A	N/A	7	.08
Country Residential 4 (Fig. 23)	60	30	9.0	2 - 3.7 m	N/A	6	.06
Country Residential 3 (Fig. 22)	60	30	8.0	2 - 3.5 m	N/A	6	.06
Country Residential 2 (Fig. 16)	60	30	8.0	2 - 3.5 m	N/A	6	.06
Country Residential 1 (Fig. 17)	60	25	7.0	N/A	N/A	6	.06
Local Industrial (Rural) (Dwg. No. T5 & T6)	60	30	11.0	N/A	N/A	6	.025
Industrial Collector	60-70	30	12.5	N/A	N/A	6	.025

Notes: a. Posted speed to be 10 km/h less than design speed.
b. Land for noise attenuation will be in addition to the road right-of-way requirement.
c. Additional travel lane width may be required to accommodate cyclists, e.g. on arterials the outside lanes are 4.2 m wide.
All specifications shall be pre-approved by the Department of Pubic Works prior to being utilized.

TABLE 7.1D
SUMMARY OF RECOMMENDED DESIGN STANDARDS FOR STREETS
RURAL - HAMLET

Classification	Minimum Radius of Curvature	Minimum Intersection Spacing	Suggested Cut Corner	Sidewalks	Lighting Poles and Other Obstructions	Parking	Access
Arterial (Fig. 9)	440 (100 kph max)	200	15	Required	5 from edge of Pavement	Prohibited	Restricted
Collector Road (Fig. 10)	440 (100 kph max)	200	15	Required	5 from edge of pavement	Prohibited	Restricted
Local Road 2 (Fig. 13)	300 (90 kph max)	200	15	Required	5 from edge of pavement	Restricted	Permitted
Local Road 1 (Fig. 14)	300 (90 kph max)	200	15	Required	5 from edge of pavement	Prohibited	Permitted
Country Residential 4 (Fig. 23)	150 (60 kph max)	60	10	Recommended	2 from edge of pavement	Restricted	Permitted
Paved Country Residential 3 (Fig. 22)	150 (60 kph max)	60	10	Recommended	2 from edge of pavement	Restricted	Permitted
Country Residential 2 (Fig. 16)	150 (60 kph max)	60	10	Recommended	2 from edge of pavement	Restricted	Permitted
Country Residential 1 (Fig. 17)	150 (60 kph max)	60	10	Recommended	2 from edge of pavement	Restricted	Permitted
Local Industrial (Rural) (Dwg. No. T5 & T6)	90 (50 kph max)	60	15	Recommended	2.25 from edge of pavement	Restricted	Permitted
Industrial Collector	150 (60 kph max)	60	15	Recommended	2.25 from edge of pavement	Restricted	Permitted

TABLE 7.1E
SUMMARY OF RECOMMENDED DESIGN STANDARDS FOR STREETS
RURAL-HAMLET

Classification	Design Speed[a] (km/h)	Right-of-Way Width (m)	Pavement Widths[h] (m)	Travel Lanes[c]	Parking Lanes	Maximum Gradients (%)	Maximum Superelevation (m/m)
Hamlet Residential	60	25[b]	11	2 - 3.5 m	Optional	7	.06
Hamlet Collector	60	30	11	2 - 3.5 m	N/A	6	.06
Hamlet Commercial	60	30	11	2 - 3.5 m	N/A	7	.08

Notes: a. Posted speed to be 10 km/h less than design speed.
b. Land for noise attenuation will be in addition to the road right-of-way requirement.
d. Additional travel lane width may be required to accommodate cyclists, e.g. on arterials the outside lanes are 4.2 m wide.
All specifications shall be pre-approved by the Department of Pubic Works prior to being utilized.

TABLE 7.1F
SUMMARY OF RECOMMENDED DESIGN STANDARDS FOR STREETS
RURAL

Classification	Minimum Radius of Curvature	Minimum Intersection Spacing	Suggested Cut Corner	Sidewalks	Lighting Poles and Other Obstructions	Parking	Access
Hamlet Residential	150 (60 kph max)	60	10	Required min. 1 side	2 from edge of pavement	Permitted	Permitted
Hamlet Collector	150 (60 kph max)	60	10	Required both sides	2 from edge of pavement	Restricted	Permitted
Hamlet Commercial	150 (60 kph max)	60	10	Recommended	2 from edge of pavement	Restricted	Permitted

Notes: a. Posted speed to be 10 km/h less than design speed.
b. Land for noise attenuation will be in addition to the road right-of-way requirement.
e. Additional travel lane width may be required to accommodate cyclists, e.g. on arterials the outside lanes are 4.2 m wide.
All specifications shall be pre-approved by the Department of Pubic Works prior to being utilized.

TABLE 7.2 TEST FREQUENCY

Specification	Type of Test	Minimum Test Frequency	Remark:
Trench Backfilling Trench Backfilling & Compaction for Electrical Installation	Density Test: - Trench longer than 15 m - Trench shorter than 15 m	2 tests per 600 mm of depth for every 100 m of trench length 3 tests per trench	Testing will vary with location of project and consequences of trench settlement.
Roadway Excavation, Backfill & Compaction	Grading/Fill Compaction: Subgrade Preparation: Proof Rolling:	1 density test per 2000 m² of compacted lift 1 density test per 1000 m² of compacted subgrade lift Entire project	
Aggregate: General Granular Sub-base Granular Base	Source Sampling: Compaction: Proof Rolling	1 sieve analysis per 500 tonnes (250 m³) of asphalt aggregate for crushing control 1 sieve analysis per 2500 (1250 m³) tonnes of base and subbase aggregate 1 density test per 1500 m² of compacted granular lift of road Entire project	Required 2 weeks prior to commencing work
Stabilization: Lime	Source Sampling: Test Area: Proof Rolling:	400 m² to establish and demonstrate work methods and timing At completion of curing period	Required 2 weeks prior to commencing work
Soil Cement	Source Sampling (aggregate): Mix Design: Thickness Test: Compaction Test: Strength Test:	1 sieve analysis per 2500 tonnes (1250 m³) 1 core sample per 1000 m² of soil cement in place 1 density test per 1000 m² of soil cement in place 1 7-day compressive strength test per 1000 tonne of soil cement	Required 2 weeks prior to commencing work Required 2 weeks prior to commencing work Areas suspected to have inadequate thickness
Topsoil	Analysis:- On-site Sources - Contractor Supplied	1 analysis report for each topsoil source Contractor to supply 1 litre sample of each topsoil type for testing	Required 4 weeks prior to commencing work

TABLE 7.2 TEST FREQUENCY - CONTINUED

Asphaltic Concrete Paving	Mix Design: Density/Thickness Test: Mix Proportions:	3 cores per 6000 tonnes of asphalt pavement (5000 m^2 for a 50 mm lift) 1 Marshall core per 6000 tonnes of mix, with a minimum of 1 test from each full day's production	Required 2 weeks prior to commencing work
Watermain	Hydrostatic/Leakage Test: Bacteria/Chlorine Test:	Test section not to exceed 365 m in length	Provide County at least 24 hours notice
Storm Sewer Sanitary Sewer	Television and Photographic Inspections:	Upon completion of storm sewer installation, after backfilling	
Forcemains	Hydrostatic/Leakage Test:	Test section not to exceed 365 m in length	Provide County at least 24 hours notice
Concrete Curbs & Gutter, Walks, Medians, Driveways & Swales General Concrete Slip Formed Concrete	Mix Design: Slump Test: Air Content Test: Strength Test:	1 per 20 m^3 for each class of concrete poured, min. 1 per day 1 per 20 m^3 for each class of concrete poured, min. 1 per day 1 per 20 m^3 for each class of concrete poured, min. 1 per day	Required 2 weeks prior to commencing work Every truck until consistency is established Every truck until consistency is established

Part 1 – Lot Grading

8.1.0 Plans

.1 The Developer shall submit plans indicating the following information:

a. The contours of the existing ground.

b. Proposed elevations, grades, and drainage.

c. The location of all drainage and water storage facilities.

d. Proposed elevations of development and all lot corners.

e. The direction of surface drainage.

f. The proposed elevations and grades on public lands.

.2 A common drawing shall be used to consolidate the above information. (Grading Plan).

8.2.1 Design

.1 The grading design shall compliment the overall design of both major and minor storm sewer systems. In general a lot shall be graded in such a manner that no surface water will be conducted to any property other than a drainage system on public property. Where surface drainage is directed from one lot toward another lot a drainage easement shall be registered with the plan of subdivision.

.2 Public lands shall be graded to drain to a storm water system.

.3 Boulevard areas shall be graded toward the road at a minimum 2% grade.

8.2.0 Lot Grading

8.2.1 Plans

.1 The Developer shall submit to the municipality an overall plan of the area to be developed clearly indicating the following information:

a. The existing surface elevations.

b. The proposed lot corner elevations.

c. The design floor and final ground elevation at all planned structures.

d. The location and elevation of building services.

e. The direction of drainage and any drainage easements.

.2 The developer shall submit an individual lot grading plan for each lot in accordance with Standard detail drawing 1.

8.2.2 Retaining Walls

.1 Where extremes in elevation of adjoining lots require the construction of a retaining wall, such shall be indicated on the proposed grading plan. No work or construction shall be permitted on lots subject of or adjacent to the said retaining wall without a commitment of the either owner of the two lots to construct such a retaining wall at the time of building construction.

8.2.3 Design

.1 In general, lots shall be graded to achieve a minimum of a 4% slope away from the building and a minimum slope of 2% along lot lines.

.2 In cases where the backyard slopes toward the building, provisions are required to keep the surface runoff at least 3.0 metres from the building with the possibility of draining the surface water along the lot lines to the street.

.3 Reserves and public lands shall be graded to drain toward developed streets, lanes or drainage systems.

8.2.4 Surface Drainage

.1 Where surface drainage swales are required they are to be constructed as outlined in Section 5.12.0 and Drawing No 7.29.

Part II – Landscaping

8.3.0 Description

.1 Work under landscaping includes but is not limited to the following:

a. Site preparation.
b. Seeding and/or sodding.
c. Planting.

8.3.1 Scope

.1 This section covers the following areas:

a. Boulevards -Areas between curb and sidewalk.
-To be topsoiled and sodded by the developer.
-Plant material as per 8.4.0.

b. Buffer Strip -Areas separating roads and property.
-To be topsoiled and sodded by the developer.
-Plant material as per 8.4.0.

c. Utility lots and walkways.
-To be topsoiled and seeded by the developer.
-Plant material as per Section 8.4.0.

d. Median strips and traffic islands.
-To be topsoiled and seeded by the developer.
-Plant material as per Section 8.4.0.

e. Public Service and recreation lands.
-To be topsoiled and seeded by the developer.
-Plant material as per Section 8.4.0.

.2 For fencing requirements see Section 8.10.0

8.3.2 Landscaping Plan

.1 The Developer shall submit a landscaping plan detailing the proposed improvements. This plan shall be drawn to a scale of 1:1000 and shall identify areas to be seeded or sodded, location and name of all trees and shrubs, location of plant beds, location and type of fence, location of park furniture or playground equipment.

.2 The developer shall submit detailed drawings of proposed park furniture or playground equipment for approval by the County Director of public works. All park furniture and playground equipment shall meet current CSA standards.

.3 No landscaping shall commence until the landscaping plans have been approved by the County.

8.4.0 Landscaping design requirements

8.4.1 General Requirements

.1 Landscape specifications for rough site work, topsoil, seed and sod, trees, shrubs, ground cover, and mulches, see Sections 8.5 through 8.9.

.2 Where possible, trees will be set back a minimum distance from above and below ground utilities and property lines as specified in this section.

.3 Trees will be setback a minimum of 1.0 metres from back of curb, walk or verge.

.4 Shrubs shall be setback a minimum of 0.45 metres from any back of curb, sidewalk, verge, or landscape edging.

.5 All plant materials shall be specified on the approved plant list on the landscape drawings.

.6 Planting bed layouts are to be designed to easily accommodate large turf maintenance and mowing equipment.

.7 Uniform or screen fences shall be positioned wholly on adjacent privately owned lands.

.8 Uniform or screen fencing is to meet Leisure Services standards. See Section 8.10.

.9 Furniture may be provided by the developer and placed at strategic locations. The following setbacks shall be respected:

a.	Benches	1.0 metres from back of walkway.
b.	Waste Receptacles	250 mm from back of walk.
c.	Picnic tables	Designed in clusters to the satisfaction of the County.

.10 Furniture shall be anchored to a concrete base.

.11 No annual planting will be approved in planting beds to be maintained by the County.

8.4.2 Residential Boulevards

.1 Boulevards separated by a walk must be graded and sodded between the curb and walk by the Developer to the satisfaction of the County Director of Public Works.

.2 Boulevards shall be designed with a minimum boulevard tree spacing as specified by the “Boulevard Trees and Spacing Guidelines”. Section 8.4.5.

.3 The minimum deciduous tree calliper shall be 60mm.

8.4.3 Collector Roadways

.1 Collector boulevards must be graded, topsoiled, sodded and landscaped by the Developer to the satisfaction of the County Director of Public Works.

.2 Boulevards shall be designed with a minimum tree spacing of one tree every 6 to 10 linear metres as defined in Section 8.4.5.

.3 The minimum deciduous tree calliper shall be 60 mm. The minimum coniferous tree height shall be 2.5 metres. A tree mix of 60% Coniferous and 40% deciduous is suggested.

.4 Boulevards may be designed to include planting beds, shrubs and ground cover.

.5 The minimum shrub height and spread shall be 600 mm.

8.4.4 Major entrance routes to the County or Hamlets

.1 Boulevards shall be designed with tree spacing as indicated in Section 8.4.5.

.2 Boulevards shall be designed to include large planting beds with trees, shrubs, and ground cover.

.3 The minimum deciduous tree calliper shall be 80 mm. The minimum coniferous tree height shall be 3.0 metres. A tree mix of 60% coniferous and 40% deciduous is required.

.4 The recommended shrub height and spread is 600 mm to 1200 mm.

8.4.5 Development of Previously Developed Lands

.1 In the event the Developer is redeveloping existing facilities or previously serviced lands, the Development Officer may require the landscape plans to be approved by the Director of Public Works prior to the issuance of a Development Permit.

.2 Spacing Guidelines

Boulevard Tree and Spacing Guidelines	
Common Name	Maximum Spacing (Metres)
American Elm (Not Recommended)	10
Poplar Brooks	10
Poplar NW	10
Brandon Elm (Not Recommended)	8
Summit Ash	8
Patmore Ash	8
Black Ash	8
Manchurian Ash	8
Oak	8
Linden	6
Birch	6
Mountain Ash	6

Pear	6
Flowering Crab Apple (Dependant on species)	4-6
Cherry (Dependant on species)	4-8
Pine (Dependant on species)	4-8
Spruce (Dependant on species)	4-8
Swedish Columnar Poplar	3-6
Tower Poplar	3-6

Note: The Developer may suggest other trees for roadway boulevards depending on site specific constraints. Landscaping drawings will be reviewed on an individual project basis.

8.4.6 Medians and Entry Features

.1 If landscaped, road islands, medians, and entry features must be topsoiled, sodded and planted with trees, shrubs, and ground cover by the Developer to the satisfaction of the County. All road island, median and entry feature designs must be low maintenance.

.2 The minimum deciduous tree calliper shall be 60 mm.

.3 Tree and shrub design shall consider the importance of vehicular site lines.

.4 Trees and shrubs should be contained within planting beds. The minimum shrub height and spread shall be 600 mm.

.5 Planting beds are to be designed C/W weed liners, landscape edging and a minimum of 100 mm wood mulch or decorative crushed granular or shale surface.

.6 If turf areas are designed within road islands or medians, the total turf area shall exceed 75 m^2.

.7 No free standing architectural features, i.e. signs, sculptures, light poles, or entry gates, shall be located on turf areas.

.8 Paving stone and paving stone header, concrete or other hard surface verge or walks may be approved by the County.

.9 A planting cross section detail for islands and medians shall be drawn showing all utilities within 3.0 metres of the planting root zones, limits of the road base and sub base, limits of compacted verge base materials, topsoil, mulches, and the root zone of trees and shrubs. The cross section shall be referenced to the Planting Detail.

.10 A planting detail plan shall provide information regarding alignment of roads, curbs, walks, utilities, free standing features, proposed planting, landscape edging, and mulches.

.11 Lighting, if provided, must be approved by the Director of Public Works.

.12 Sewers and other utilities should not be aligned under landscaped areas.

8.4.7 Walkways

.1 The Developer must grade, topsoil, seed or sod, and plant trees along any walkway right-of way.

.2 There shall be a minimum of four trees for every 35 linear metres of walkway. Trees and ground cover shall be as specified in “Plant Materials Appropriate for 6 Metre Right-of-Way Walkways”.

.3 Where possible, trees will be set back a minimum of 1.0 metres from adjacent private property lines.

.4 Trees shall be grouped in rows. Tree groups shall be positioned on either side of the walk and groupings will be staggered. The minimum deciduous tree calliper should be 60mm. The minimum coniferous tree height should be 2.5 metres. A tree mix of 60% coniferous and 40% deciduous is recommended.

.5 Ground cover will be massed within planting beds. The maximum spacing for ground cover plants is 750 mm o/c. Trees should also be placed in planting beds.

.6 Planting beds should be designed complete with weed liners, landscape edging and a minimum of 100 mm of wood chip mulch. Decorative crushed granular material will not be approved as a substitute for wood mulch.

.7 Furniture may be provided by the Developer and placed in strategic locations within the walkway.

.8 Screen and uniform fences shall conform to specification 8.10.

Plant Materials Appropriate for 6 Metre Right-of-Way Walkways

The following lists a variety of plant materials, for 6 metre or wider walkways, approved for use by the County.

Trees

Common Name	Minimum Spacing (Metres)
Lodgepole Pine	4.0
Black Ash	8.0
Linden	6.0
Pin Cherry	4.0
Schubert Chokecherry	4.0

Pyramidal Flowering Crab		4.0
Japanese Tree Lilac		4.0
Columnar Aspen		4.0
Tower Poplar		4.0

Ground Cover

Common Name		Minimum Spacing (Metres)
Caragana	Common	3.0
	Globe	1.0
	Pygmy	1.0
Cherry – Nanking		2.0
Cotoneaster – Hedge		2.0
Cranberry	Nannyberry	5.0
	Wayfaring Tree	3.0
Dogwood – Red Osier		2.0
Honeysuckle	Clavey's Dwarf	1.0
	Tartarian	3.0
	Zabels	2.0
Prinsepia		3.0
Potentilla		1.0

8.4.8 Pipelines and Major Utility Corridors

.1 Utility corridors must be graded, topsoiled, seeded or sodded and landscaped by the developer.

Permitted near overhead power lines

Common Name	Height at Maturity (Metres)
Pincherry	5
Western Chokecherry	5
Black Cherry	6
Tartarian Maple	6
Amur Maple	4
Flowering Crab Apple	5
Hathorne	5
Showy Mountain Ash	5
Green's Mountain Ash	5
French Pussy-Willow	5
Mugo Pine	6
Pyramidal White Cedar	5
Montgomery Blue Spruce	3
Caragana	3
Hedge Cotoneaster	2
Highbush Cranberry	3
Nannyberry	5
Dogwood	3
Elder	4
Honeysuckle	3
Lilac	5
Saskatoon	4

Not permitted within 8 metres of overhead power lines

Common Name	Height at Maturity (Metres)
Trembling Aspen	8
Balsam Poplar	20
Northwest Poplar	20
Plains Cottonwood	30
White Spruce	15
Colorado Blue Spruce	15
Manitoba Maple	14
Laurel Leaved Willow	15
Golden Leaved Willow	15
Sharp Leaved Willow	10
Green Ash	15
Patmore Green Ash	15
American Elm	20
Brandon Elm	15
Siberian Elm	12
Paper Birch	12
European White Birch	12
Cut Leaved Weeping Birch	20
Slender Weeping Birch	12

Pipeline and other major corridor plant list

Common Name	Planting Size - Height (Metres)
Pine	2
Spruce	2
Fir	2

Common Name	Planting Size – Ø (Diameter) (Millimetres)
Silver Maple	50
Black Ash	50
Patmore Green Ash	50
Summit Green Ash	50
Larch	50
American Elm	50
Harbin Chinese Elm	50
Linden Laurel Leaf Willow	50
Amur Maple	50
Crab Apple	50
Amur Cherry	50
Pincherry	50
Schubert Chokecherry	50
Bur Oak	50
Mountain Ash	50
Lilac	50

8.4.9 Storm Water Management Facilities

.1 Dry pond and areas surrounding new storm water management facilities must be graded, topsoiled, seeded or sodded, and landscaped by the developer to the satisfaction of the County Director of Public Works.

.2 Plant materials will be selected to respect hydrological and soil saturation characteristics of the facility.

8.4.10 Natural Areas

.1 Existing natural and naturalized areas which can not be protected during development must be restored with native plant materials similar to the surrounding environment.

.2 The Developer will design an appropriate mix of native trees, shrubs, and ground cover to rehabilitate impacted natural areas.

.3 The Developer shall design and construct any drainage facilities which may be required to mitigate the impact of development on natural areas.

.4 The Developer shall implement sound geotechnical, structural, and bioengineering principals in the rehabilitation of natural areas.

8.5.0 SITE PREPARATION

8.5.1 Materials

.1 Fill materials shall be free of stones, clods, sticks, roots, concrete, toxic materials, or any other extraneous materials.

.2 Topsoil shall be natural weed free fertile agricultural soil capable of sustaining vigorous plant growth.

8.5.2 Subgrade Prepation

.1 The subgrade shall be completely free of live quackgrass roots.

.2 The subgrade shall be graded and rolled to a firm even surface.

.3 The final surface shall be graded so that there is no runoff onto adjacent property and no surface ponding.

8.5.2 Existing Utility Appurtenances and Features

.1 All existing and new utility appurtenances shall be adjusted to final finished grade elevations.

.2 All existing features shall be protected against damage. (e.g. trees, shrubs, monuments, curbs, walks, etc).

8.6.0 PLACING OF TOPSOIL

.1 Topsoil shall be placed and compacted to a uniform minimum depth of 150 mm with allowance for future settlement. The upper 50 mm of soil shall be free of lumps 6 mm or larger.

8.7.0 SEEDING

8.7.1 Materials

.1 A blended approved fertilizer shall be applied to all seeded areas no more than 48 hours prior to seeding.

.2 Grass seed shall be certified Canada #1 comprising of the following recommended varieties in the proportion by weight shown below.

A) Lawns:

Kentucky Blue Grass	35%
Creeping Red Fescue	65%

A) Road sides and ditches:

Kentucky Blue Grass	20%
Creeping Red Fescue	45%
Perennial Rye Grass	20% (Max)
White Clover	15%

8.7.2 Execution

.1 The soil surface shall be loose, smooth, and free of debris.

.2 Fertilizer shall be applied to the soil at a rate of 3 kg/100m².

.3 Grass seed shall be applied at a rate of 3 kg/100m². The following methods are recommended for seed application.

a) The use of a cyclone type seeder with the seed applied in equal amounts in perpendicular directions.

b) A specialized mechanical seeder calibrated for grass seeding.

c) Hydro seeding including turf-fibre application of 1350 kilograms (dry matter) per hectare.

8.8.0 SOD

8.8.1 Materials

.1 Approved fertilizer shall be applied to the soil at a rate of 3 kg/100m² prior to sod placement.

.2 All sod shall be certified and shall be composed of the same grass varieties as indicated in section 8.7.1.

.3 Where pegs are required to hold sod in place they must be wooden. Metal pegs will not be accepted.

8.8.2 Execution

.1 Soil shall be smooth, well graded, fertilized and free of debris when placing sod.

.2 Sod shall be laid so that the long side is parallel to the slope and joints should be staggered.

.3 Joints shall be tightly fitted and should not be visible.

.4 Sod laid on slopes of 2:1 or greater shall be held in place by wooden pegs driven flush with the surface of the sod.

8.8.3 Maintenance

.1 Maintenance shall include all measures necessary to establish all seeded or sodded areas to a vigorous growing condition.

.2 The first mowing should only be done after the grass is a minimum of 75 mm in height and covers 100% of the area.

.3 If required the landscaped areas shall be watered on a regular basis until growth is established.

.4 The Developer shall provide weed control in cases where weeds are present in landscaped areas. When herbicides are used they shall be applied in accordance with manufacturers recommendations. Any damage resulting from herbicide use shall be remedied at the Developer's expense.

.5 The Developer shall repair, reseed or resod any area that is thin, burned or washed out.

.6 Maintenance shall include the erection and removal of all temporary protection, fences, barriers, or signs.

.7 The maintenance period of grass or other landscaped areas shall be two (2) years from the date of issuance of the Completion Certificate.

.8 The County shall inspect the landscaped areas upon written request by the Developer. The request must be received at least ten (10) days prior to the anticipated date of inspection.

8.9.0 PLANTING (TREES AND SHRUBS)

8.9.1 Materials

.1 The Developer shall furnish and plant material agreed to in the Development Agreement. All plant material shall conform to the horticultural standards of the “Canadian Nursery Trades Association”.

.2 All plants shall be typical of their species or variety and shall have normal growth habit. They shall be sound, healthy and vigorous, well branched and densely foliated when in leaf. They shall be free from disease and pests.

.3 Substitutions will not be permitted unless written proof is submitted that the specific plants or sizes are unobtainable and such substitutions are acceptable to the County.

.4 All plant matter is subject to approval by the County.

8.9.2 Site Preparation

.1 Boulevards and medians shall be excavated to its proper depth and be made ready for soil placement.

.2 Tree locations shall be approved by the County prior to planting.

8.9.3 Planting Operations

.1 Tree pits shall be excavated at least 300 mm in diameter larger than the tree spread of roots and of sufficient depth to allow a minimum of 150 mm of planting mixture beneath the ball of roots.

.2 Shrubs shall be planted in pits a minimum of 300 mm in diameter and 300 mm deeper than the shrub spread of roots.

.3 Planting beds shall be adjusted to permit 225 mm of planting mixture under roots of all plants.

8.9.4 Moving and Placing Native Plants

.1 The sizes of root balls for trees shall be as specified below. Ball sizes are minimum and should be adjusted according to growth habits or plants. All ball sizes shall be sufficient to contain 75% of the fibrous root system.

Deciduous Trees		
Root mm	Root Ball Ø mm	Machine Ball Ø mm
25 – 45	610	
50	760	1110

75	915	1420
100	1065	1675
125	1370	1675
150	1470	2336
200	1825	2336
250	2285	2336

Note: Deciduous trees larger than 75 mm Ø shall be moved by machine spade.

Coniferous Trees		
Height metres	Root Ball Ø mm	Machine Ball Ø mm
1.50 – 1.75	760	1110
1.75 – 2.00	915	1110
2.00 – 2.25	1065	1420
2.25 – 2.50	1220	1420
2.50 – 2.75	1370	1675

For deciduous trees with a calliper of more than 250 mm and for coniferous trees taller than 2.75 metres, the root ball shall be increased by 150 mm for every additional 25 mm in diameter or 300 mm in height.

8.9.5 Maintenance

.1 Maintenance of trees shall include protective or preventative spraying when required.

.2 Defective landscaping shall be repaired as soon as possible once it is evident.

8.9.6 Guarantee Period

.1 The maintenance period for all planted material shall be two years from the date of issuance of the Completion Certificate.

.2 Any plant that is dead, not true to name or size as specified, or not in satisfactory growth, as determined by the County shall be removed from the site and replaced with a satisfactory plant.

8.9.7 Uniform Fencing

.1 Uniform wood fencing shall be constructed in approved colour and as approved by the County.

.2 Chainlink fencing and gates shall be constructed in accordance with manufacturers standards.

.3 Uniform fencing shall be constructed adjacent to and at the following locations:

a) Arterial Roadways
b) Parks and playgrounds
c) Public Walkways and utility lots
d) School sites
e) Municipal owned lands – e.g. Firehall sites etc.
f) Multiple Family sites
g) Neighbourhood Commercial sites
h) Institutional sites
i) Other areas as required by the County

Typically wooden fencing shall be installed where residential property adjoins the above mentioned facilities and chainlink fencing installed where the other facilities adjoin arterial roadways.

.4 Gates opening into the lot shall be installed at the mid-point of residential lots which back on to a public park.

.5 Wood rail fencing constructed in accordance with manufacturers standards may be approved by the County for selected park or walkways.

8.9.8 Maintenance Period

.1 The maintenance period for fencing shall be two years from the date of issuance of the Completion Certificate.

End of Section 8

9.1.0 UTILITY SERVICE

9.1.1 General

.1 Franchise utilities include but are not limited to electric power, telephone, natural gas, and cable TV.

9.1.2 Rights-of Way

.1 Where required, the Developer shall provide rights-of-way and easements of sufficient size and location to satisfy franchise utilities. Refer to Standard Drawings 7.129 to 7.134 for preferred locations.

.2 All easements shall be registered in the name of the County.

9.1.3 Installation

.1 The developer shall obtain approval from the utility company and the County for the location and method of installation of franchise utilities.

.2 Utilities shall be installed in a manner to ensure they do not interfere with each other.

.3 Service boxes, transformers, poles, etc. shall be placed in locations that do not interfere with driveways or other utilities.

9.1.4 Costs

.1 All capital costs and contribution fees required by the utility companies shall be paid by the developer.

End of Section 9

10.1.0 GENERAL

.1 This section refers to the unique requirements of manufactured home subdivisions.

.2 Unless specified in this section, manufactured home subdivisions shall meet all of the requirements set out in this specification.

.3 Detailed plans in accordance with Sections 1 and 2 shall be provided and approved by the County prior to any construction.

10.2.0 Density

.1 The maximum density shall not exceed 20 manufactured homes per hectare or 8 homes per acre.

10.3.0 Open Space

.1 A minimum of 10% of the developed area shall be set aside as open space in one of the following manners:

a) Small sites a minimum of 500 metres² in size located at strategic points within the development.

b) One large area located within the development with easy access from all homes.

c) A combination of (a) and (b) above.

10.4.0 Landscaping

.1 A detailed landscaping proposal must be submitted with the subdivision layout plan.

.2 Landscaping must include a three metre wide buffer of trees or shrubs around the periphery of the site.

.3 The landscaping buffer shall not be considered as part of the open space provision required above.

10.5.0 Roads and Streets

.1 All streets, roads and walkways shall be constructed to the same standard as any other municipal development.

.2 Plans and specifications shall be approved by the County prior to any construction.

.3 Surface drainage must be managed and controlled within the site.

10.6.0 Utilities and Services

.1 All services and utilities shall be installed within municipal property or easements registered to the County.

10.7.0 Parking

.1 In addition to individual lot parking spaces, a common parking area shall be provided with a minimum of 1 parking space per 10 lots.

.2 Each lot must have two parking spaces finished to the same surface as the street. No on street parking will be permitted.

10.8.0 Storage

.1 An enclosed storage compound shall be provided at a rate of 7 m^2 per lot.

10.9.0 Service Buildings

.1 Service buildings shall be located a minimum of 6 metres from any manufactured home.

10.10.0 Lot Size

.1 The minimum frontage of any lot shall be 11 metres and the minimum depth of any lot shall be 23 metres.

.2 The minimum separation between manufactured homes, attachments or associated out buildings shall be 5 metres.

.3 No manufactured home shall be located within 3 metres of the front property line of an internal road and 8 metres of the lot line of a public road.

10.11.0 Skirting and Attachments

.1 The total floor space of attachments must not exceed 50% of the floor area of the manufactured home and must be finished to present the same appearance as the manufactured home.

.2 Separate storage buildings shall not exceed 3 metres X 3 metres in size.

.3 Skirting shall be provided on all units and shall be finished to match or compliment the manufactured home.

10.12.0 Landscaping

.1 The Developer shall be responsible for landscaping the site and individual lots.

.2 Landscaping shall be maintained by the developer for a two year period following the issuance of the Completion Certificate.

10.13.0 Garbage

.1 Provisions shall be made for individual garbage bins or a screened compound for multiple units.

10.14.0 Fencing

.1 No individual fences or hedges will be accepted unless the developer accepts responsibility for its installation and maintenance.

.2 Where fences or hedges are permitted they should conform to a uniform standard for the development.

10.15.0 Site Requirements

.1 All manufactured homes shall be installed on a foundation, piles, or blocking and shall be skirted within 30 days of installation on the lot or by May 1st if installation occurs between November 1st and April 1st.

End of Section 10

11.1.0 GENERAL

.1 It is the intent of this section to outline the basic requirements for a RV Park development.

.2 As each development is unique, the Developer is encouraged to use innovative techniques to maximize the potential of the site. Disruption of surface features should be kept to a minimum so that the "natural nature" of the site may be retained.

11.2.0 Plans

.1 The Developer shall submit concept plans to the County at a minimum scale of 1:1000 to adequately define the existing conditions as well as the proposed improvements and must include the following:

a) Legal land description
b) North arrow, plan scale, and project name
c) Registered Property lines, Rights-of-way, and easements
d) Adjacent roadways and land use
e) On-site buildings, utilities, and other improvements
f) Existing natural features. e.g. trees, sloughs, drainage, eskers, etc.
g) Environmentally sensitive areas such as wildlife runs, nesting areas, etc.
h) Contours of the existing ground (Maximum interval 1 metre)
i) Identify any adjacent land use which might affect human enjoyment of the park. e.g. Landfills, lagoons, highways, heavy industrial activity, etc.
j) Proposed roadways, walkways and trails, parking areas, and camping areas.
k) Structures such as administration buildings, bathrooms, sani-dumps, and garbage collection.

.2 The Concept plan is intended to illustrate the proposed development in a general sense. It should show the location of the proposed user area as well as proposed site improvements. The concept plan should be reviewed and approved by the County and Provincial authorities before proceeding to the detail design stage.

.3 Detail plans shall be of sufficient detail to determine the correct location and construction of the individual elements of the development.

.4 Detail plans shall be submitted to the County for approval prior to any improvements taking place and should contain the following:

a) All existing and proposed roads, drawn to scale
b) Sufficient elevations to establish drainage patterns
c) A drainage plan
d) Major activity areas. e.g. campsites, walkways, etc
e) Structures shown at their proposed location and intended use.
f) Location of visitor services such as, toilets, firewood stations, garbage bins, water stations, sewage facilities, etc.
g) Existing trees or vegetation with the segments to be removed clearly highlighted.

11.3.0 Recommended Design Guidelines

11.3.1 Roads

a) Utilize one-way roads as much as possible to avoid traffic conflicts. Larger sites should utilize a series of one-way roads.
b) Roadways should have a minimum width of 4 metres for a one way road and 8 metres for a two way road.
c) Curved roads are preferred to keep the traffic speeds down.
d) Intersections should be constructed as close to a 90° angle as possible and should be flared enough to allow large RV's to easily turn corners
e) The minimum recommended road crossfall is 3%.
f) The minimum road structure should be 150 mm of subgrade preparation, 150 mm of pit run, and 50 mm of 20 mm crushed gravel.
g) All dead-end roads shall have a turn around. A final campsite is not to be utilized as a turn around.

11.3.2 Campsites General

a) Provide a variety of campsite styles.
b) At least one site per loop should be handicap accessible.
c) Approximately 15% of sites should be double sites. (Typical campsites are shown on the Standard detail drawings).
d) Provide privacy. The minimum recommended separation is 15 metres.
e) Campsites should be a minimum of 5 metres from a roadway.
f) Install barriers to restrict vehicles to roads and campsites.
g) Campsite parking areas should have the same structure as the roads.
h) Campsites should be cleared and grubbed by hand.

11.3.3 Campsites – Single

a) Easy to back into. Back in spurs should be at a 45° to 60° angle to the road.
b) Campsite spurs should be 4 metres wide and 18 metres long.
c) Level a 6 X 6 metre area for camp stove and picnic table. (Tent sites require a larger level area).
d) Activity pads should be to right or rear of the parked vehicle spur. Campsites on the left side of the road should be at a 60° angle to allow room for the activity pad.

11.3.4 Campsites - Double

a) Provide approximately 15% double back-in campsites to accommodate campers travelling with another party.
b) Double sites should each have their own activity area so that they may be used as single sites.
c) One double site is calculated as two single sites for determining visitor service requirements.

11.3.5 Drive-Through Campsites

a) Larger RV's and trailers should be accommodated by some pull though or pull over campsites in each loop.
b) Pull over campsites must be located to the right of traffic flow.
c) Pull over sites should be 15 metres long and 4 to 5 metres wide.
d) Avoid short cutting curves when constructing pull through campsites as confused traffic might divert through the site.
e) Pull through campsites should be 18 metres long and 4 to 5 metres wide.
f) Pull through sites should be constructed on tangent sections of roadway at a 45° to 60° angle to the road.

11.3.6 Serviced Campsites

a) To minimize costs serviced sites should be on a common loop.
b) All services should be located on the left side of the site.
c) Electrical services are to conform with the Electrical Protection Act. Electrical service should provide one 15 Amp duplex and one 30 Amp duplex receptacle per site.
d) Sewer services should utilize a 75 mm sewer ferrule and plug and must be separated a minimum of two metres from the water service.
e) The water service should be a 20 mm swivel hose connection with water pressure of 140 Kpa. to 480 Kpa. (20 PSI to 70 PSI).
f) Water bibs are to have backflow prevention and self draining curb stops. (Insulation and heat trace is optional).

11.3.7 Visitor Services

a) All RV parks are to have toilet facilities. The minimum requirement is two seats per 15 campsites.
b) Unless a closed water and sewer system is provided, keep drinking water sources at least 30 metres from the nearest toilet.
c) Registration procedures should be clearly indicated on a sign near the entrance to the RV park and facilities for registration should be considered in the design of the park.
d) Visitor services should be clustered and within easy access and walking distance from all campsites. Locating clusters near roads will minimize trail requirements and reduce disturbance to other campers.
e) Services such as firewood, picnic shelters, picnic areas, and playgrounds shall be provided at the discretion of the developer.

11.3.8 Typical site layout and Services

a) For Typical site layout and services see Standard Drawings No. 11.10 to 11.13.

End of Section 11

12.0 GENERAL

.1 Low pressure sanitary collection systems are normally installed in cases where there is inadequate grade to install a normal gravity system. Due to the increased cost of installation and maintenance of low pressure sewage collection, gravity collection systems are strongly preferred.

.2 The components of a low pressure sewer collection system are the septic tank, the effluent pumping system, a check valve, and a pressurized piping system.

12.1 Design Criteria

12.2 Septic Tanks

.1 The minimum requirement for a single family septic tank is a 3000 litre two compartment tank. The first compartment should have at least 2/3 of the tank capacity. For details see Standard Drawing No. 12.10

.2 Effluent pumping is done from the second tank compartment of the tank.

.3 The tank should have a high level alarm installed so that a flashing light or a combination flashing light and audible alarm sound in the residence when the tank level is dangerously high.

.4 Elevations should be checked to insure that the pump shut off level in the tank is significantly lower than the discharge level of the low pressure sewer system. If this is not possible then a gravity sewer system shall be installed or a complex low pressure system with a vacuum break from within the tank or a reliable method of maintaining pressure within the system.

12.3 Effluent Pumps

.1 Effluent pumps shall be selected for their durability, capacity, and system requirements.

.2 Submersible pumps installed in the secondary chamber of the septic tank are preferred over centrifugal pumps installed within the residence.

.3 Low pressure sewer systems should be designed so that all pumps on the system achieve the same pressure and volume of flow at the main line discharge point of the collection system.

12.4 Fittings

.1 All collection systems must include a curb stop, a gate valve, and a double check valve. The curb stop is typically located adjacent to the water curb stop. The gate valve and the double check valve should be securely installed between the pump discharge and the sewage collection system.

.2 All valves and check valves on a low pressure sewer system should be brass or stainless steel.

.3 Other fittings may be material compatible with the pressure pipe, stainless steel or brass.

12.5 Service Connections

.1 The service connection should be a minimum of 40 mm Ø DR-21 PVC or 40 mm DR-21.0 H.D.P.E for services on systems with pressures not exceeding 415 Kpa. (60 P.S.I.).

.2 A curb stop shall be installed on the property line to allow for isolation of the service.

.3 The service connection to the main line must be made by a material compatible Tee or approved stainless steel saddle. Brass saddles will not be permitted.

12.6 Sewer Collection System

.1 Low pressure sewer collection systems shall be designed so that nominal flow velocity is greater that 0.6 metres / second and the maximum peak velocity is less than 3.0 metres / second. In any case the minimum pipe diameter for a low pressure sewer main is 50 mm.

.2 The following guideline shall be used to determine the minimum main line requirements.

Maximum Number of Single Family Service Connections	Minimum Sewer Main Collector Pipe Diameter
40 or less	50 mm
70	75 mm
120	100 mm

.3 All low pressure sewers shall be tested for leakage at a minimum test pressure of 100 P.S.I. (690 Kpa.) or 1.5 times the maximum operating pressure at the lowest point in the system. Which ever is greater.

.4 Where ever possible pressure tests shall be conducted with the curb stops open pressurizing against the check valves.

.5 Low pressure sewer depth of bury requirements are 2.7 metres except under roadways where the minimum depth of cover is 3.0 metres.

End of Section 12

CLASS A BEDDING

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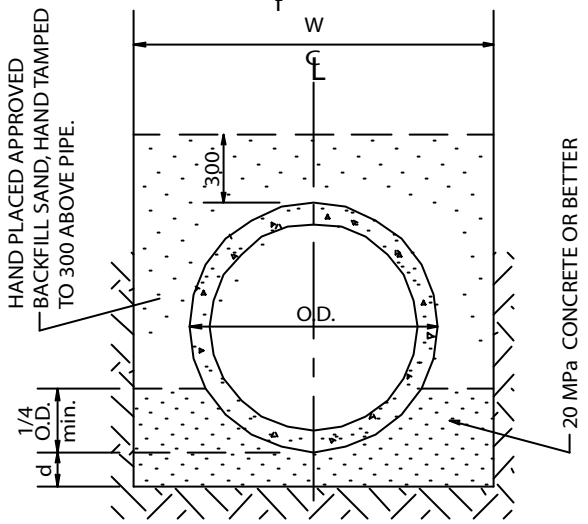

CLASS B BEDDING

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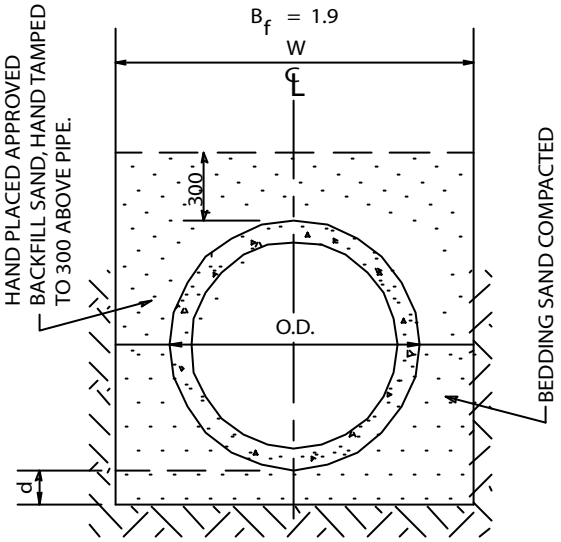

CLASS C BEDDING

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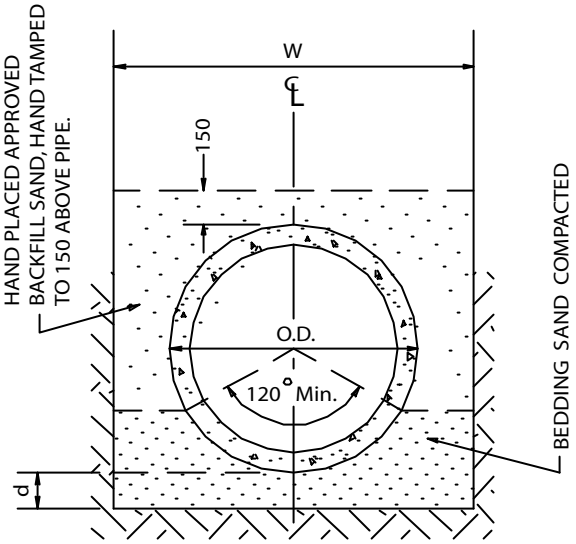

CLASS B BEDDING

ALTERNATE - 375 I.D. & UNDER

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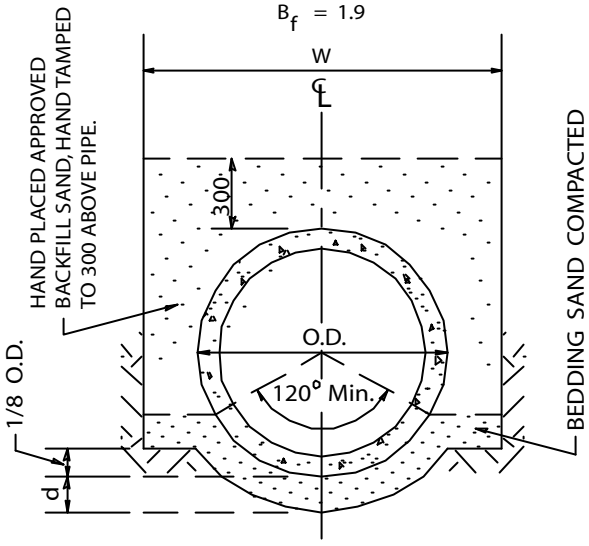


NOTES:

W (TRENCH WIDTH) - O.D. + 450mm (MINIMUM)
O.D. - OUTSIDE PIPE DIAMETER
I.D. - INSIDE PIPE DIAMETER
B_f - BEDDING FACTOR

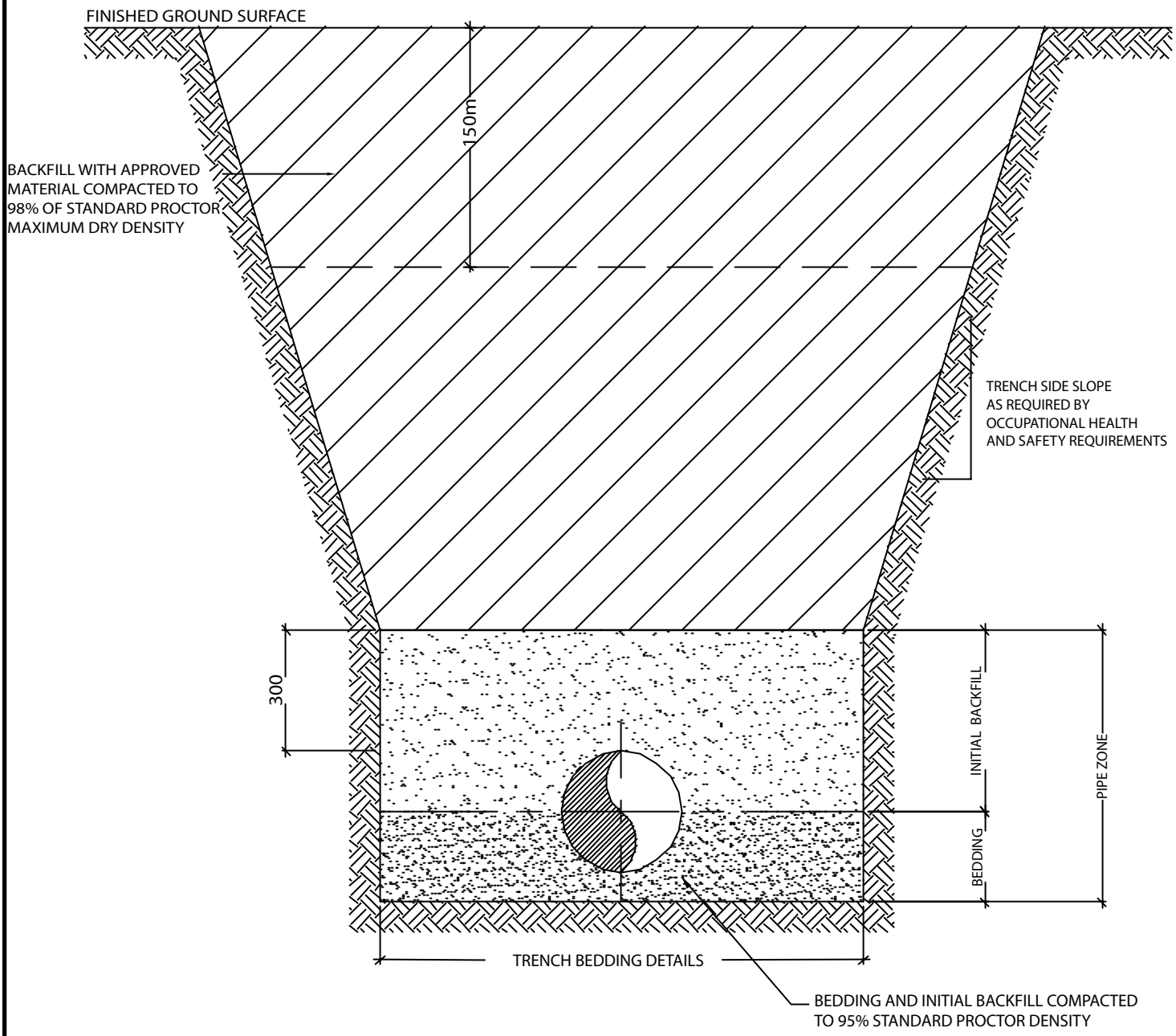
d=DEPTH OF BEDDING BELOW PIPE
I.D. - 675mm OR SMALLER, d min. - 75mm
I.D. - 750mm TO 1500mm, d min. - 100mm
I.D. - 1650mm AND LARGER, d min. - 150mm

ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	07/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

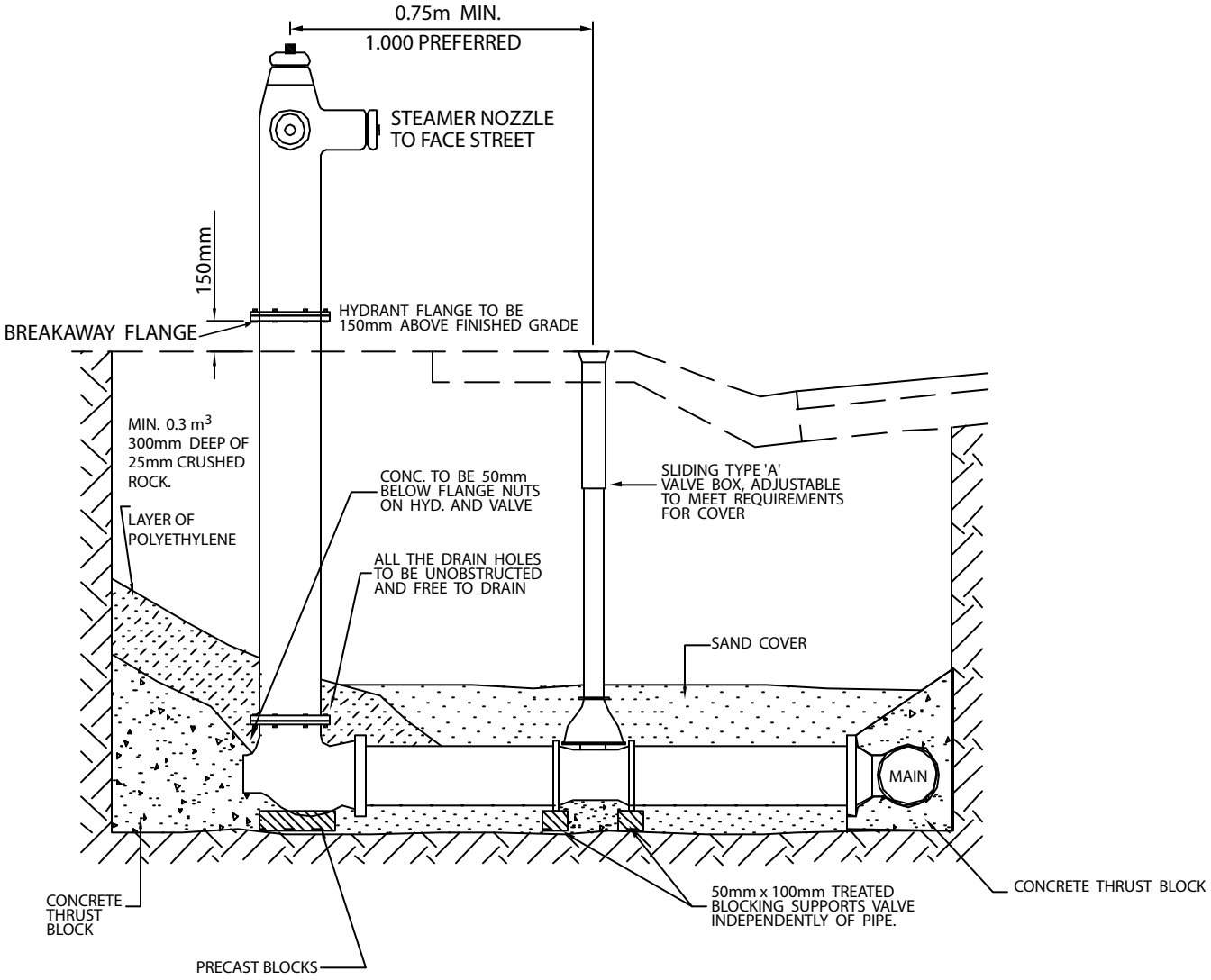
DRAWING 3.10
PIPE BEDDING DETAIL



ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED

Brazeau County

DATE: 08/2006	DRAWING 3.11 TRENCH BACKFILL
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	



NOTES:

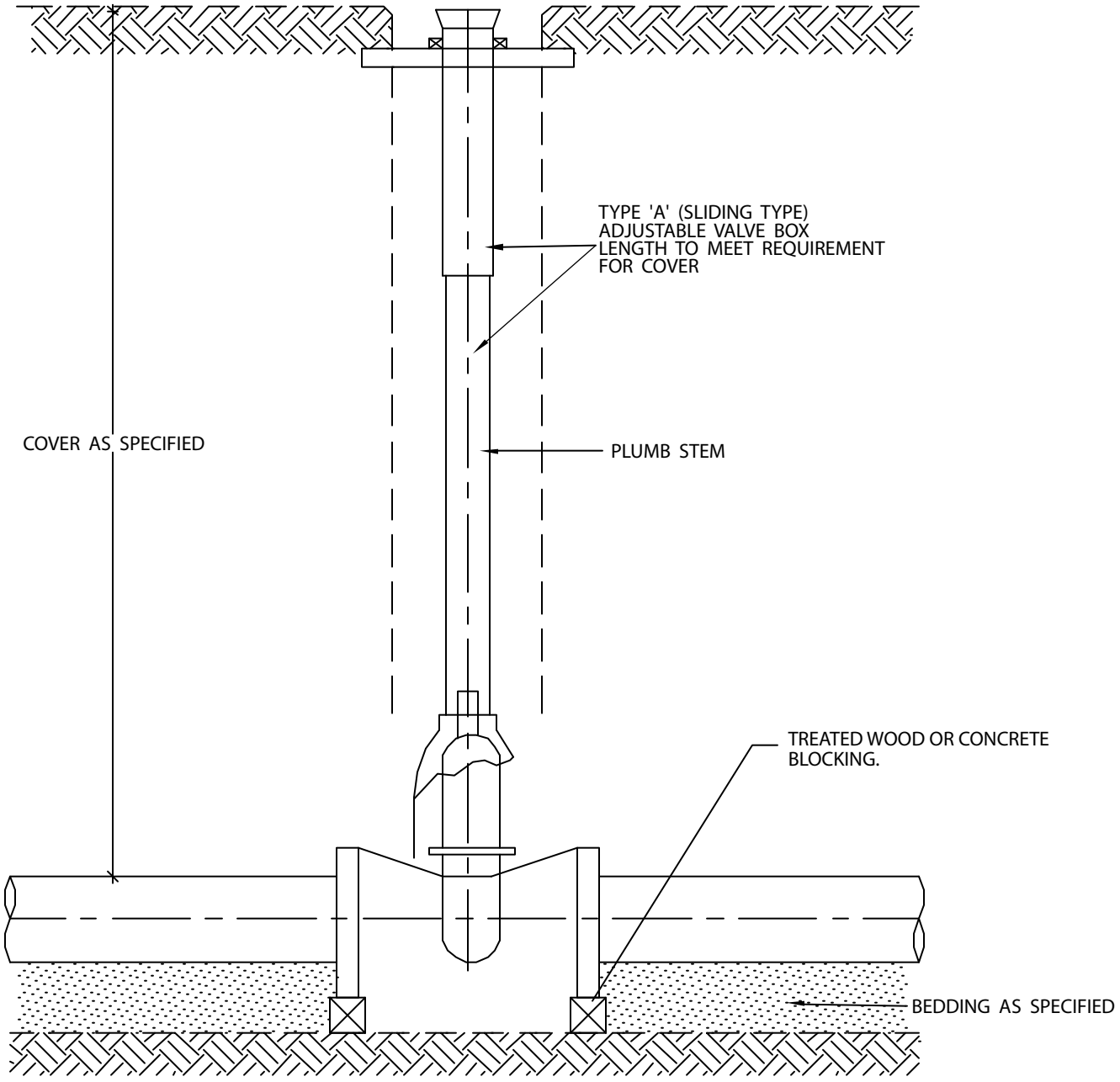
1. HYDRANT AND VALVE EACH TO BE CATHODICALLY PROTECTED WITH A 5.5kg ZINC ANODE.
2. VALVE TO BE LOCATED IN BOULEVARD WHERE POSSIBLE.
3. HYDRANT TO BE PAINTED ACCORDANCE WITH NFPA GUIDELINES.

ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE

Brazeau County

DATE: 08/2006	DRAWING 3.12 TYPICAL HYDRANT CONNECTION
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	

NOTE: HYDRANTS AND VALVES TO BE "CANADA VALVE" BRAND

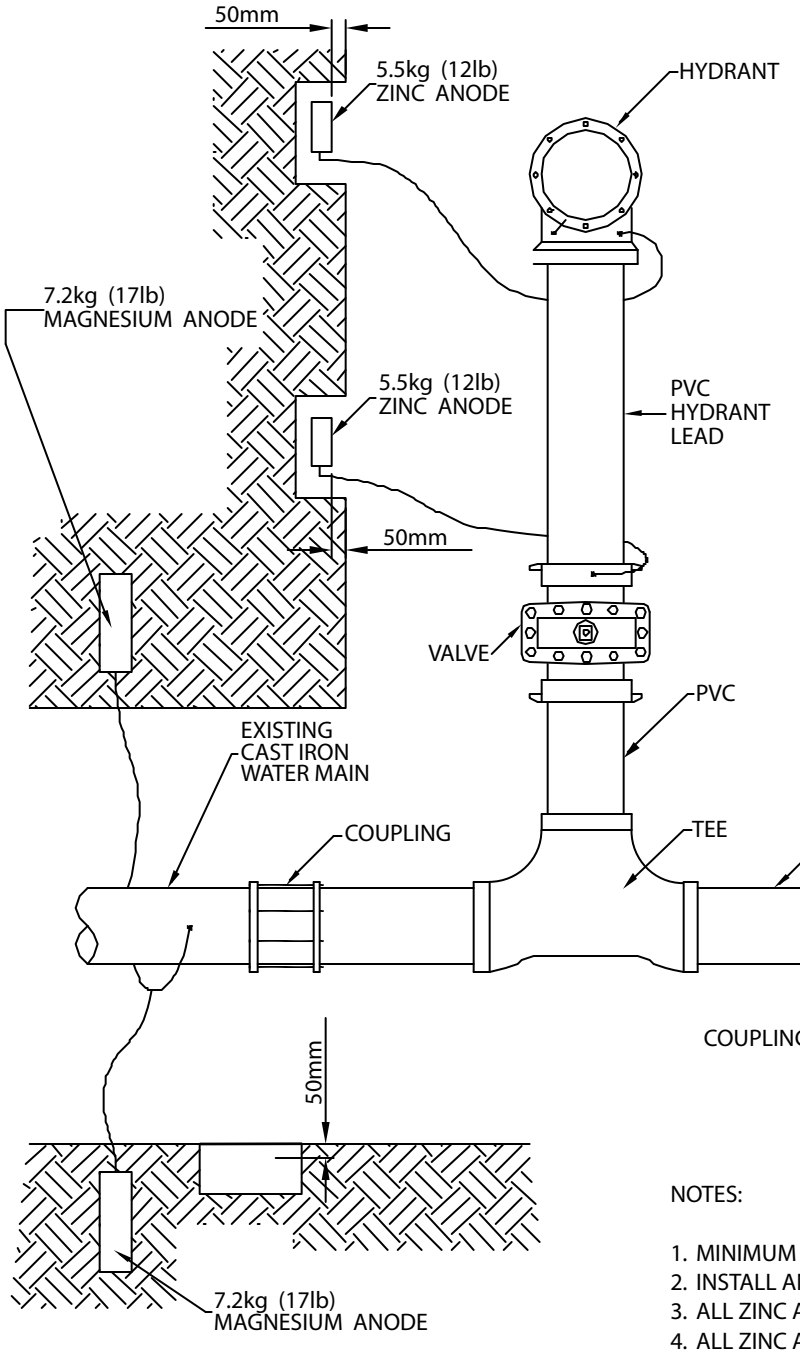


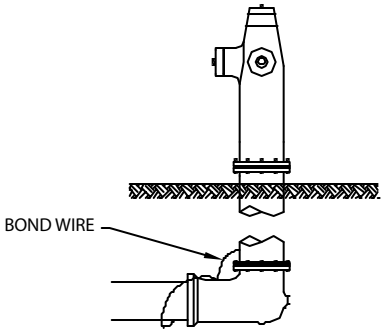
ALL DIMENSIONS IN MILLIMETERS

Brazeau County

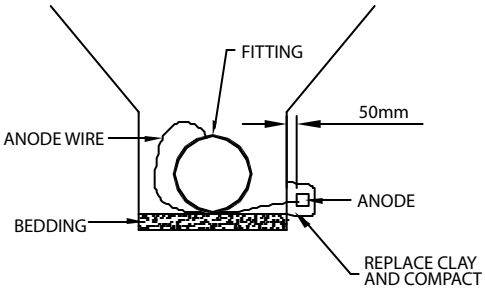
DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 3.13
VALVE SUPPORT DETAIL





HYDRANT ELEVATION



DETAIL A

NOTES:

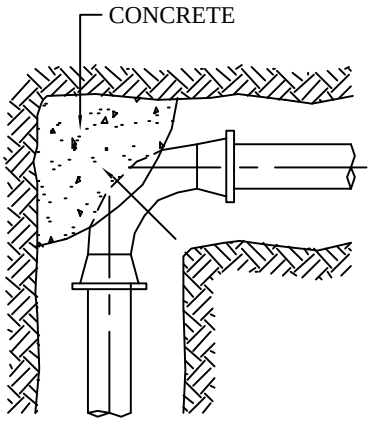
1. MINIMUM DISTANCE FROM ANODE TO PIPE IS 150mm.
2. INSTALL ANODE AT APPROX. PIPE DEPTH IN NATIVE SOIL.
3. ALL ZINC ANODES ON FITTINGS AND VALVES ARE 2.3kg. (5lb).
4. ALL ZINC ANODES ON HYDRANTS ARE 5.5kg (12LB).
5. ZINC ANODES TO BE EMBEDDED INTO TRENCH WALL TO PROVIDE FOR A MINIMUM OF 50mm OF COMPACTED CLAY COMPLETELY SURROUNDING THE ANODE.

5. ANODES TO BE AT LEAST 300mm CLEAR OF THRUST BLOCKS.

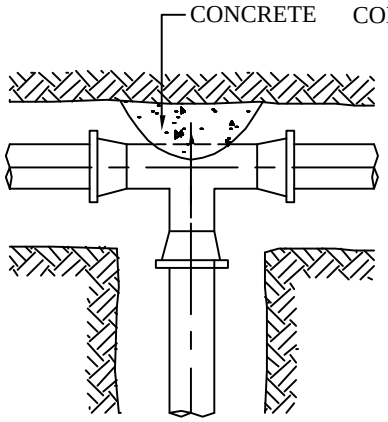
ALL DIMENSIONS IN MILLIMETERS

Brazeau County

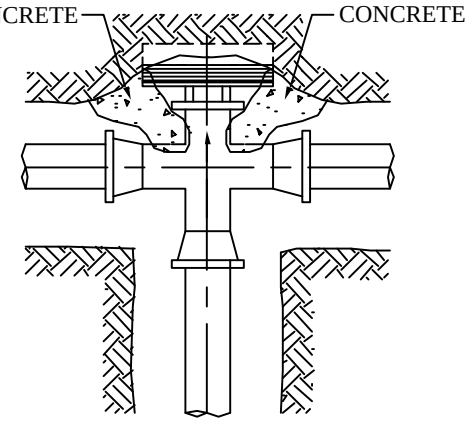
DATE: 08/2006	DRAWING 3.14 ANODE LOCATIONS AND INSTALLATIONS
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	



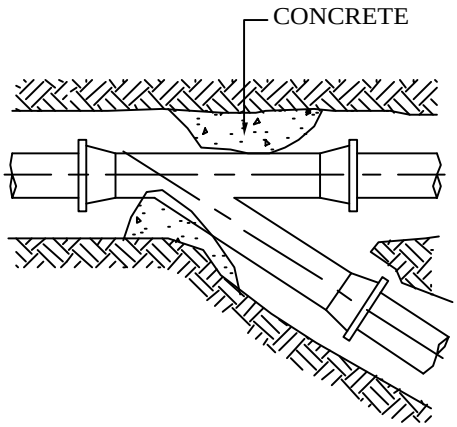
HORIZONTAL 90° BEND



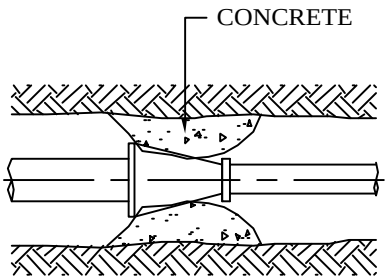
TEE



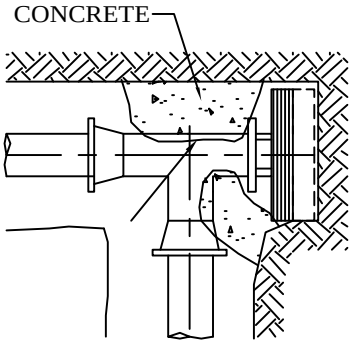
CROSS WITH PLUG



WYE



REDUCER



TEE WITH PLUG

THRUST BLOCK AREAS FOR FITTINGS AT 1.035 MPa. PRESSURE FOR SOILS WITH MINIMUM BEARING OF 200KPa. (AREAS IN SQUARE METERS)

PIPE DIA. / FITTING ANGLE	150	230	250	300	350	400	450
11 1/4'	0.15	0.20	0.28	0.43	0.57	0.71	0.85
22 1/2'	0.15	0.26	0.28	0.43	0.57	0.71	0.85
45'	0.23	0.38	0.56	0.80	1.12	1.50	1.77
90'	0.23	0.70	1.03	1.49	2.06	3.00	3.54

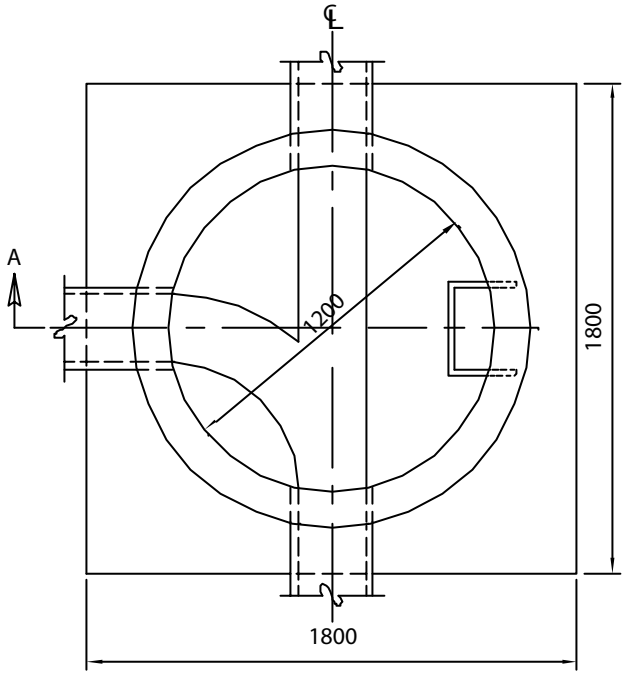
NOTE: BEARING AGAINST UNDISTURBED TRENCH WALLS REQUIRED.

ALL DIMENSIONS IN MILLIMETERS

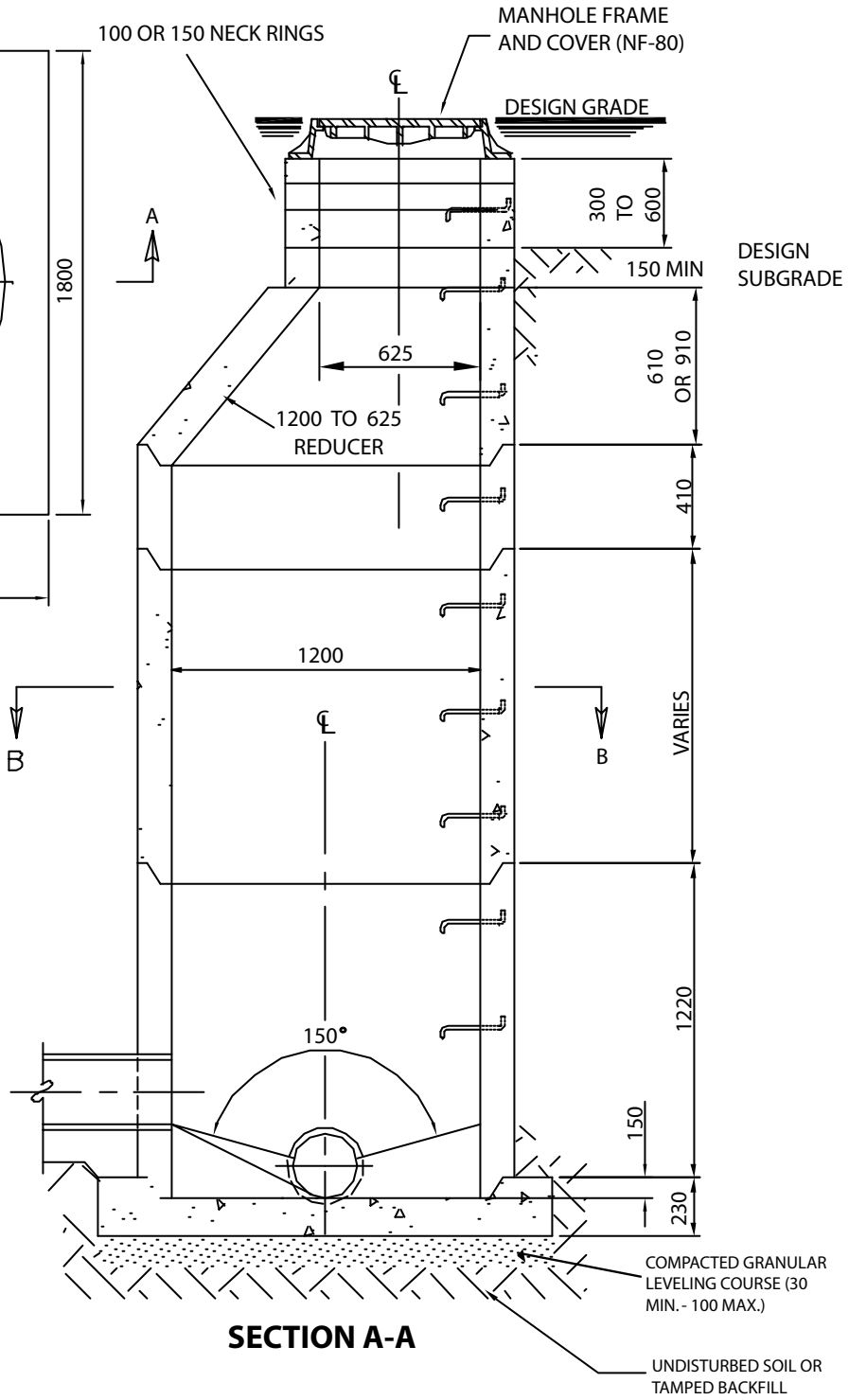
Brazeau County

DATE:	06/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 3.15
THRUST BLOCK DETAILS



SECTION B-B



SECTION A-A

NOTE:

1. MANHOLE PRECAST UNITS TO MEET A.S.T.M. C478.
2. POURED IN PLACE CONCRETE OVER 5.0m DEEP POURED IN PLACE OR PRECAST BASES SHALL BE REINFORCED WITH MINIMUM 10m BARS 250mm O/E E/W IN BOTH DIRECTIONS.
3. POURED IN PL;ACE CONCRETE TO BE 25MPa AT 28 DAYS, TYPE 50.
4. INLET AND OUTLET PIPES TO BE GROUTED FLUSH WITH WALL.
5. SAFETY STEPS REQUIRED TO FULL HEIGHT OF MANHOLE.
6. WHERE POSSIBLE STEPS TO BE POSITIONED TO FACE ONCOMING TRAFFIC.
7. RUBBER GASKET, KENT SEAL OR EQUIVALENT TO BE INSTALLED BETWEEN PRECAST BASES, PRECAST BARRELS, ALL NECK RINGS, CONE AND MANHOLE FRAME.
8. PERCHED MH'S ARE ACCEPTABLE FOR PIPE SIZES OVER 900mm.
9. FRAMES AND COVERS:
   LANDSCAPED AREAS - NF39
   HARD SURFACES - NF80
   SAG AREAS - NF 90 WITH GASKET.

ALL DIMENSIONS IN MILLIMETERS

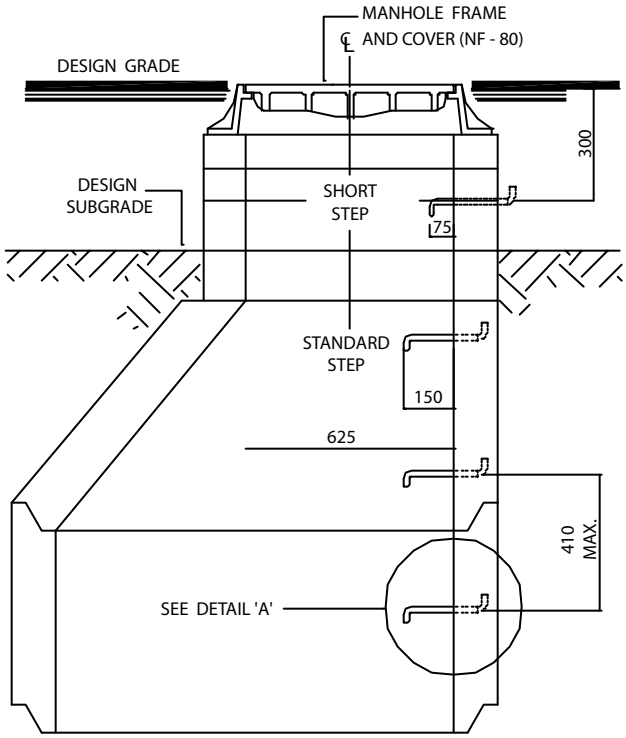
Brazeau County

DATE: 08/2006	DRAWING 4.10 STANDARD 1200 Ø MANHOLE
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	

NOTE:

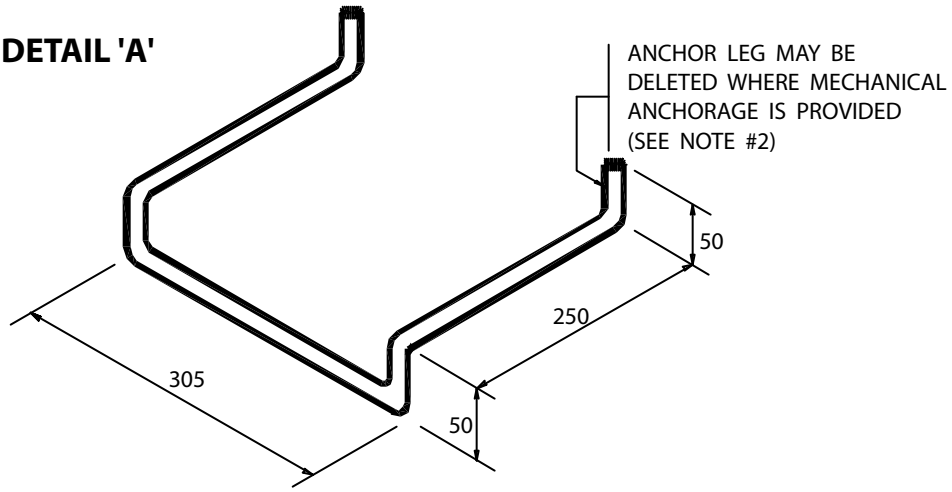
PLACEMENT:

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 "SORT 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

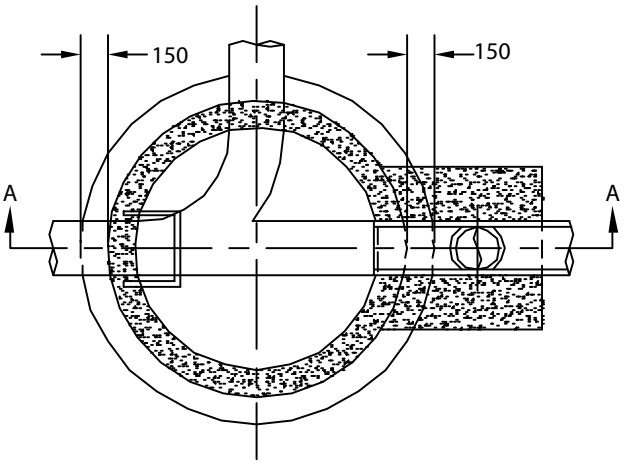
DETAIL 'A'



ALL DIMENSIONS IN MILLIMETERS

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

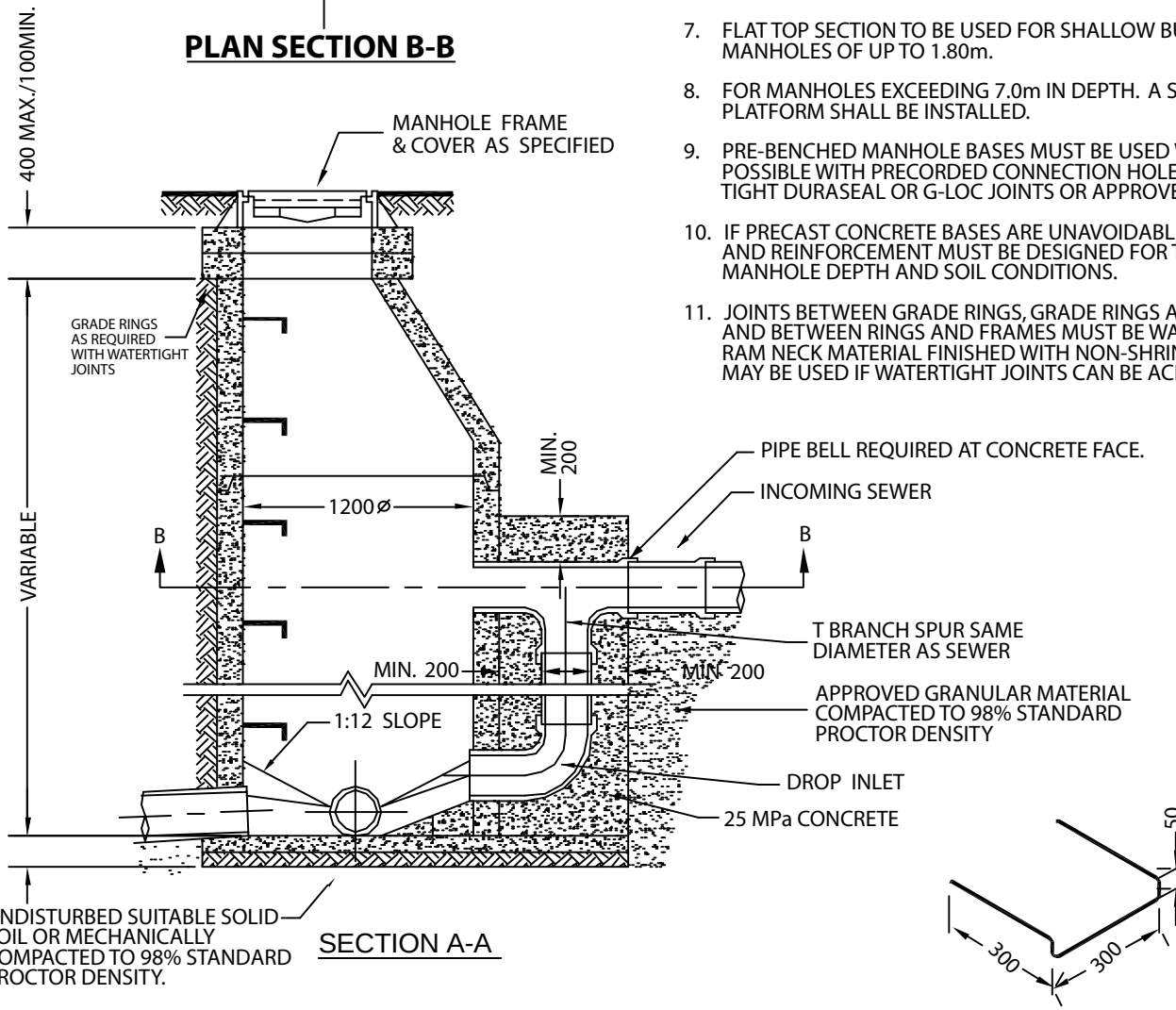
DRAWING 4.11
SAFETY STEPS FOR MANHOLES



PLAN SECTION B-B

NOTES:

1. SAFETY STEPS TO BE SPACED AT 400 MAX. DISTANCES. FIRST STEP TO BE 150 MAX. BELOW FRAME, LAST STEP TO BE 300 MAX. ABOVE BENCHING.
2. PRECAST CONCRETE COMPONENTS TO MEET CURRENT A.S.T.M. C478 STANDARDS.
3. CAST IN PLACE CONCRETE TO BE 25 MPa AT 28 DAYS.
4. ALL JOINTS TO BE SET WITH RUBBER GASKET AND FINISHED WITH NON-SHRINK GROUT INSIDE AND OUTSIDE FOR FULL CIRCUMFERENCE.
5. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
6. COMPACT BACKFILL AROUND MANHOLES TO A MINIMUM OF 98% STANDARD PROCTOR DENSITY.
7. FLAT TOP SECTION TO BE USED FOR SHALLOW BURY MANHOLES OF UP TO 1.80m.
8. FOR MANHOLES EXCEEDING 7.0m IN DEPTH. A SAFETY PLATFORM SHALL BE INSTALLED.
9. PRE-BENCHED MANHOLE BASES MUST BE USED WHEREVER POSSIBLE WITH PRECORDED CONNECTION HOLES AND WATER TIGHT DURASEAL OR G-LOC JOINTS OR APPROVED EQUAL.
10. IF PRECAST CONCRETE BASES ARE UNAVOIDABLE, THICKNESS AND REINFORCEMENT MUST BE DESIGNED FOR THE SPECIFIC MANHOLE DEPTH AND SOIL CONDITIONS.
11. JOINTS BETWEEN GRADE RINGS, GRADE RINGS AND CONES, AND BETWEEN RINGS AND FRAMES MUST BE WATERTIGHT. RAM NECK MATERIAL FINISHED WITH NON-SHRINK GROUT MAY BE USED IF WATERTIGHT JOINTS CAN BE ACHIEVED.



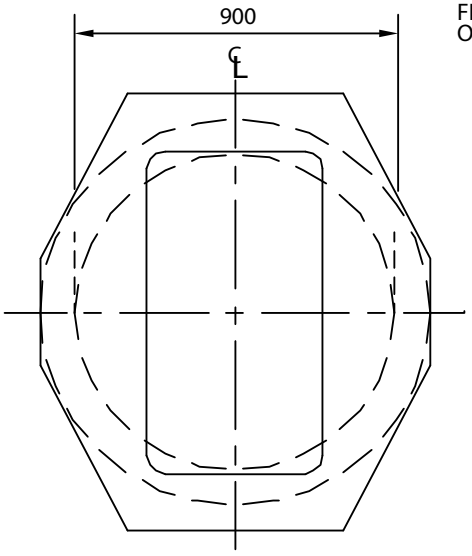
SECTION A-A

20ø ALUMINUM ALLOY MANHOLE
SAFETY STEPS

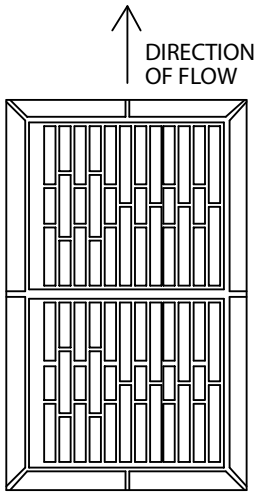
ALL DIMENSIONS IN MILLIMETERS

Brazeau County

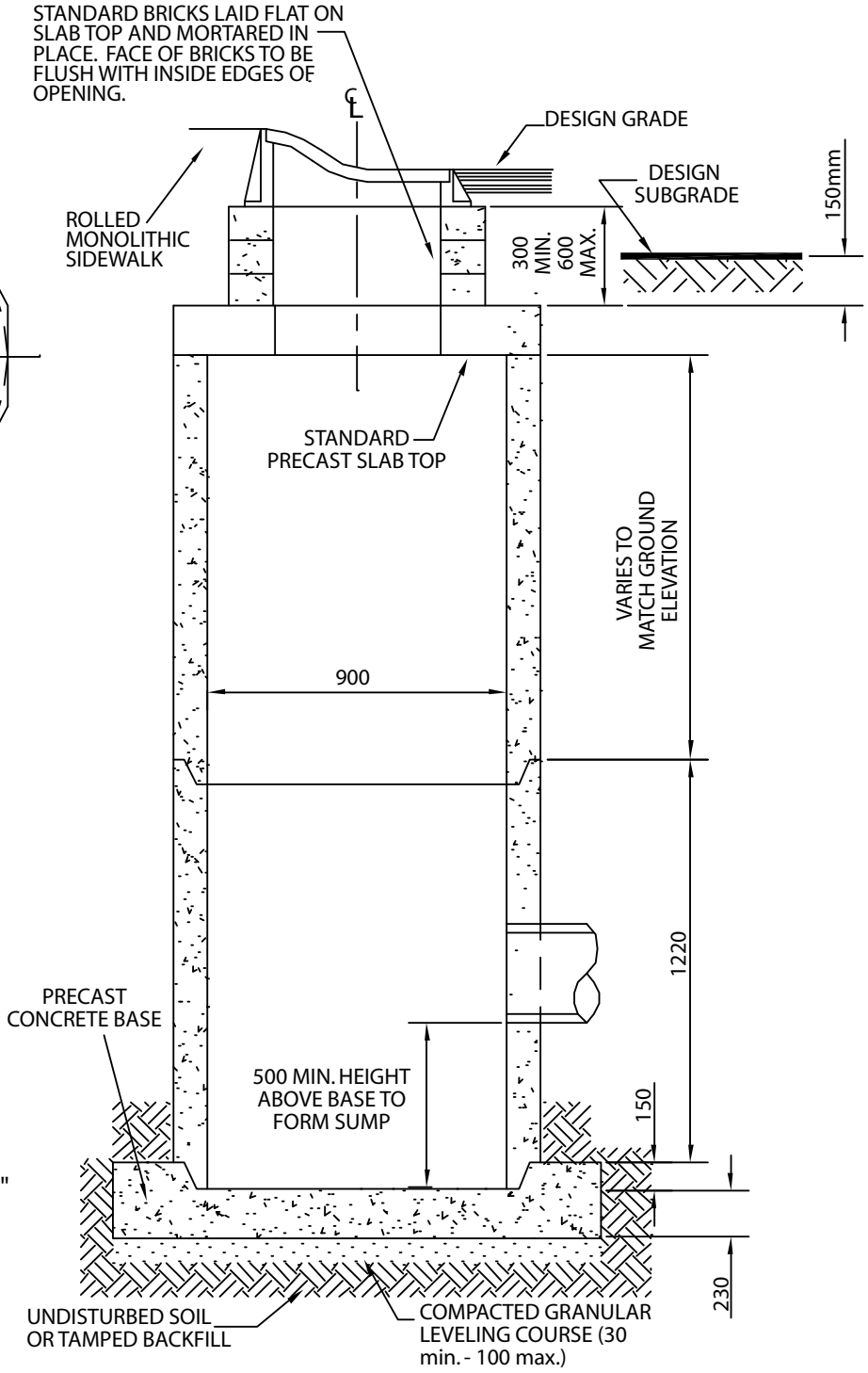
DATE: 08/2006	DRAWING 4.12 EXTERNAL DROP MANHOLE
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	



PLAN VIEW OF C.B. WITH PRECAST SLAB TOP



FRAME AND GRATE TYPE "K-2"

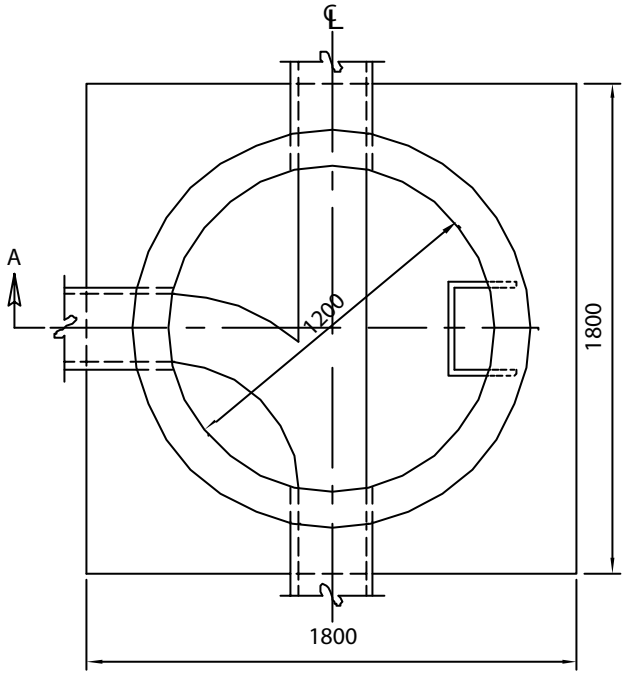


ALL DIMENSIONS IN MILLIMETERS

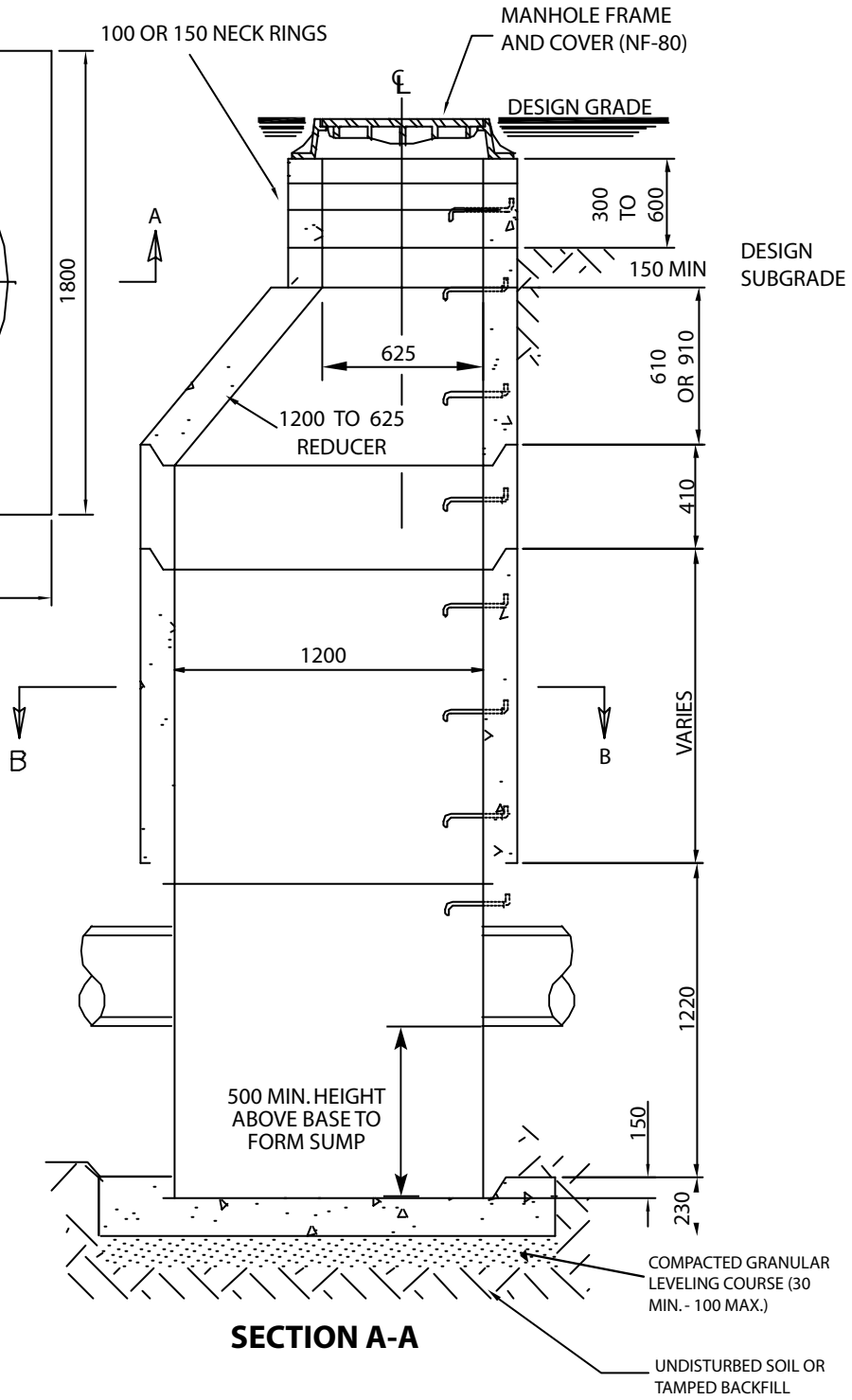
Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 4.13
STANDARD CATCH BASIN
900mm



SECTION B-B



SECTION A-A

NOTE:

1. MANHOLE PRECAST UNITS TO MEET A.S.T.M. C478.
2. POURED IN PLACE CONCRETE OVER 5.0m DEEP POURED IN PLACE OR PRECAST BASES SHALL BE REINFORCED WITH MINIMUM 10m BARS 250mm O/E E/W IN BOTH DIRECTIONS.
3. POURED IN PL;ACE CONCRETE TO BE 25MPa AT 28 DAYS, TYPE 50.
4. INLET AND OUTLET PIPES TO BE GROUTED FLUSH WITH WALL.
5. SAFETY STEPS REQUIRED TO FULL HEIGHT OF MANHOLE.
6. WHERE POSSIBLE STEPS TO BE POSITIONED TO FACE ONCOMING TRAFFIC.
7. RUBBER GASKET, KENT SEAL OR EQUIVALENT TO BE INSTALLED BETWEEN PRECAST BASES, PRECAST BARRELS, ALL NECK RINGS, CONE AND MANHOLE FRAME.
8. PERCHED MH'S ARE ACCEPTABLE FOR PIPE SIZES OVER 900mm.
9. FRAMES AND COVERS:
   LANDSCAPED AREAS - NF39
   HARD SURFACES - NF80
   SAG AREAS - NF 90 WITH GASKET.

ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

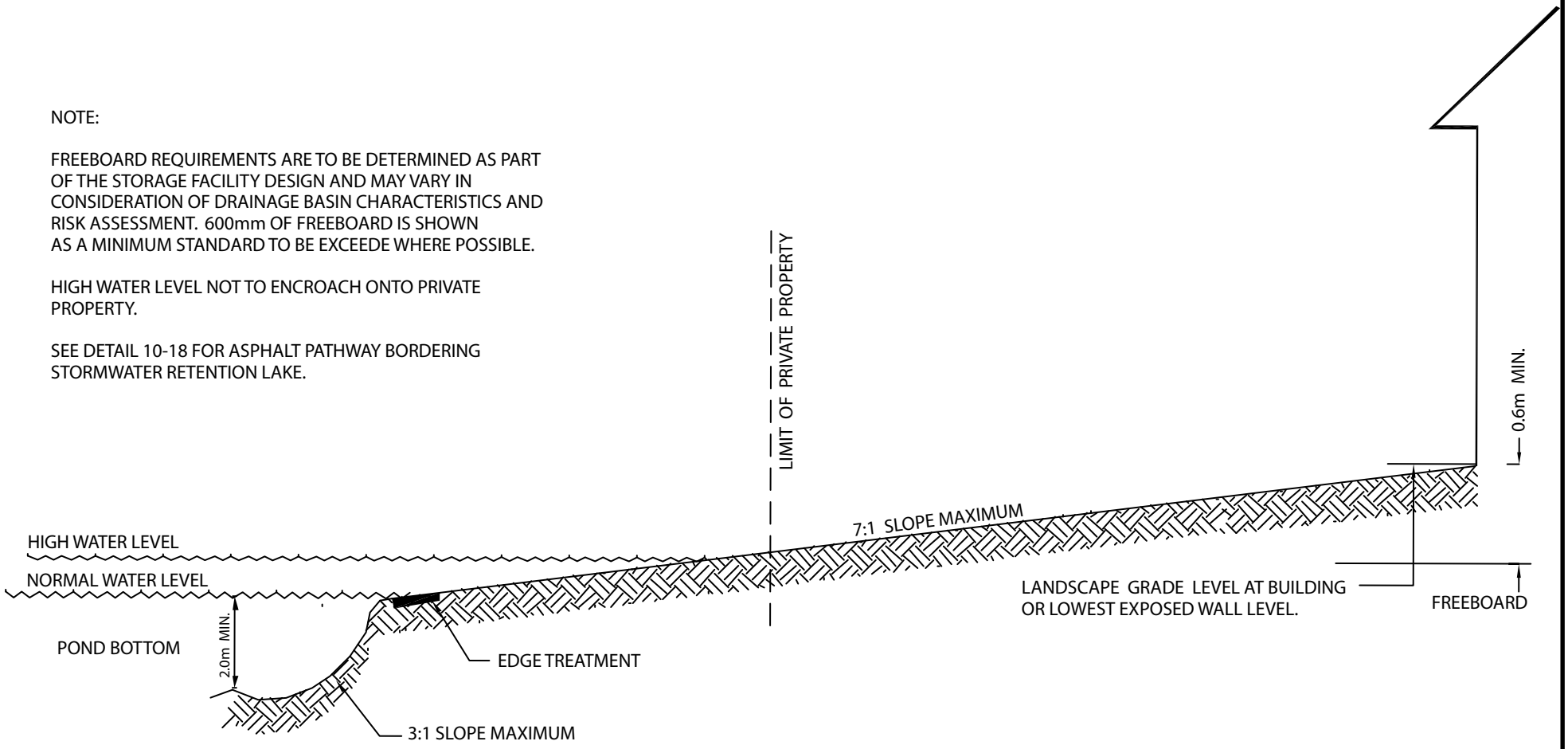
DRAWING 4.14
STANDARD
1200 Ø CATCH BASIN MANHOLE

NOTE:

FREEBOARD REQUIREMENTS ARE TO BE DETERMINED AS PART OF THE STORAGE FACILITY DESIGN AND MAY VARY IN CONSIDERATION OF DRAINAGE BASIN CHARACTERISTICS AND RISK ASSESSMENT. 600mm OF FREEBOARD IS SHOWN AS A MINIMUM STANDARD TO BE EXCEEDE WHERE POSSIBLE.

HIGH WATER LEVEL NOT TO ENCROACH ONTO PRIVATE PROPERTY.

SEE DETAIL 10-18 FOR ASPHALT PATHWAY BORDERING STORMWATER RETENTION LAKE.



ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	07/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

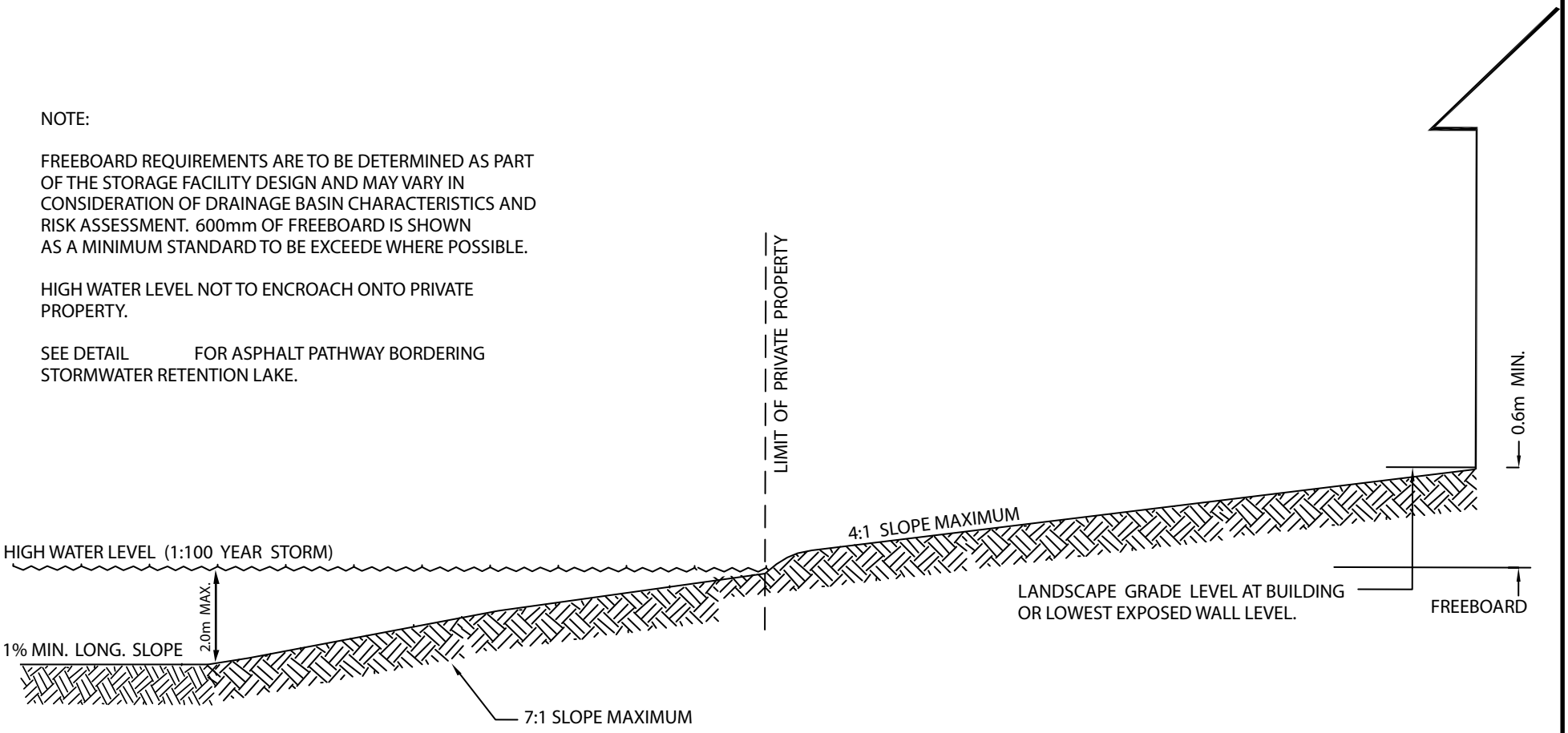
DRAWING 5.40
STORMWATER RETENTION POND GENERAL CROSS SECTION

NOTE:

FREEBOARD REQUIREMENTS ARE TO BE DETERMINED AS PART OF THE STORAGE FACILITY DESIGN AND MAY VARY IN CONSIDERATION OF DRAINAGE BASIN CHARACTERISTICS AND RISK ASSESSMENT. 600mm OF FREEBOARD IS SHOWN AS A MINIMUM STANDARD TO BE EXCEEDE WHERE POSSIBLE.

HIGH WATER LEVEL NOT TO ENCROACH ONTO PRIVATE PROPERTY.

SEE DETAIL FOR ASPHALT PATHWAY BORDERING STORMWATER RETENTION LAKE.

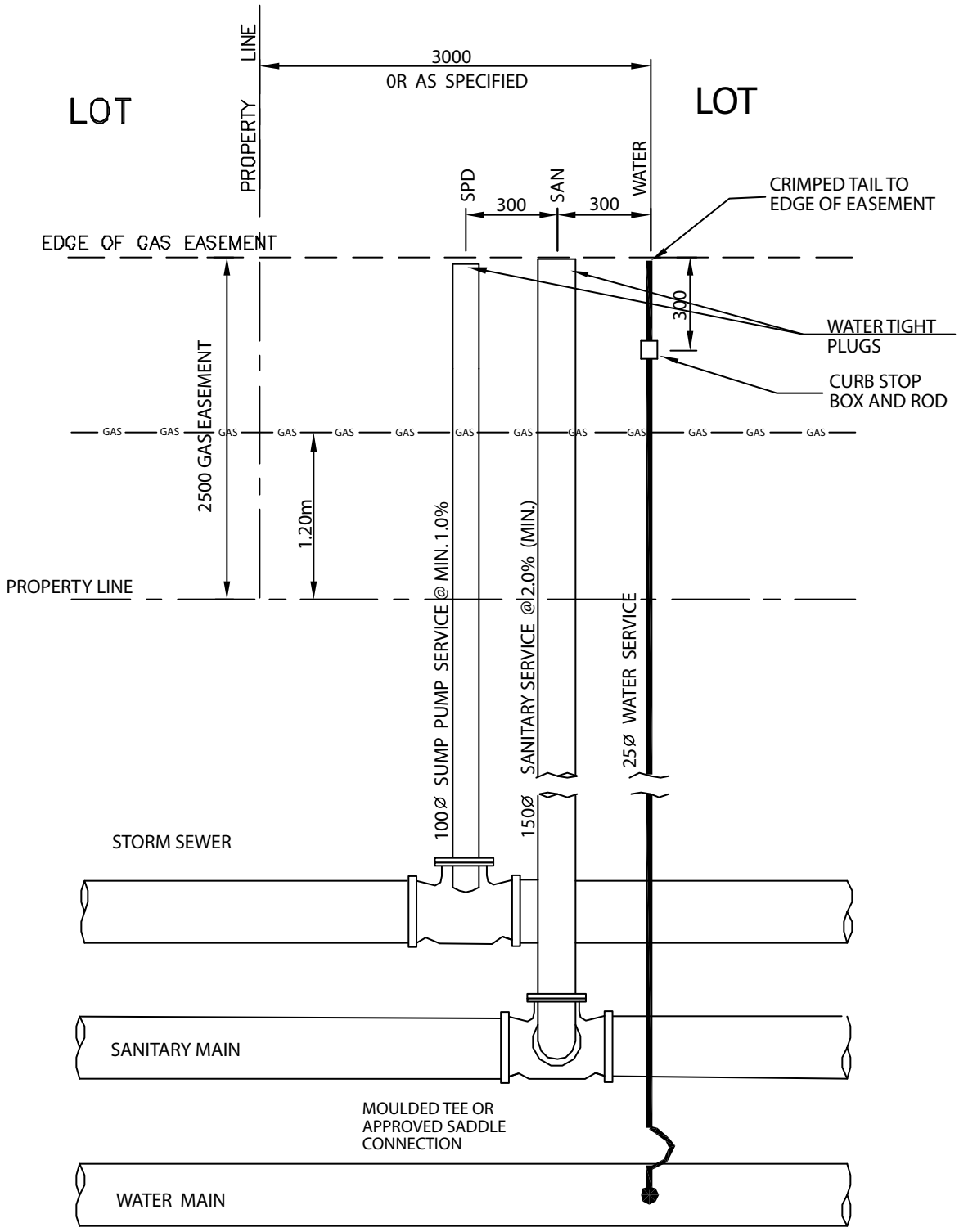


ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	10/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

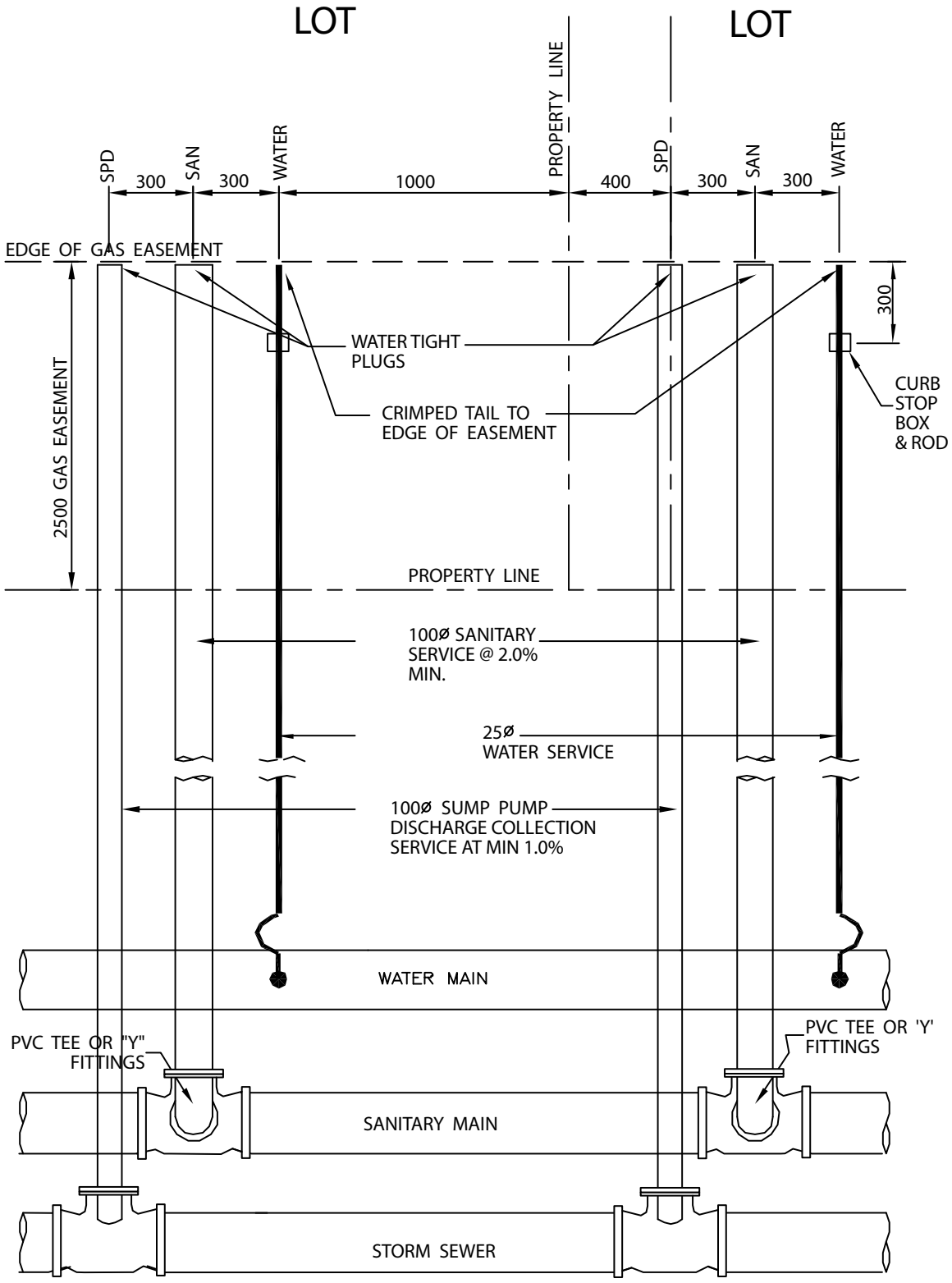
DRAWING 5.41
TYPICAL DRY POND
GENERAL CROSS SECTION



ALL DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE

Brazeau County

DATE: 08/2006	DRAWING 6.20 SINGLE SERVICE
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	



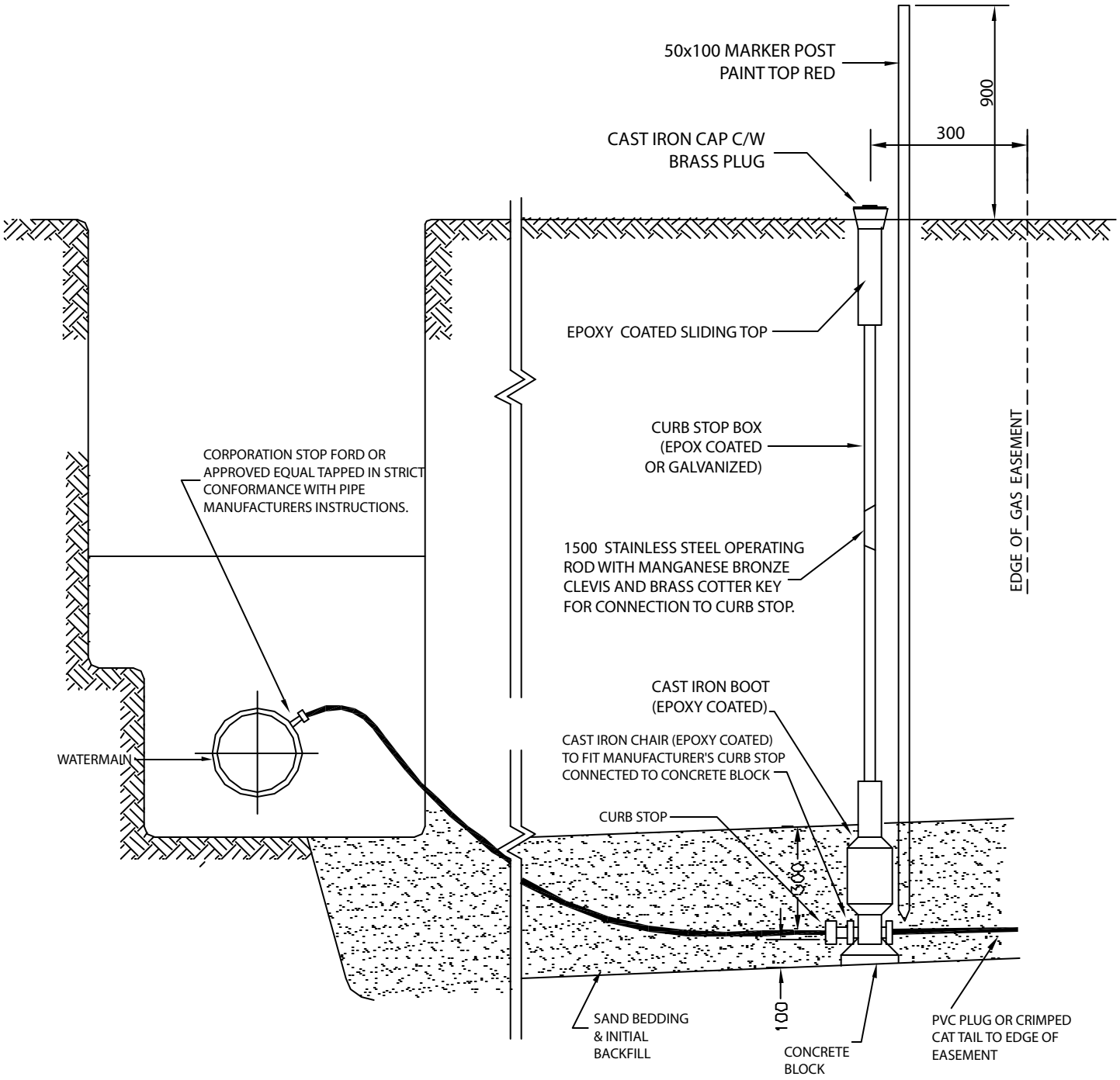
ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE: 08/2006	DRAWING 6.21 DOUBLE SERVICE
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	

NOTE;

1. COPPER LINE SHALL BE ONE PIECE, UNLESS LENGTH EXCEEDS 20.0m, AND ONLY THEN WILL A DOUBLE UNION BE ALLOWED.
2. INVERT ELEVATION SHALL BE 2.8m BELOW ESTABLISHED FINISHED GRADE.
3. MAIN STOP TAPS SHALL BE A MINIMUM OF 600mm APART AND NO LESS THAN 300mm TO A COUPLING OR COLLAR.
4. "CC" SHALL BE NEATLY STAMPED INTO THE CONCRETE CURB OR SIDEWALK DIRECTLY OPPOSITE EACH SERVICE.

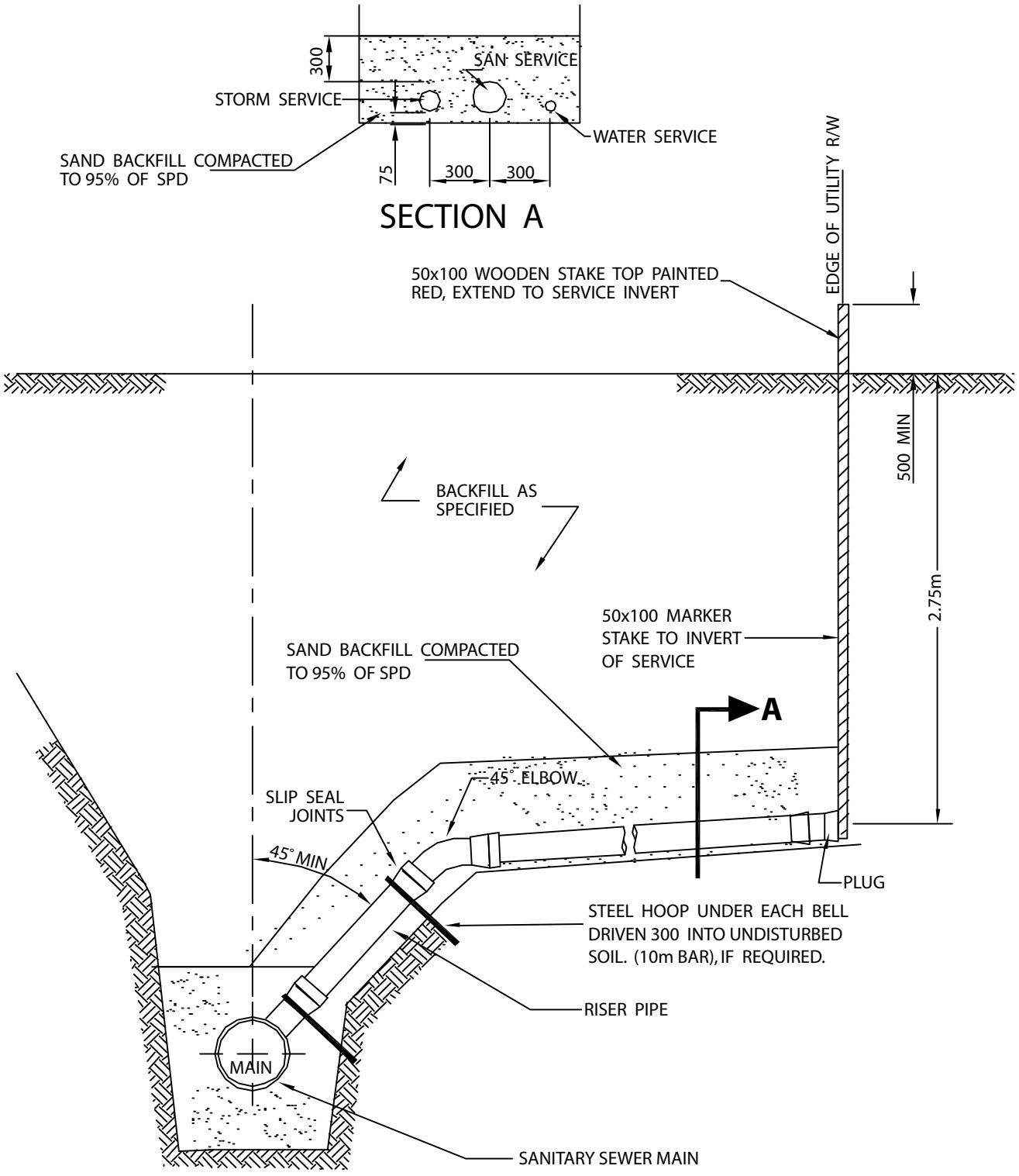


ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 6.22
50mm AND SMALLER
WATER SERVICE

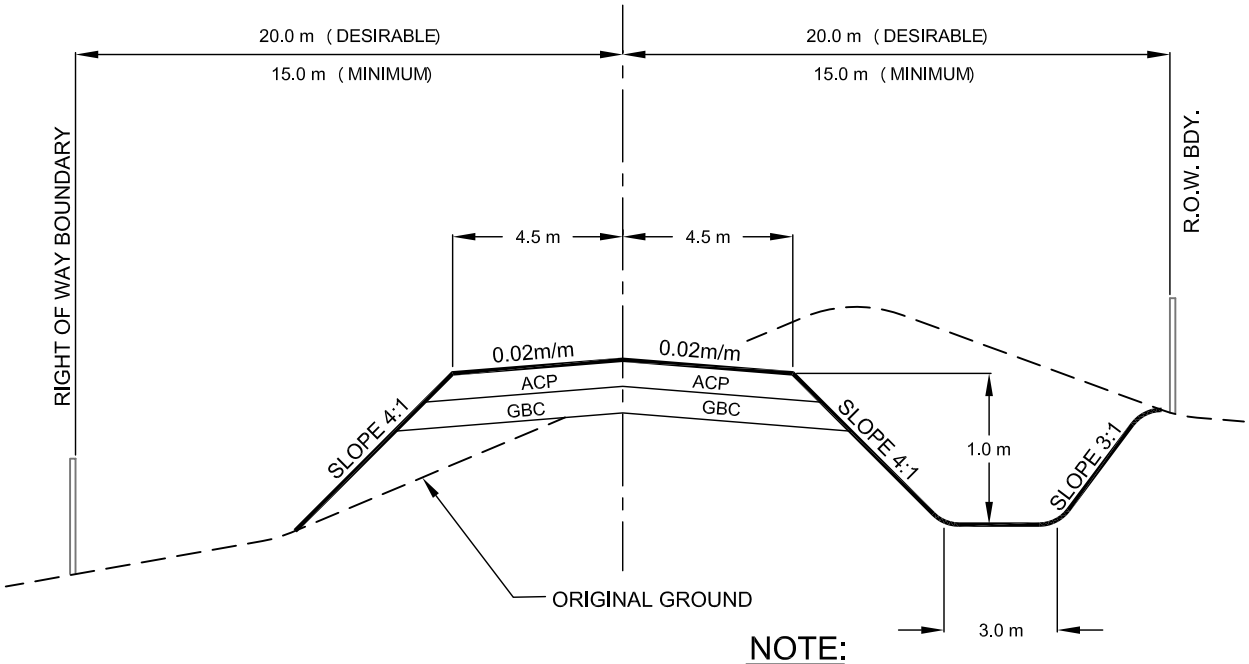


ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 6.23
SEWER SERVICE
RISER DETAIL



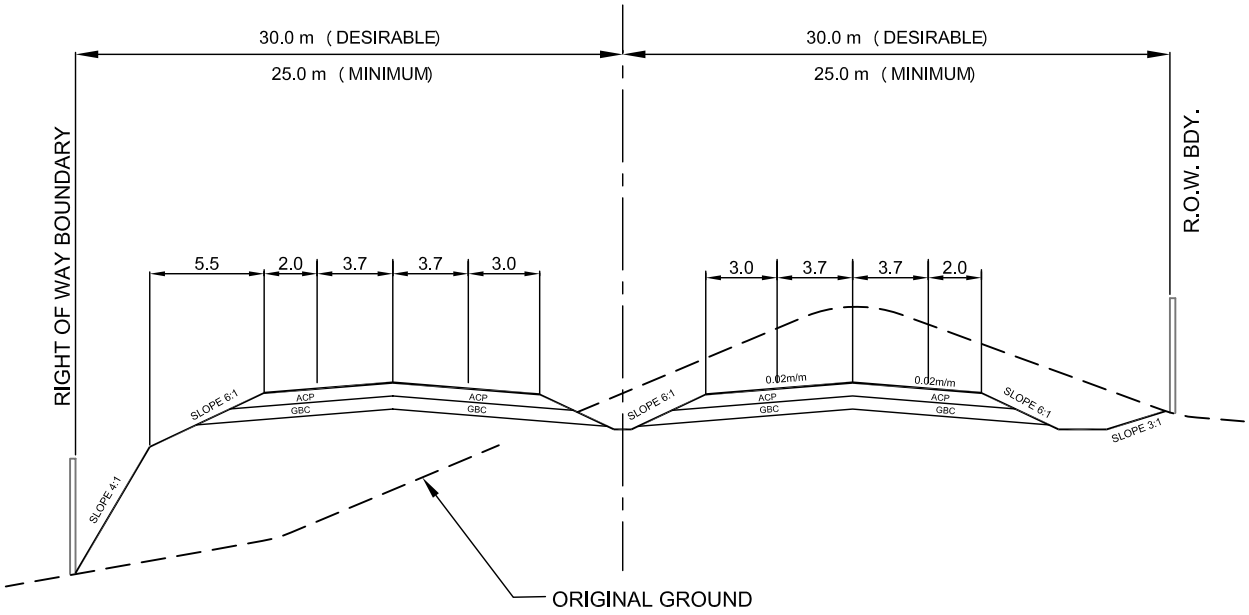
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
9.0	40.0	4:1	3:1	3:1	2:1	440	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.010
ARTERIAL ROAD
STANDARD CROSS-SECTION

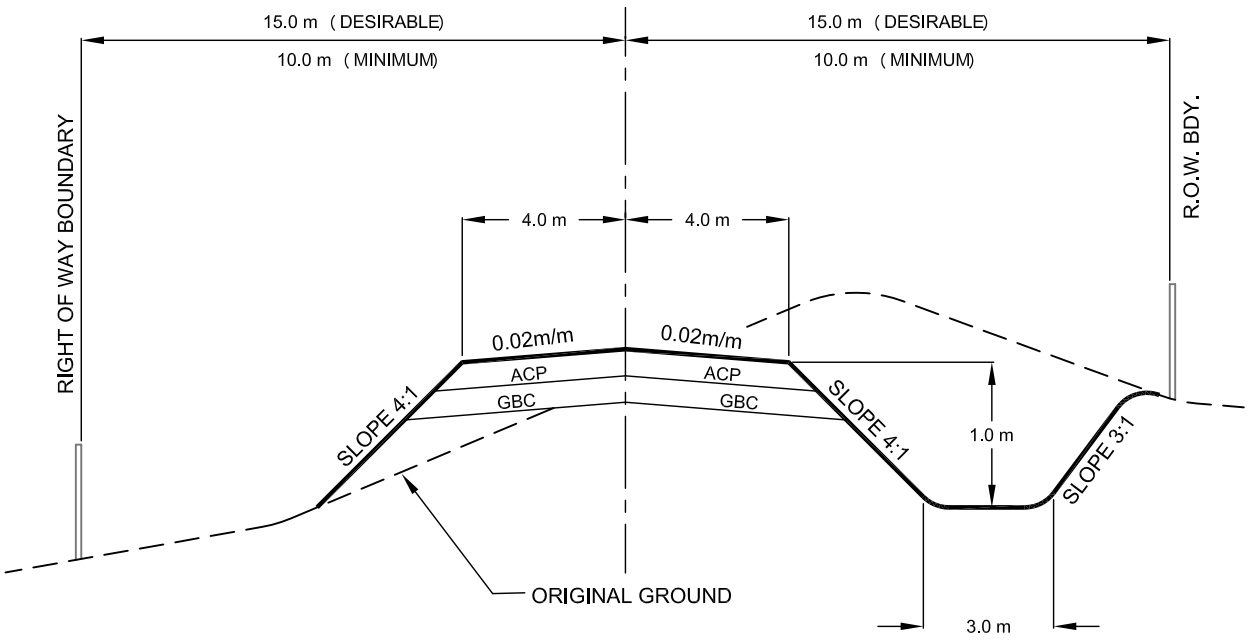


SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
12.4/12.4	50.0	6:1	6:1/4:1	5:1	3:1	440	0.06	6.0

Brazeau County

DATE:	03/2006
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.011
ARTERIAL ROAD
STANDARD CROSS-SECTION



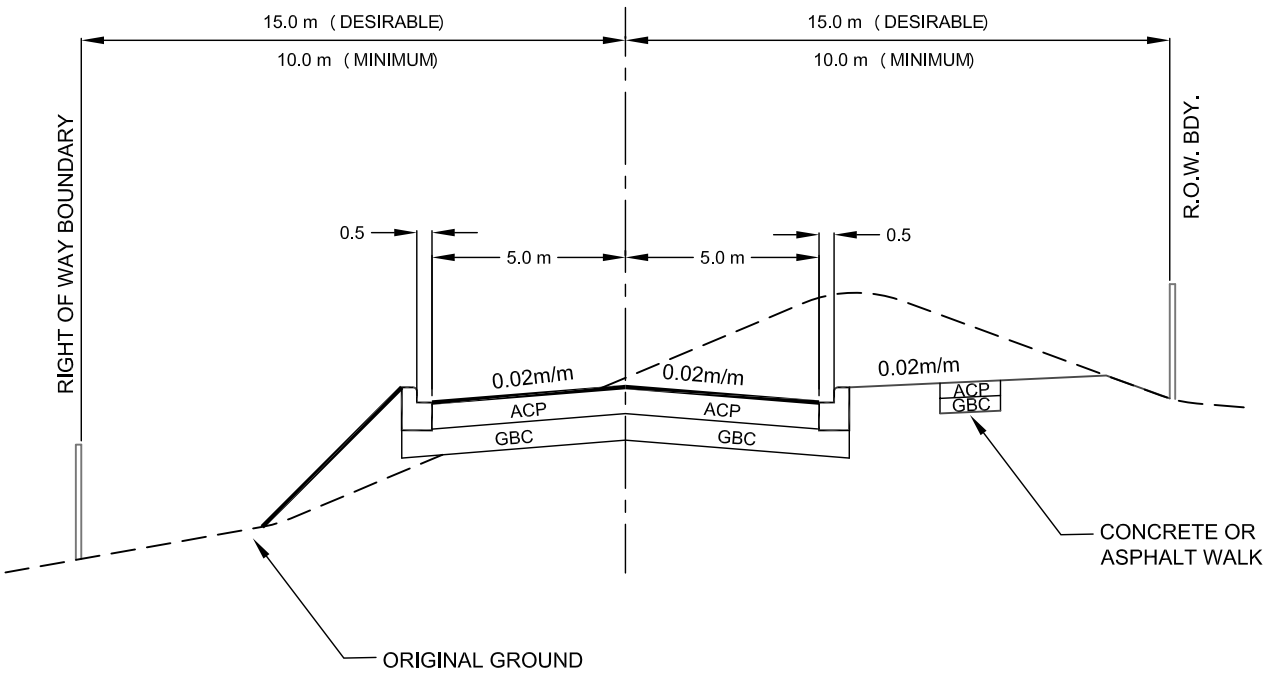
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
8.0	30.0	4:1	3:1	3:1	2:1	440	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.020
COLLECTOR ROAD
STANDARD CROSS-SECTION

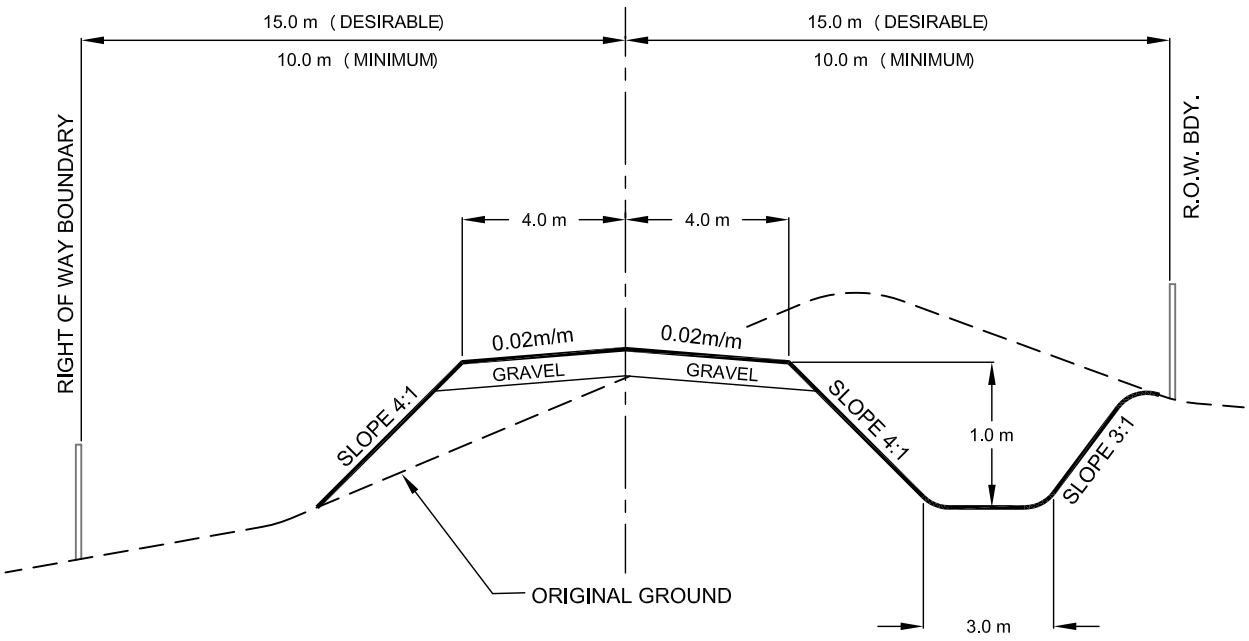


SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
10.0	30.0	2%	3:1	3:1	2:1	440	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.021
URBAN COLLECTOR ROAD
STANDARD CROSS-SECTION



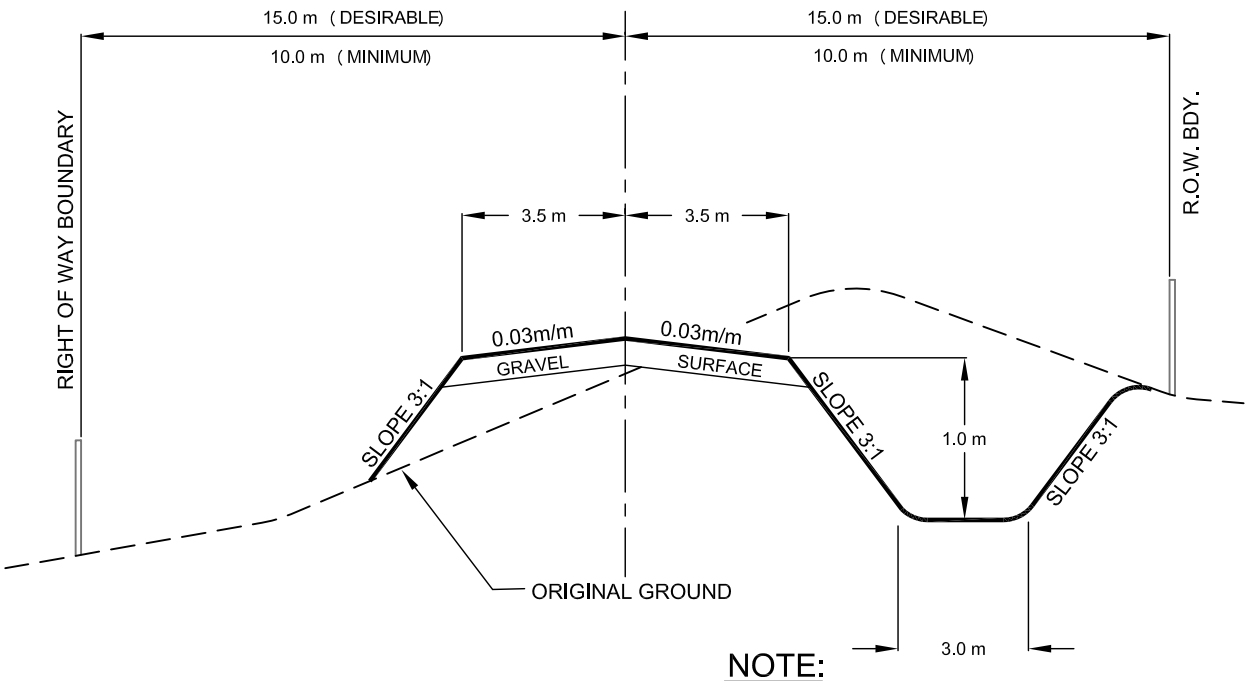
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
8.0	30.0	4:1	3:1	3:1	2:1	440	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.022
COLLECTOR ROAD-GRAVEL
STANDARD CROSS-SECTION



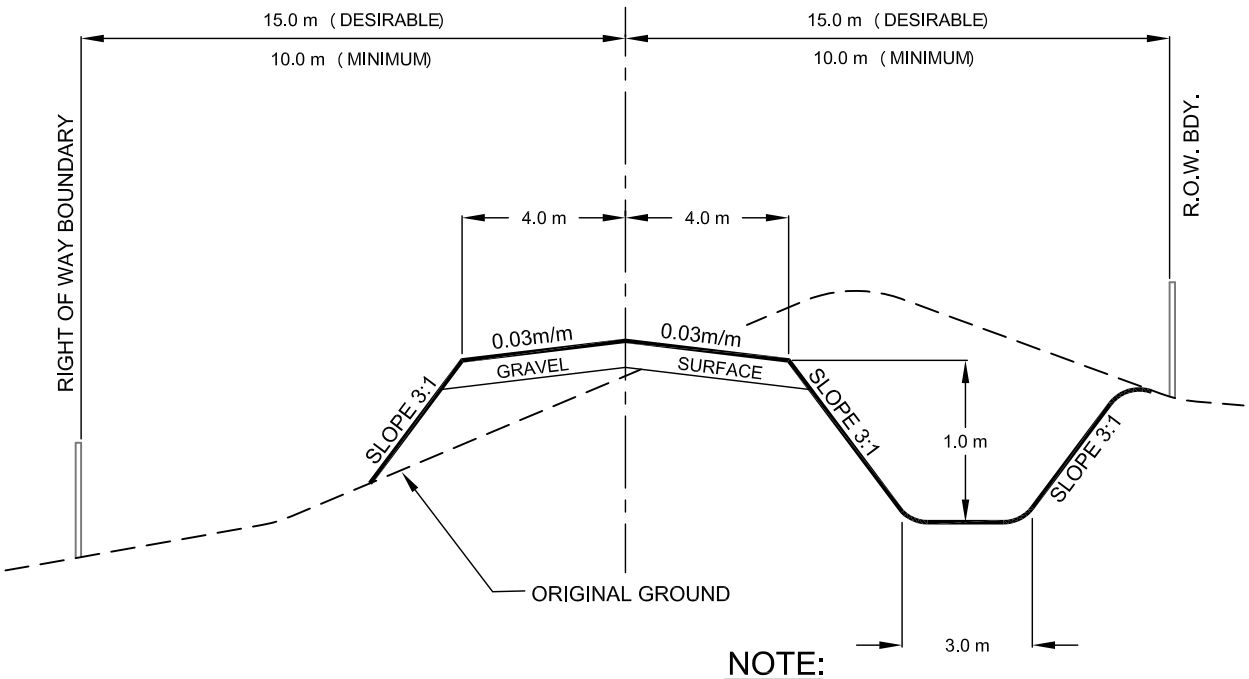
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
7.0	30.0	3:1	3:1	3:1	2:1	300	0.08	7.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.030
LOCAL ROAD 1
STANDARD CROSS-SECTION



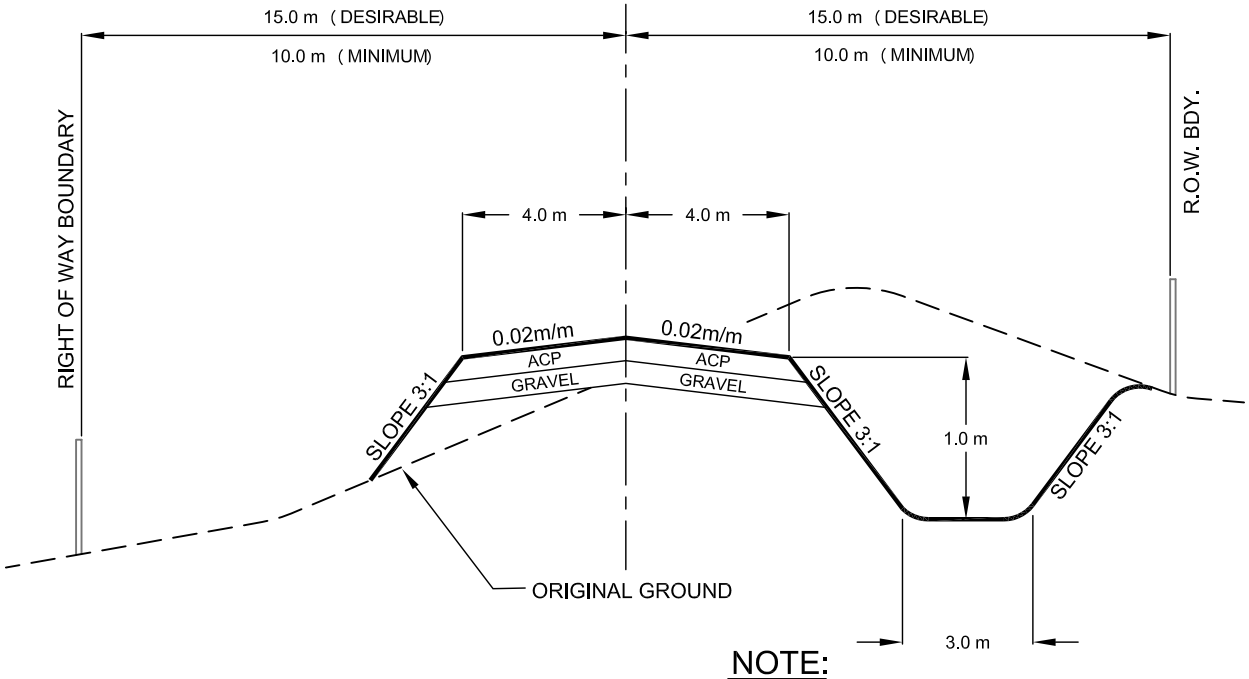
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
8.0	30.0	3:1	3:1	3:1	2:1	300	0.08	7.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.031
LOCAL ROAD 2
STANDARD CROSS-SECTION



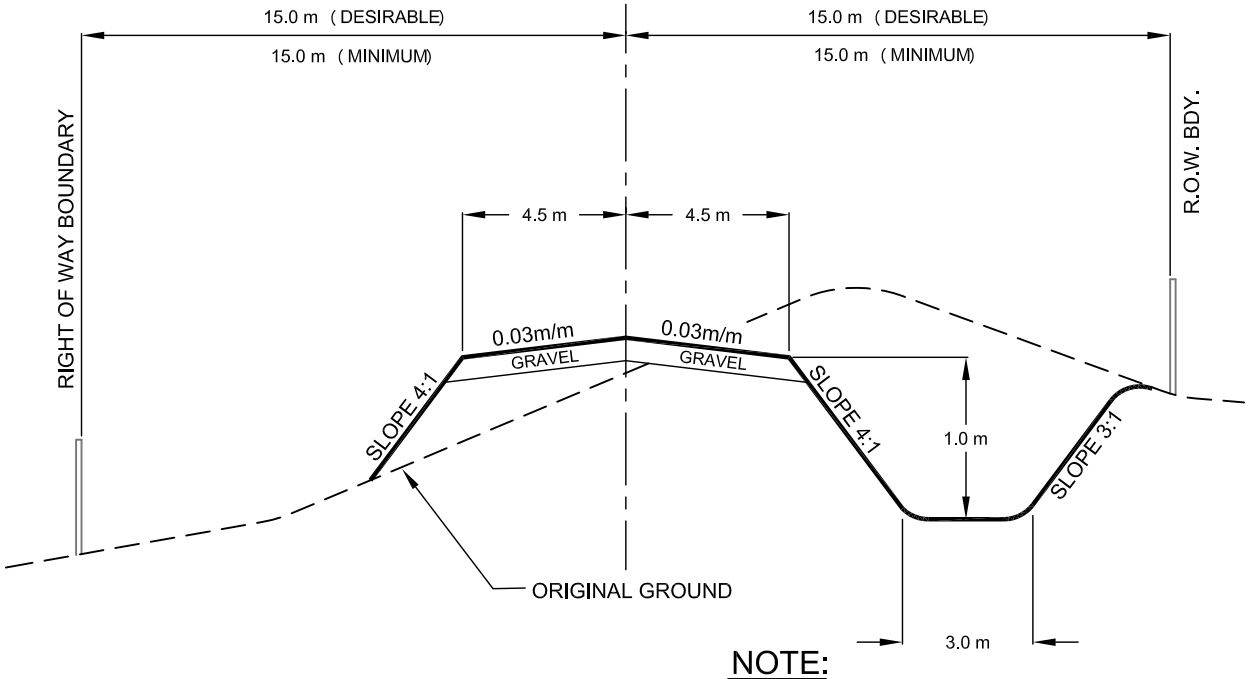
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
8.0	20.0	3:1	3:1	3:1	2:1	120	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.032
LOCAL ROAD - PAVED
CROSS-SECTION



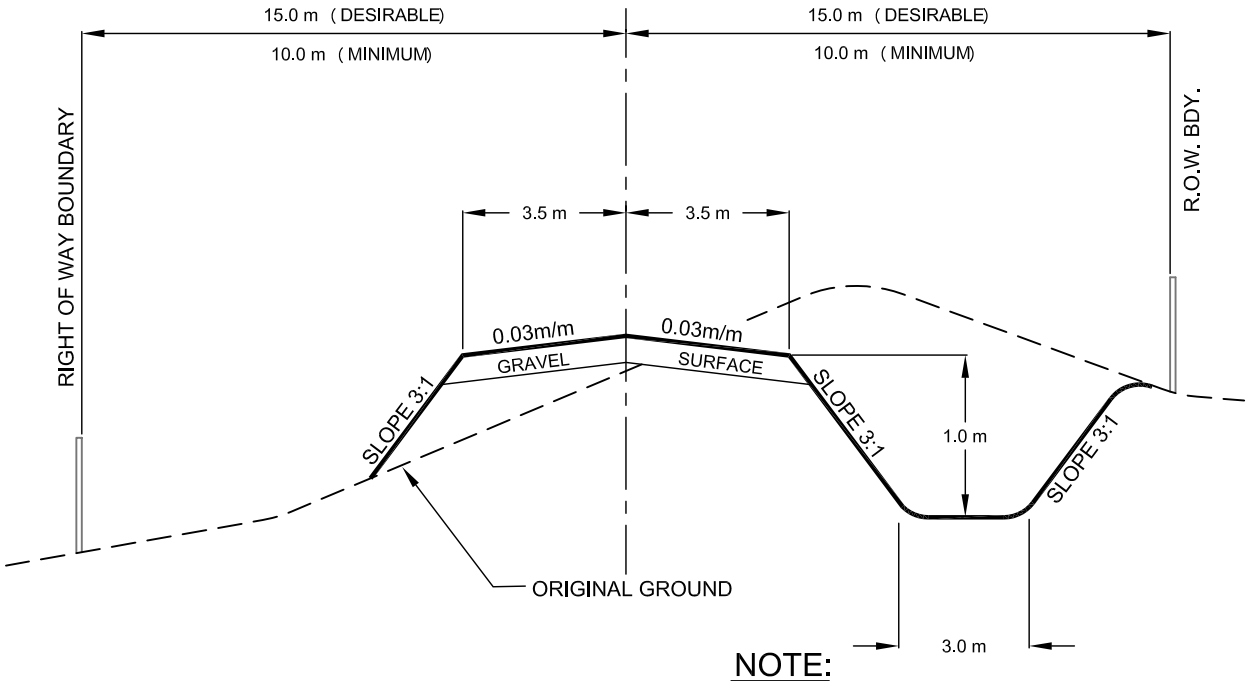
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
9.0	30.0	4:1	4:1	3:1	2:1	120	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.033
LOCAL ROAD
MODIFIED CROSS-SECTION



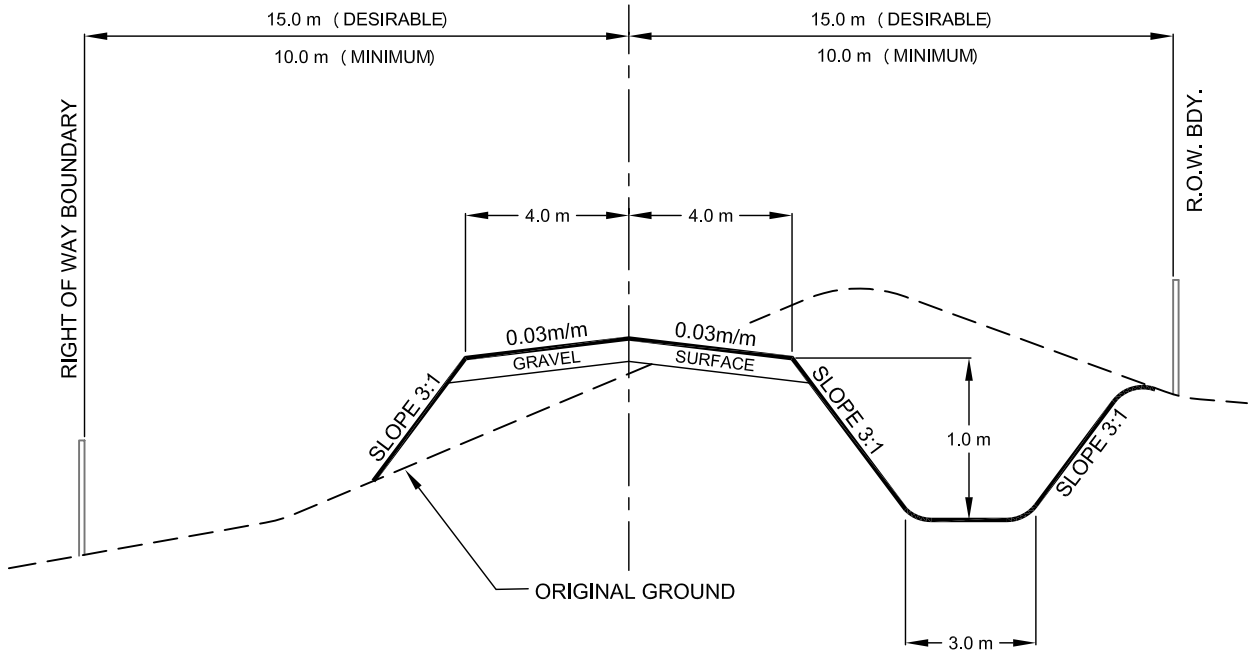
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRALBE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
7.0	30.0	3:1	3:1	3:1	2:1	120	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.040
COUNTRY RESIDENTIAL 1
STANDARD CROSS-SECTION



NOTE:

THE DEVELOPER SHALL APPLY THE FOLLOWING LIFTS OF TRAFFIC GRAVEL:

1. FIRST LIFT – AGGREGATE APPLIED UPON COMPLETION OF CONSTRUCTION – 275 TONNES PER Km. OF DESIGNATION 4 CLASS 20 (OR CLASS 30) GRAVEL.
2. SECOND LIFT – AGGREGATE APPLIED PRIOR TO COMPLETION OF THE MAINTENANCE PERIOD – 275 TONNES PER Km. OF DESIGNATION 4 CLASS 20 GRAVEL.
3. SPOT PLACING OF DESIGNATION 4 CLASS 20 GRAVEL MAY BE REQUIRED THROUGH THE MAINTENANCE PERIOD.

NOTE:

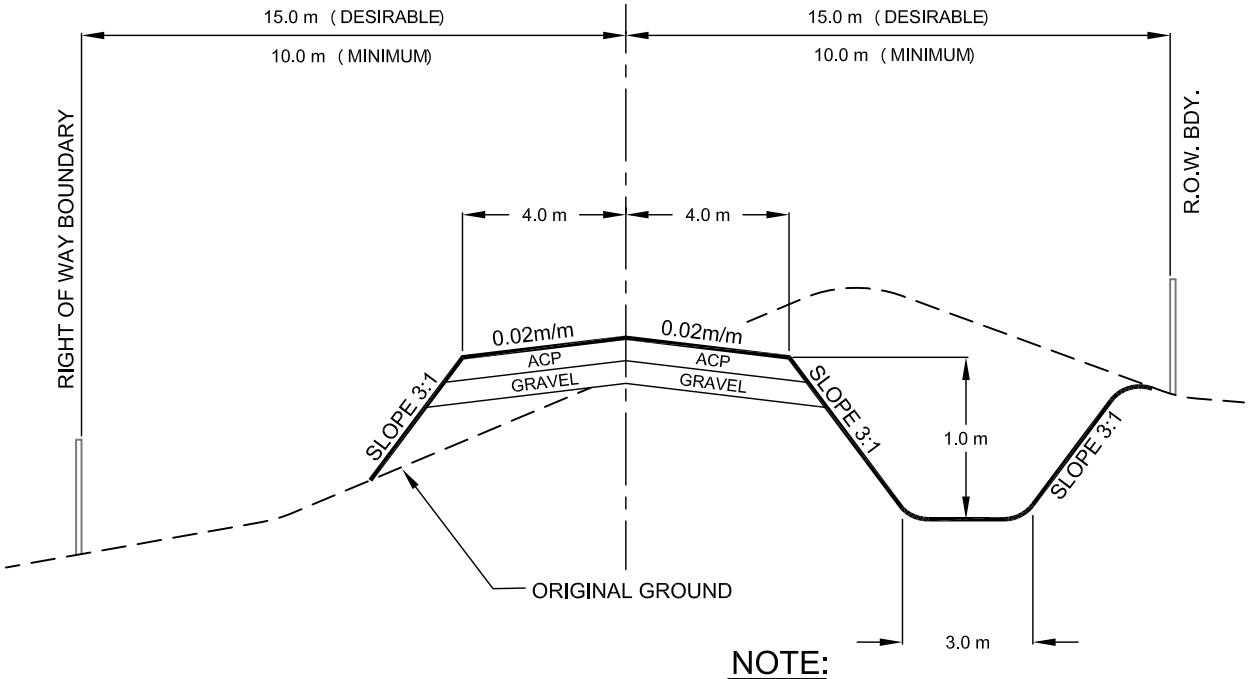
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
8.0	30.0	4:1	3:1	3:1	2:1	120	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.041
COUNTRY RESIDENTIAL 2
STANDARD CROSS-SECTION



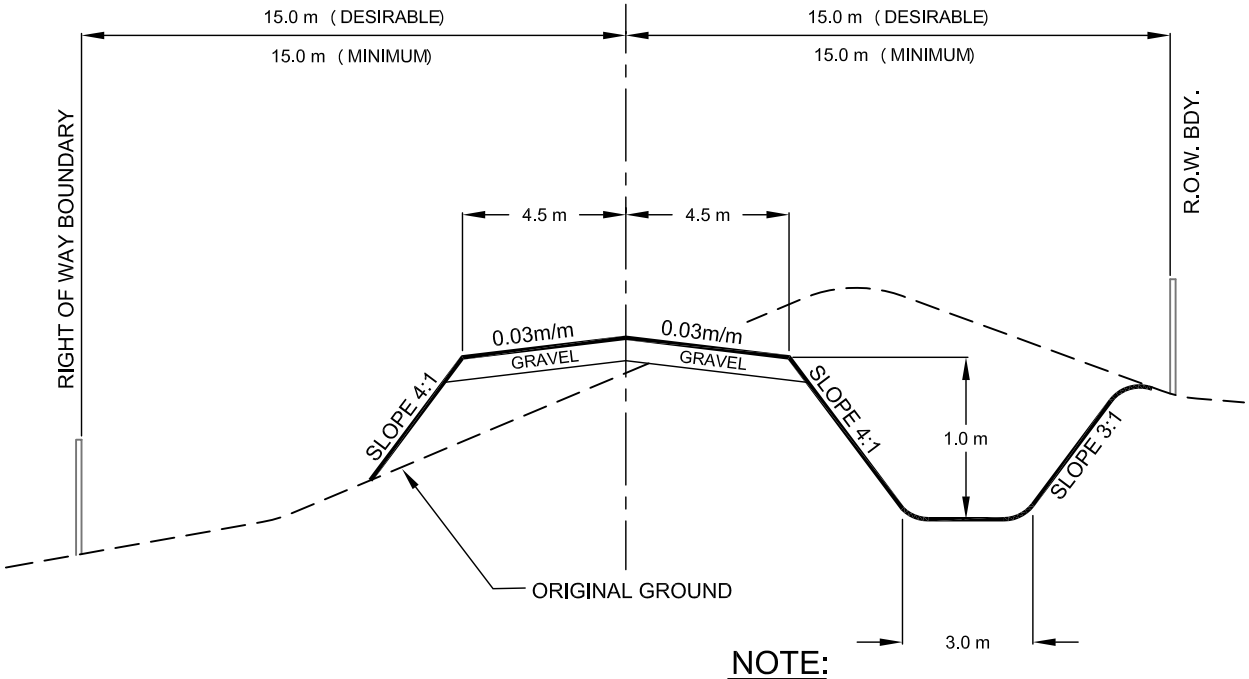
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
8.0	20.0	3:1	3:1	3:1	2:1	120	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.042
COUNTRY RESIDENTIAL 3
PAVED CROSS-SECTION



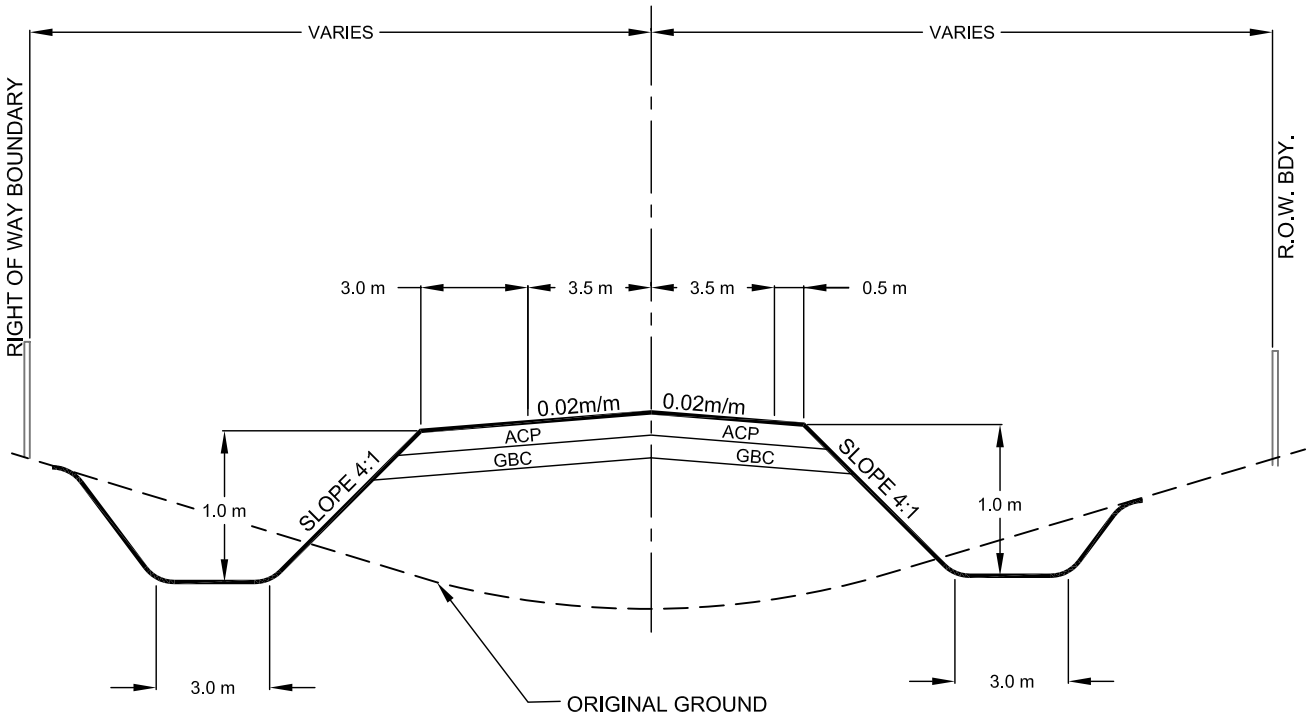
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
9.0	30.0	4:1	4:1	3:1	2:1	120	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.043
COUNTRY RESIDENTIAL 4
MODIFIED CROSS-SECTION



NOTE:

DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
10.5	VARIES	4:1	3:1	3:1	2:1	120	0.06	6.0

Brazeau County

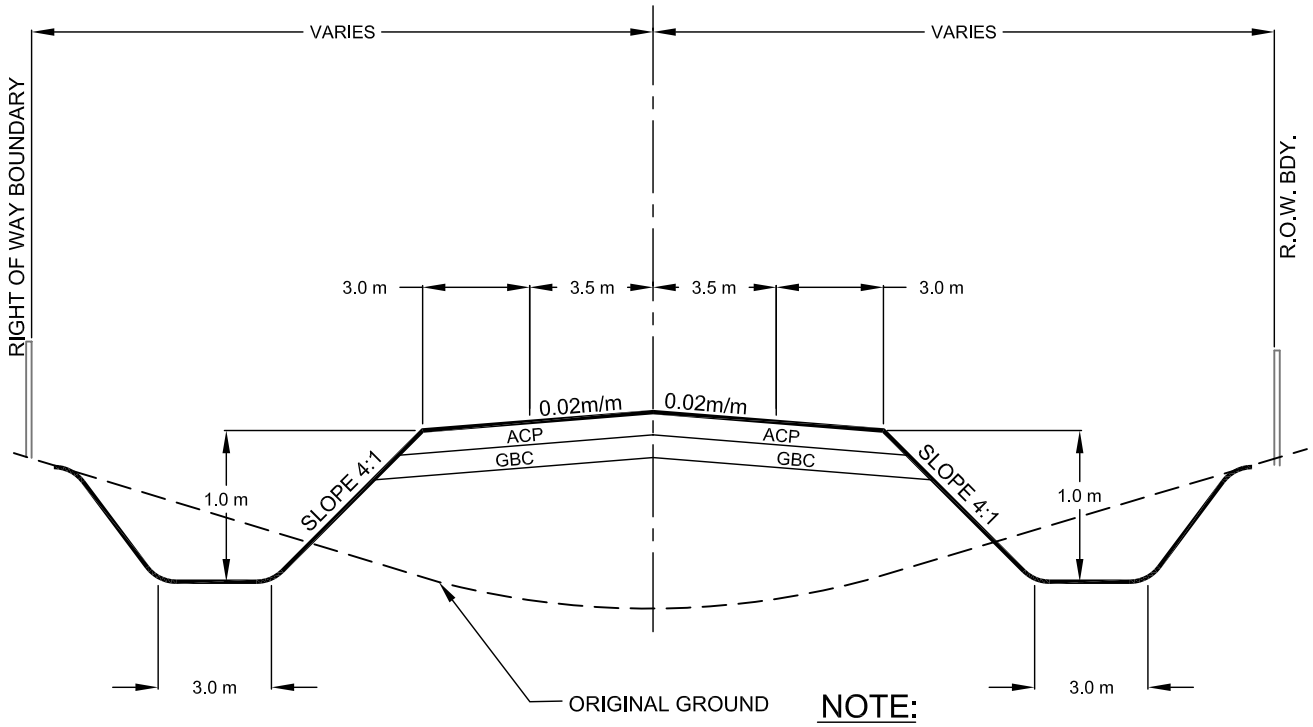
DATE: 03/2006

DRAWN: JE

CHECKED: JE

SCALE: N.T.S.

DRAWING 7.050
HAMLET LOCAL 1 (RURAL)
STANDARD CROSS-SECTION



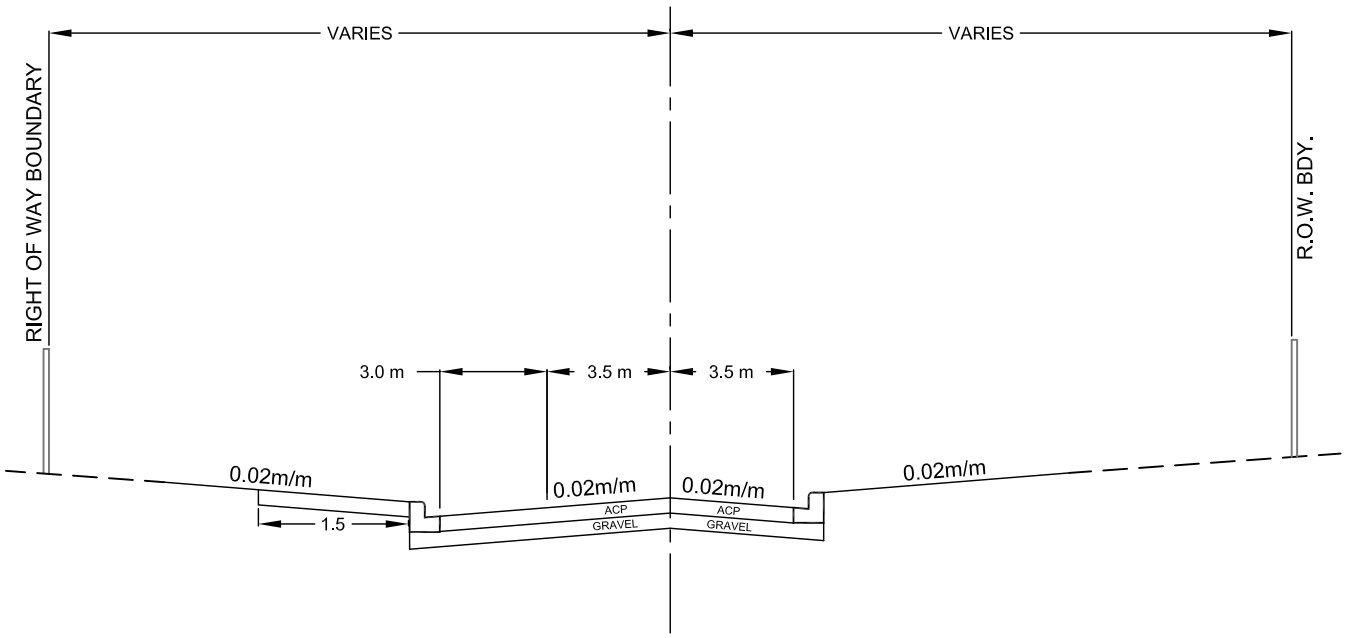
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
13.0	VARIES	4:1	3:1	3:1	2:1	120	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.051
HAMLET LOCAL 2 (RURAL)
STANDARD CROSS-SECTION

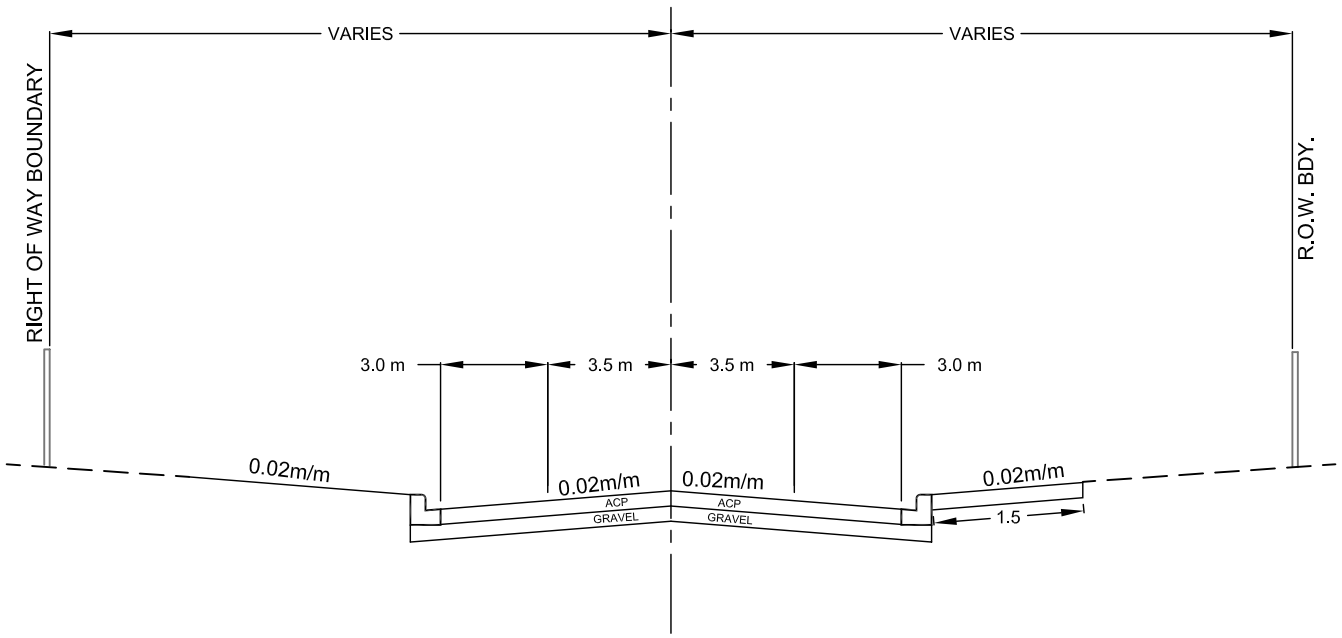


SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
10.0	VARIES	N/A	N/A	N/A	N/A	120	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.052
HAMLET LOCAL 3 (URBAN)
STANDARD CROSS-SECTION

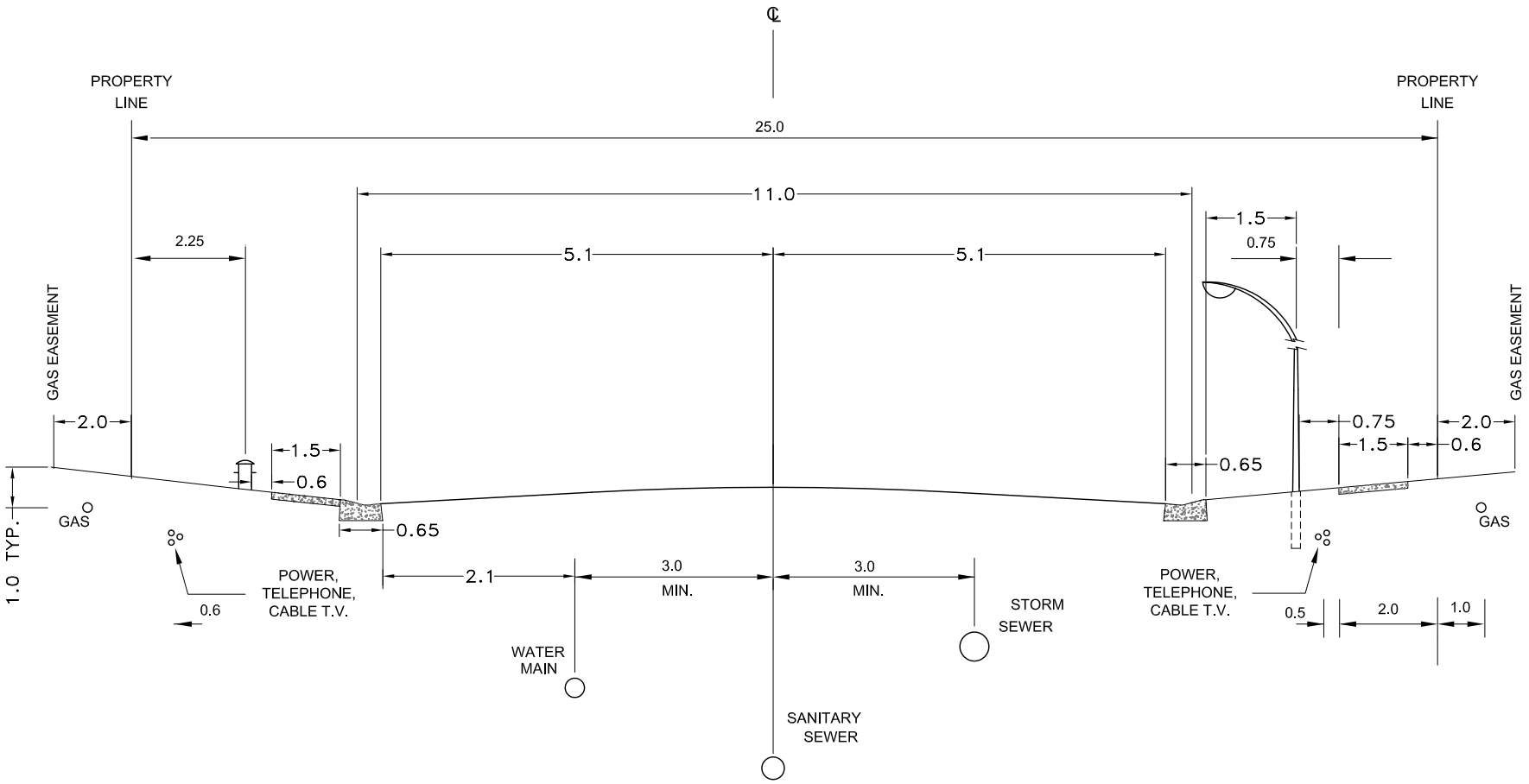


SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
13.0	VARIES	N/A	N/A	N/A	N/A	120	0.06	6.0

Brazeau County

DATE: 01/29/2001
DRAWN: JE
CHECKED JE
SCALE: N.T.S.

DRAWING 7.053
HAMLET LOCAL 4 (URBAN)
STANDARD CROSS-SECTION



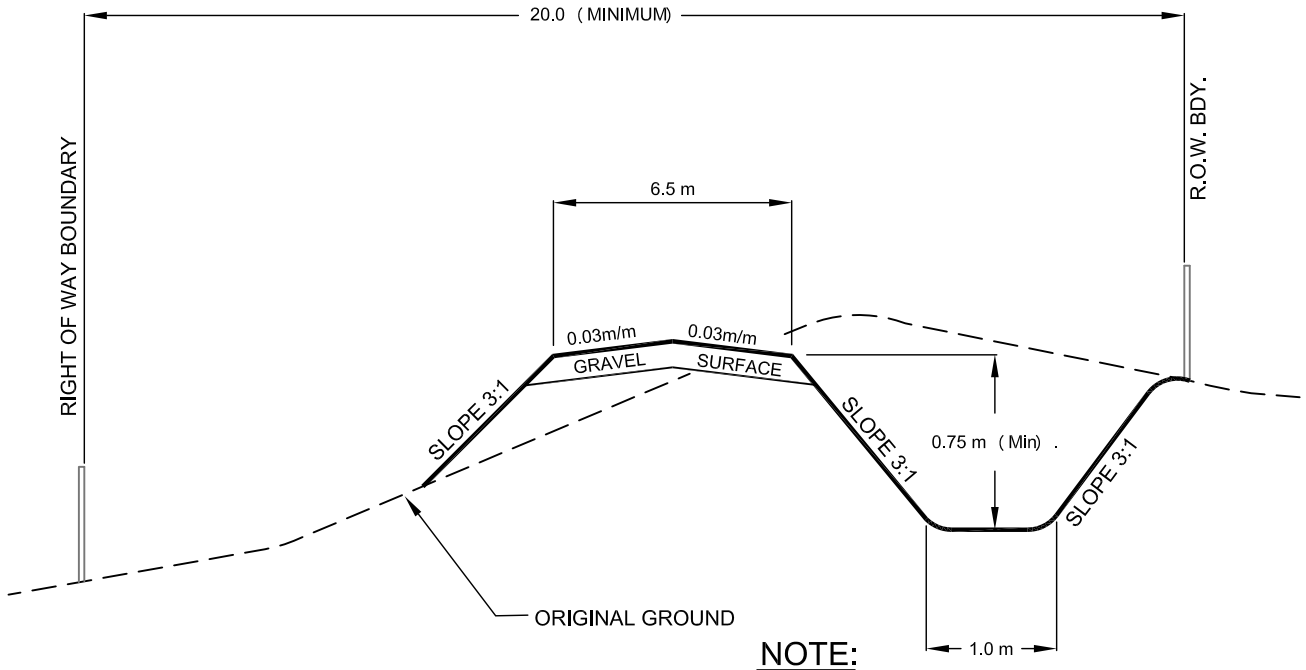
1. SIDEWALK MAY BE EITHER SEPERATE OR MONOLITHIC AS REQUIRED BY PUBLIC WORKS

2. IF NO GAS EASEMENT, CURB STOP TO BE 0.15 m ON THE ROAD SIDE OF PROPERTY

Brazeau County

DATE:	03/06
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.054
HAMLET ROAD (URBAN)
STANDARD CROSS-SECTION



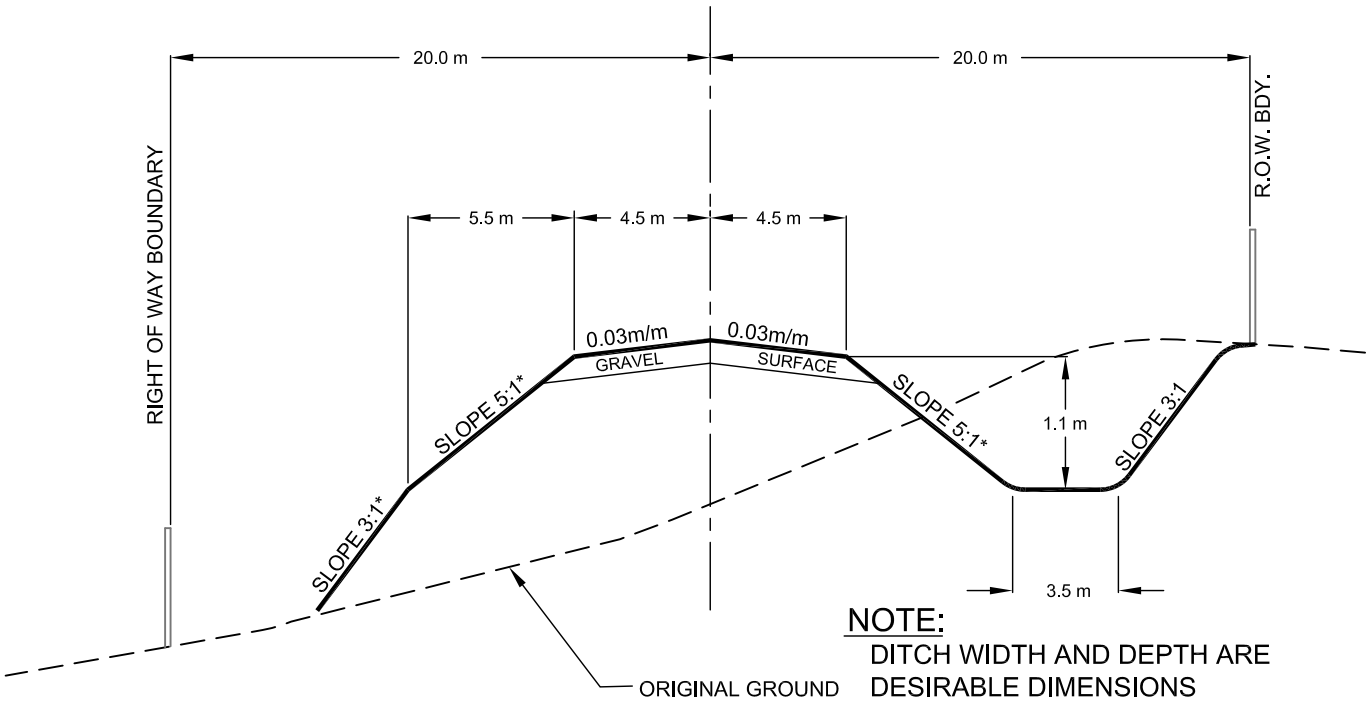
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
6.5	20.0	4:1	3:1	3:1	2:1	120	0.08	8.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.060
LEASE ROAD
STANDARD CROSS-SECTION



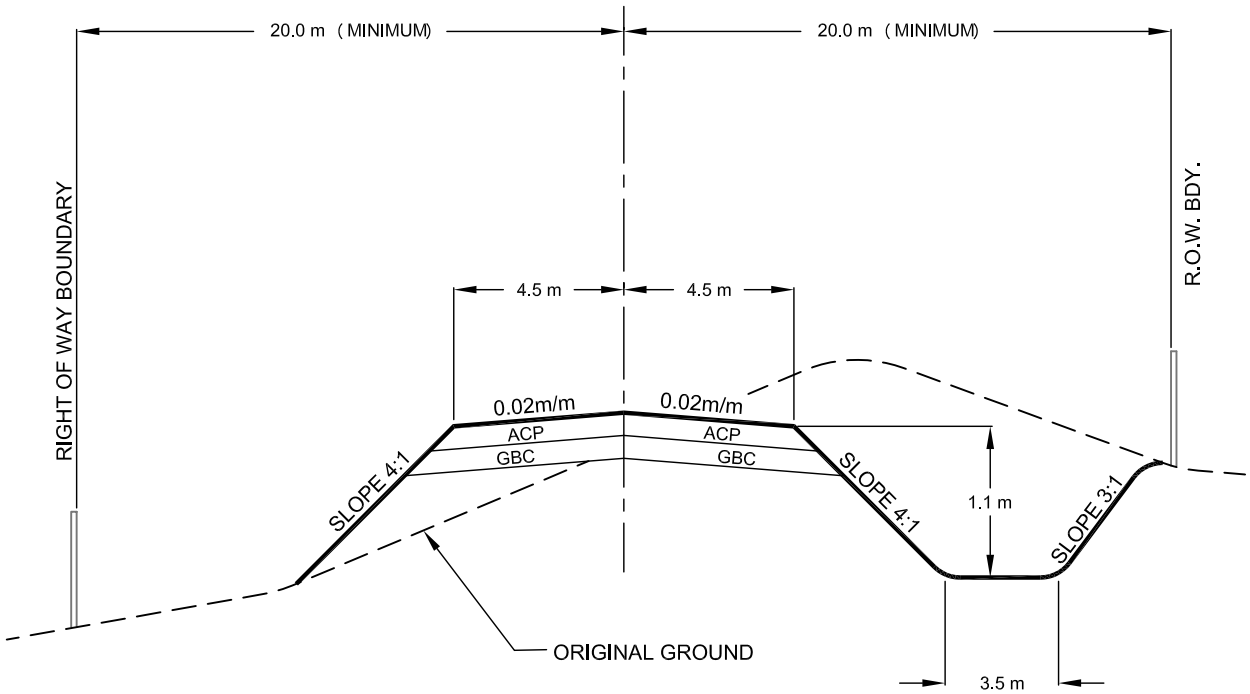
* - INITIAL SIDESLOPES TO BE MODIFIED
TO 4:1 PRIOR TO PAVING

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
9.0	40.0	5:1	3:1	3:1	2:1	440	0.06	7.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.070
RESOURCE ROAD (GRAVEL)
STANDARD CROSS-SECTION



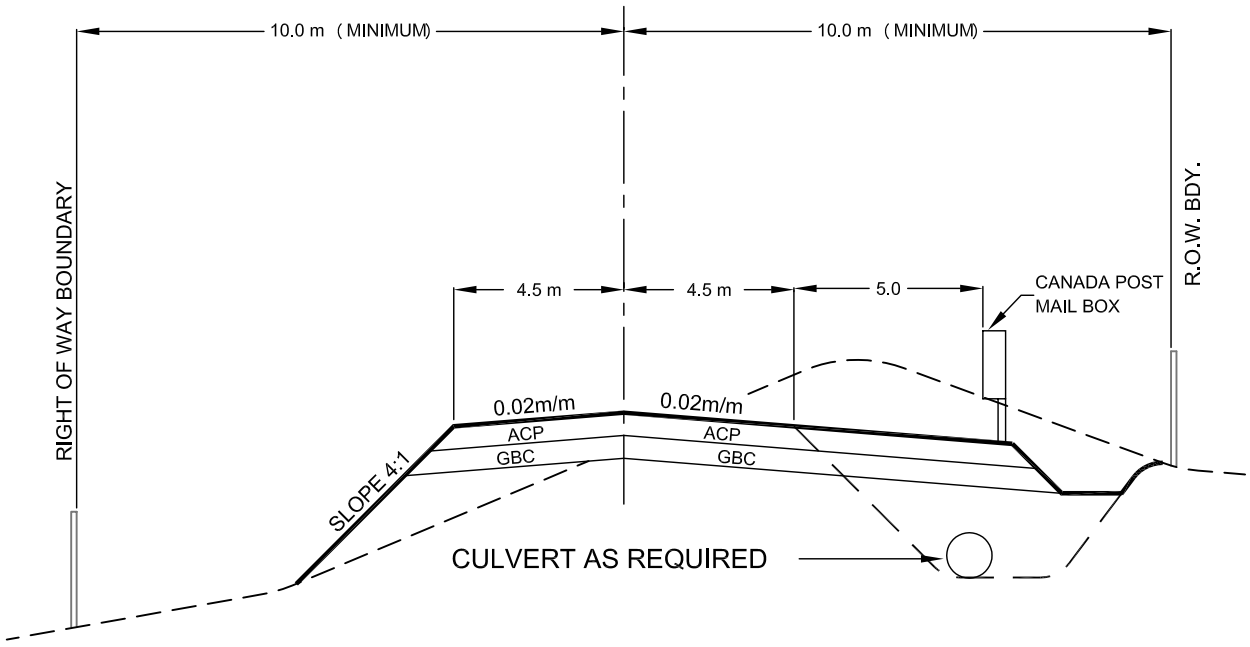
NOTE:
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
9.0	40.0	4:1	3:1	3:1	2:1	440	0.06	7.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.071
RESOURCE ROAD (PAVED)
STANDARD CROSS-SECTION

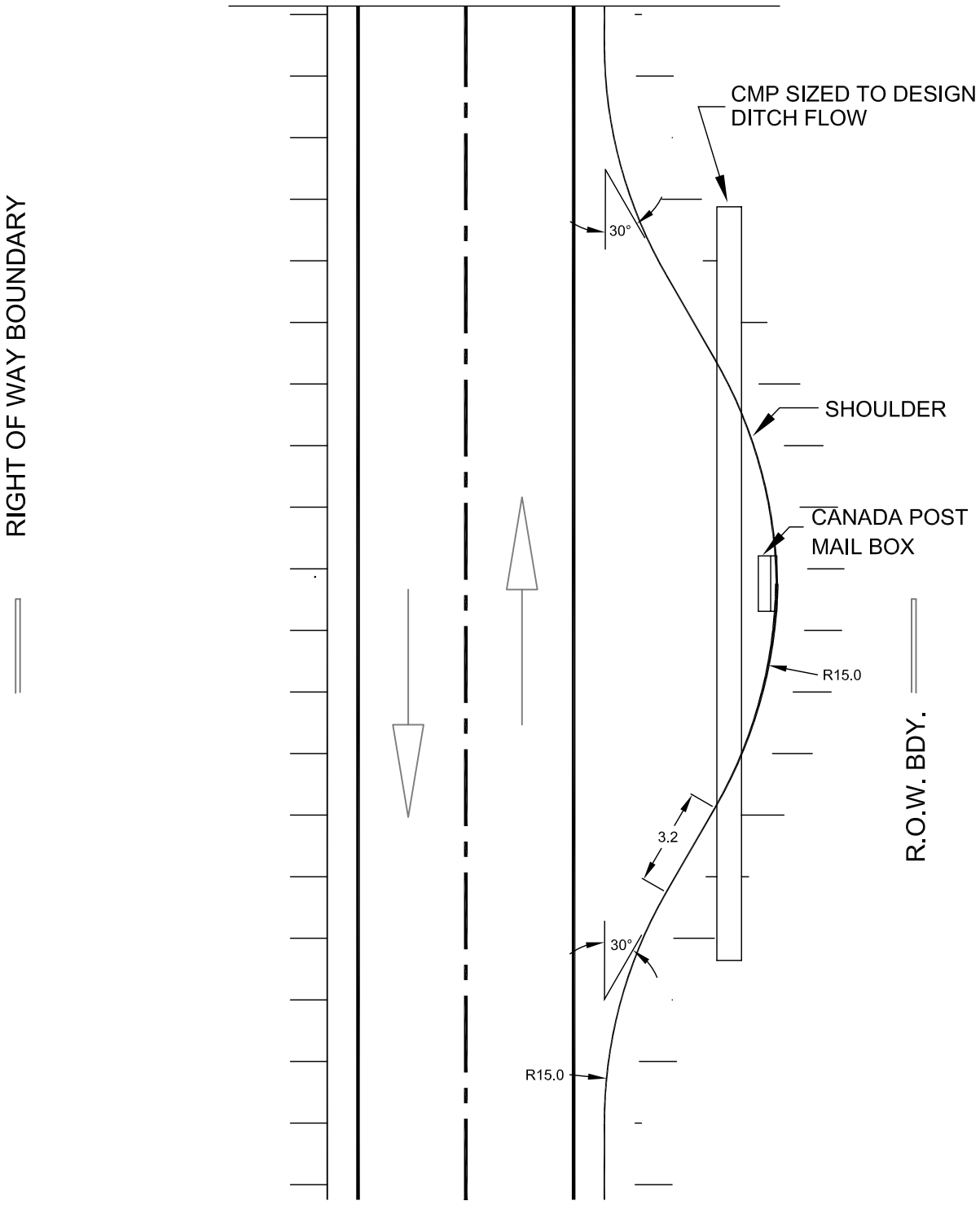


SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
VARIES	VARIES	4:1	3:1	3:1	2:1	440	0.06	6.0

Brazeau County

DATE: 03/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

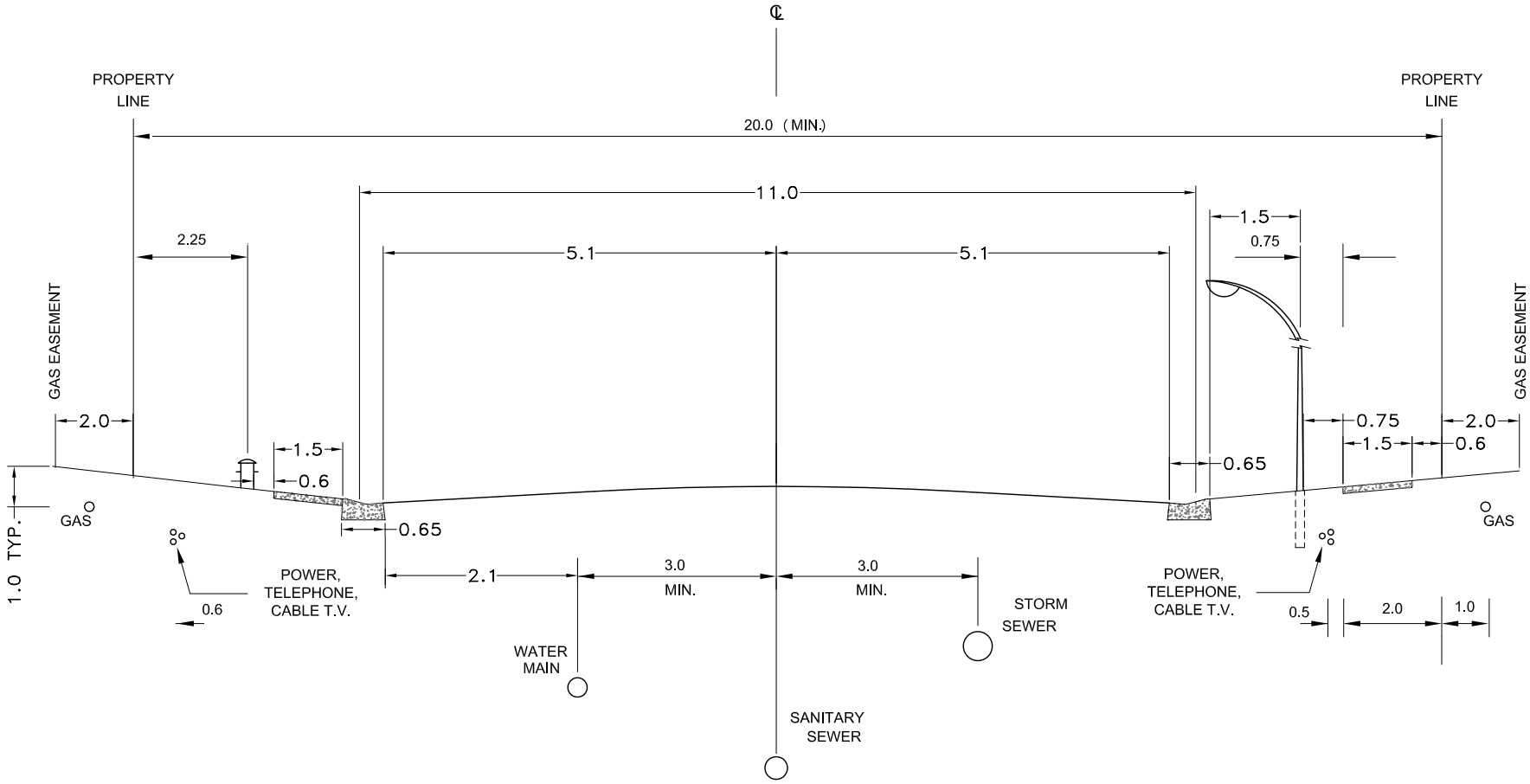
DRAWING 7.080
MAILBOX TURNOUT
STANDARD CROSS-SECTION



Brazeau County

DATE:	03/2006
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.081
MAILBOX TURNOUT
STANDARD DETAIL



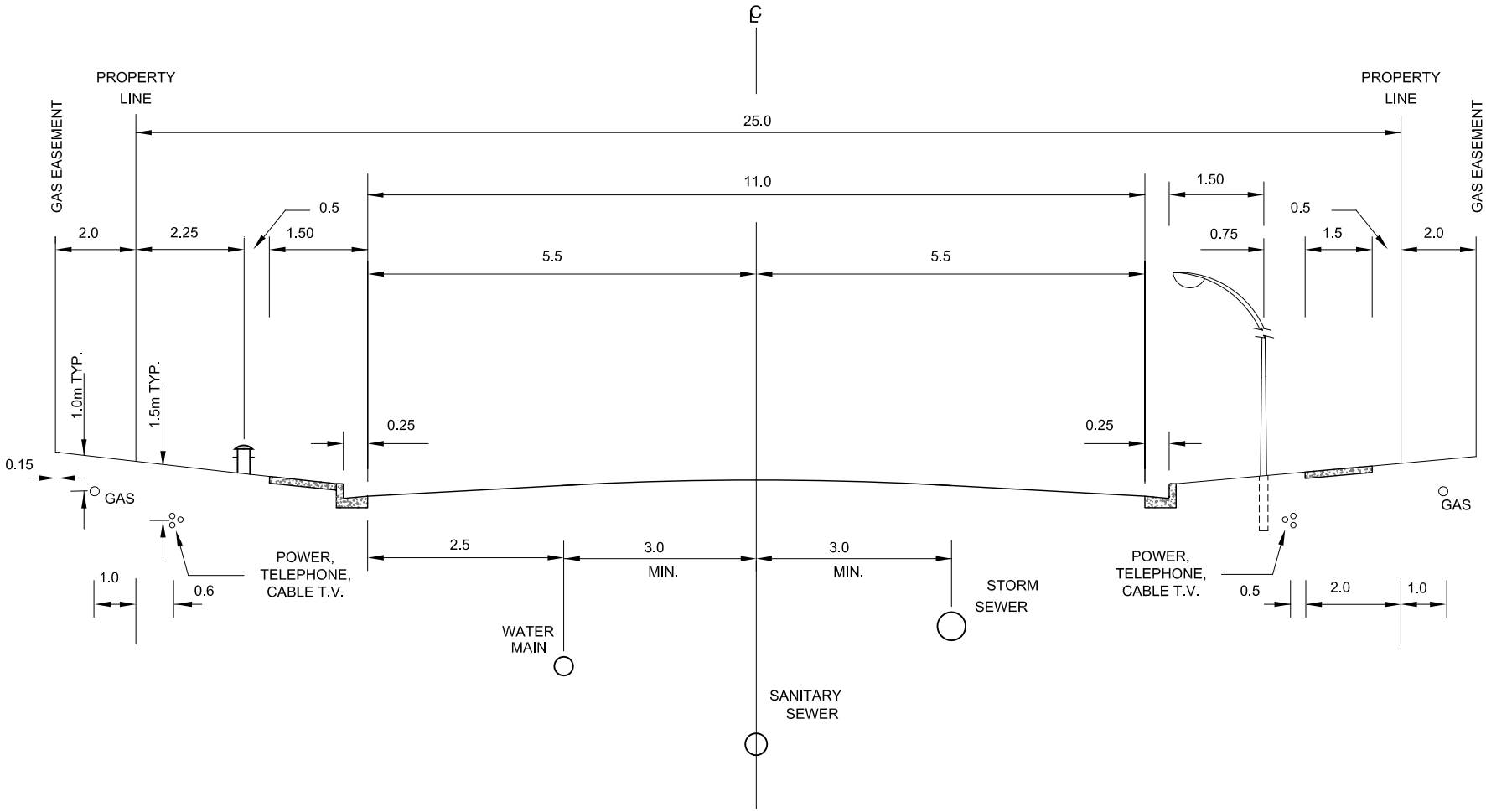
1. SIDEWALK MAY BE EITHER SEPERATE OR MONOLITHIC AS REQUIRED BY PUBLIC WORKS

2. IF NO GAS EASEMENT, CURB STOP TO BE 0.15 m ON THE ROAD SIDE OF PROPERTY

Brazeau County

DATE:	03/06
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.130
LOCAL ROAD (URBAN)
STANDARD CROSS-SECTION



SECTION

N.T.S

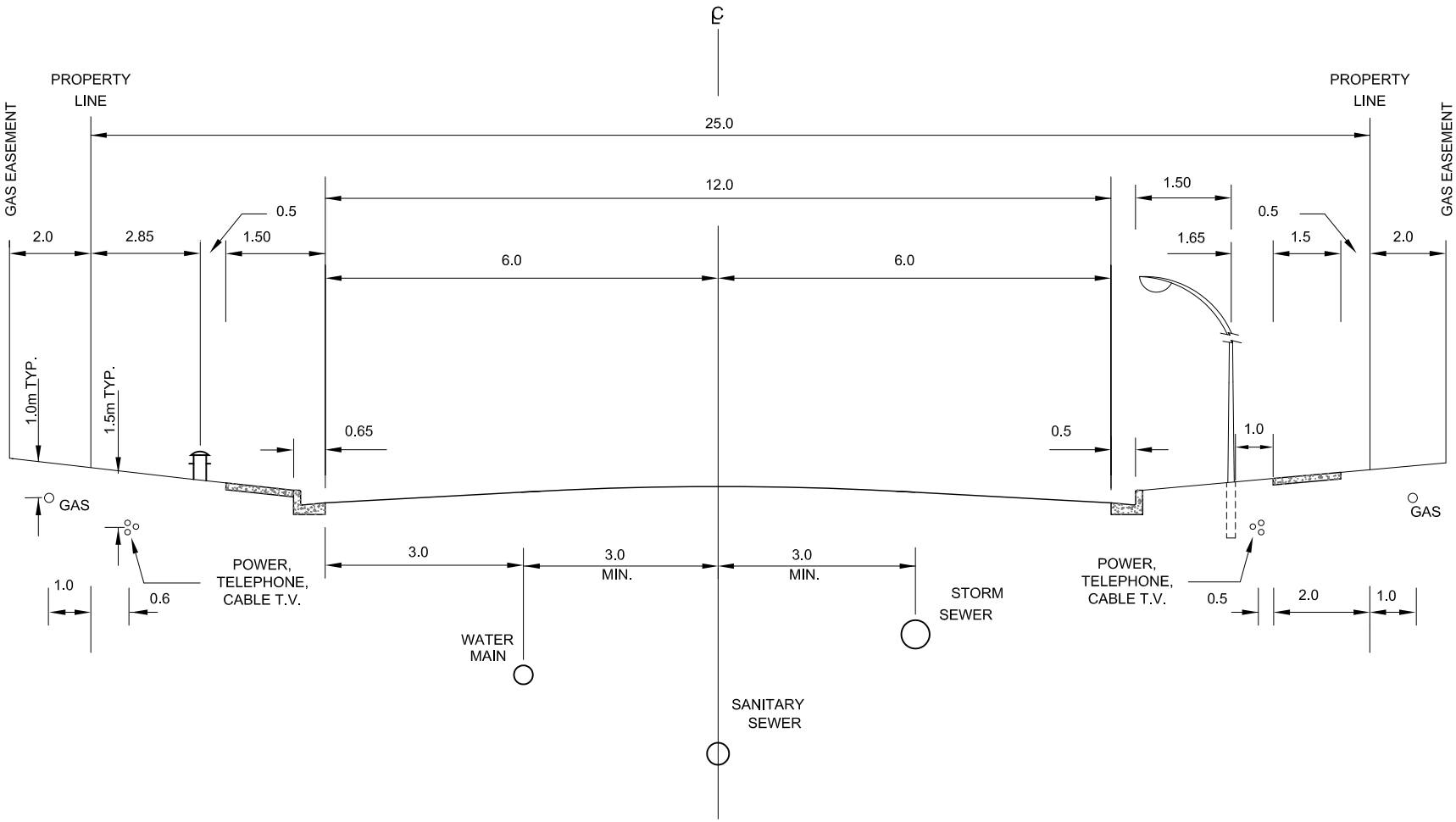
NOTES:

1. SIDEWALK MAY BE EITHER SEPERATE OR MONOLITHIC AS REQUIRED BY M.D.
2. IF NO GAS EASEMENT, CURB STOP TO BE INSTALLED 0.15m INSIDE ROAD RIGHT-OF-WAY.

Brazeau County

DATE:	03/2006
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.131
LOCAL URBAN RESIDENTIAL
STANDARD CURB CROSS-SECTION



SECTION

N.T.S

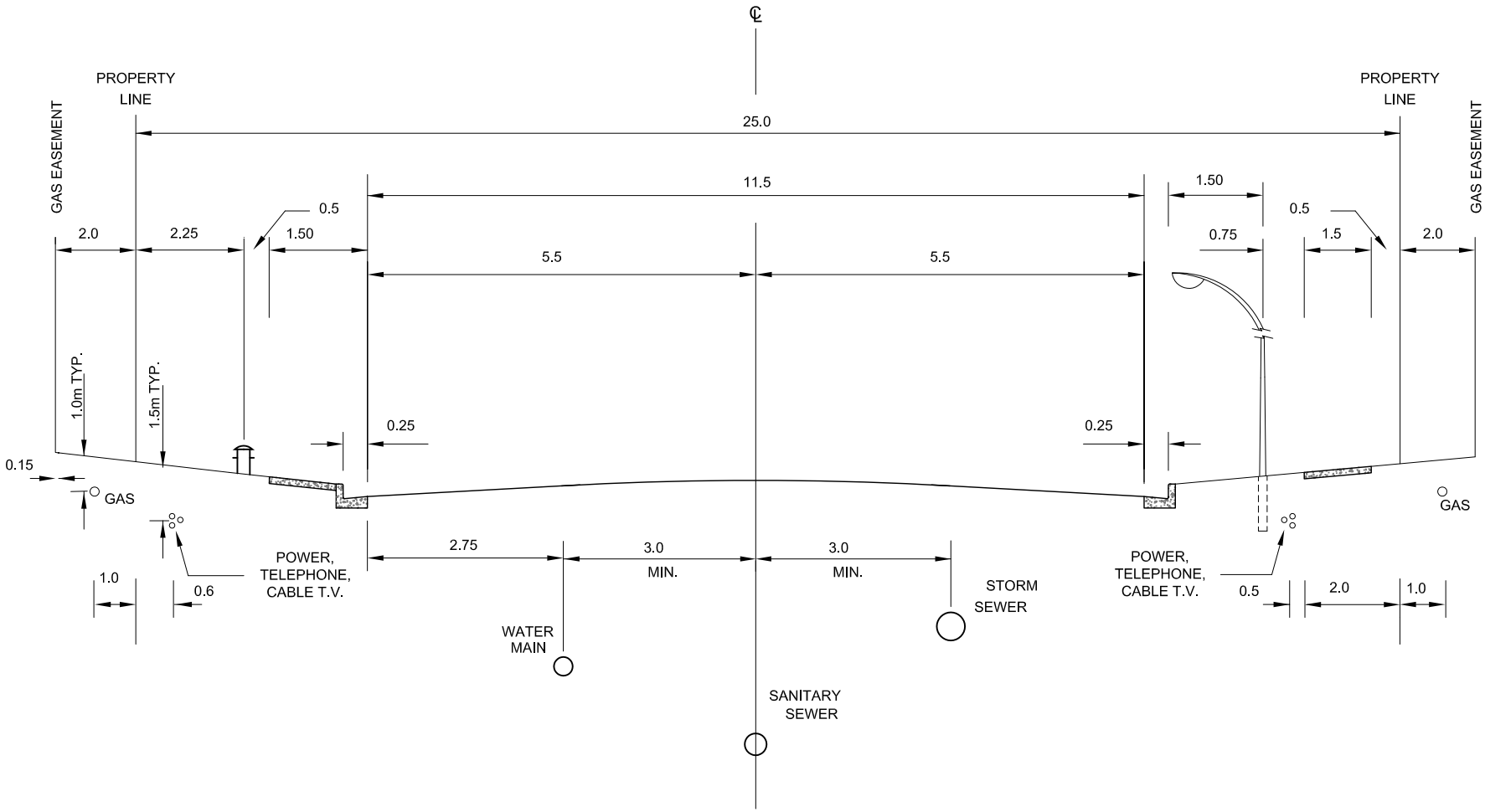
NOTES:

1. SIDEWALK MAY BE EITHER SEPERATE OR MONOLITHIC AS REQUIRED BY PUBLIC WORKS
2. IF NO GAS EASEMENT, CURB STOP TO BE INSTALLED 0.15m INSIDE ROAD RIGHT-OF-WAY.

Brazeau County

DATE:	03/2006
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.133
LOCAL STREET-COLLECTOR
STANDARD CROSS-SECTION



SECTION

N.T.S

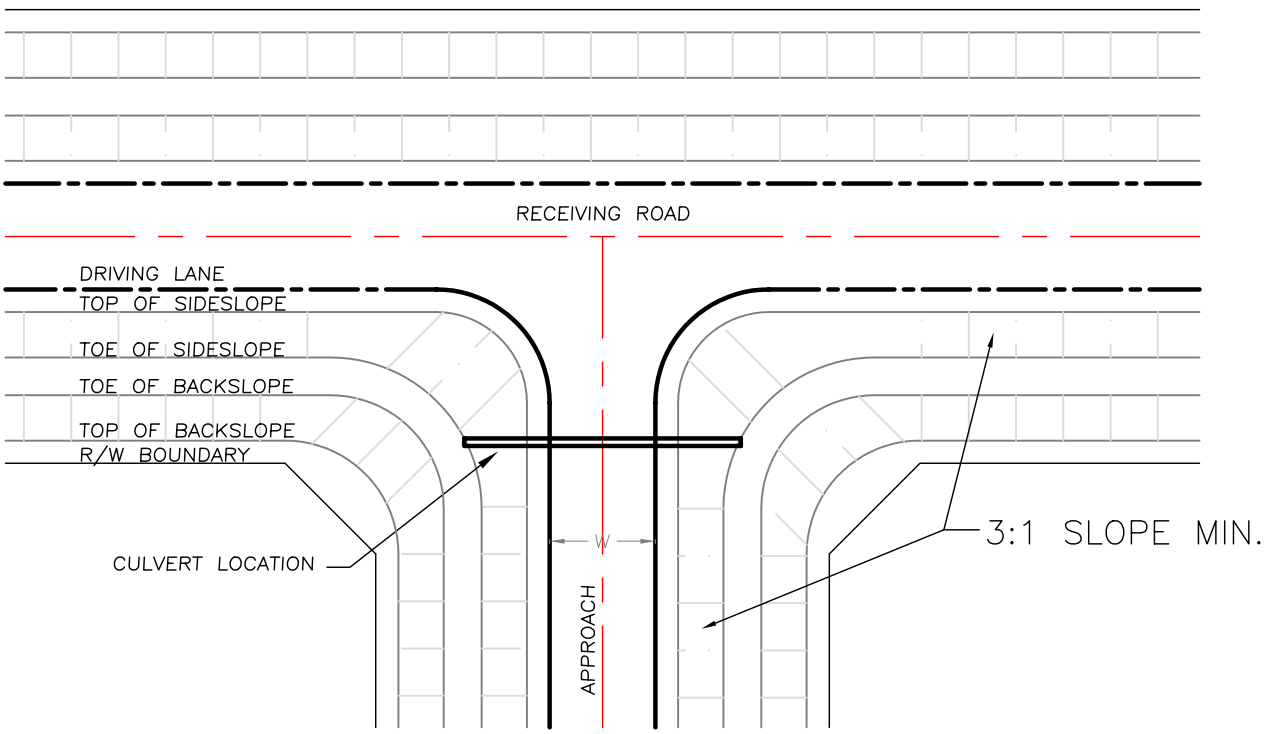
NOTES:

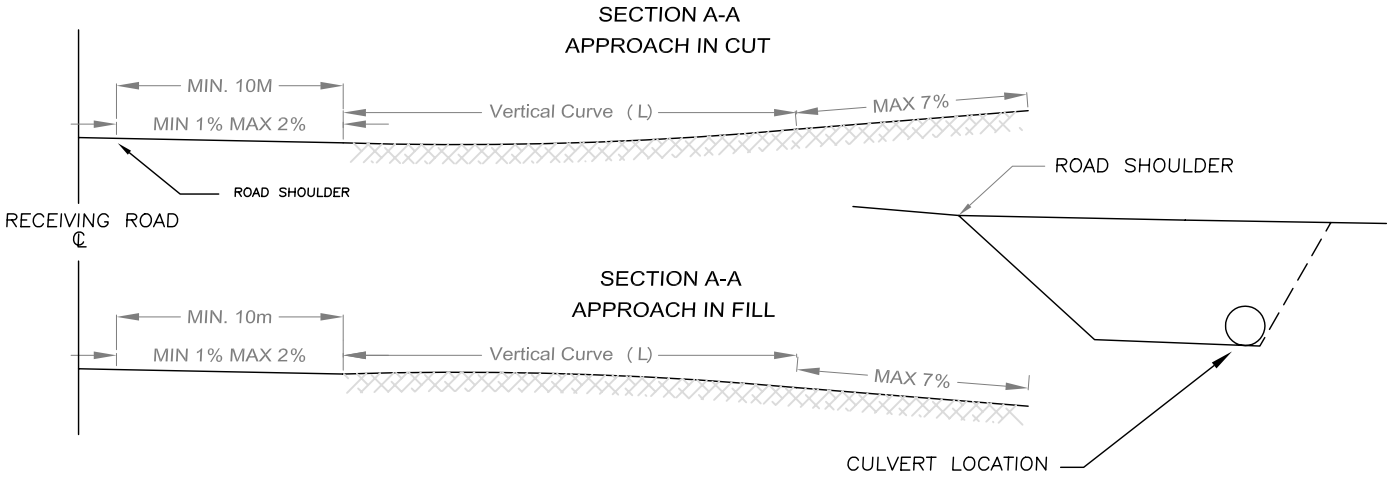
1. SIDEWALK MAY BE EITHER SEPERATE OR MONOLITHIC AS REQUIRED BY PUBLIC WORKS
2. IF NO GAS EASEMENT, CURB STOP TO BE INSTALLED 0.15m INSIDE ROAD RIGHT-OF-WAY.

Brazeau County

DATE:	03/2006
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.134
LOCAL URBAN INDUSTRIAL STANDARD CROSS-SECTION





RESIDENTIAL – MIN. 400mm Ø
INDUSTRIAL – MIN. 500mm Ø
LENGTH WILL VARY WITH DEPTH OF FILL
CULVERT SHALL BE PLACED AT THE TOE OF BACKSLOPE

DESIRABLE MINIMUM 1% IS TO PREVENT PONDING AND SUBSEQUENT ICING AT THE INTERSECTION.
DESIRABLE MINIMUM 2% IS FOR EASE OF OPERATION IN ALL WEATHER CONDITIONS.

APPROACH GRADES ARE TO BE BETWEEN 0.5% AND 3%. ABSOLUTE MAXIMUM OF 6% ARE CONSIDERED ACCEPTABLE. APPROACH GRADES UP TO 1% DOWN TOWARD THE MAIN ROAD MAY BE USED TO MATCH SUPERELEVATION OF THE RECEIVING ROAD IF DESIRABLE FOR ENGINEERING REASONS.

NOTE:
MORE THAN ONE APPROACH PER 1/4 SECTION SHOULD BE AVOIDED WHENEVER POSSIBLE

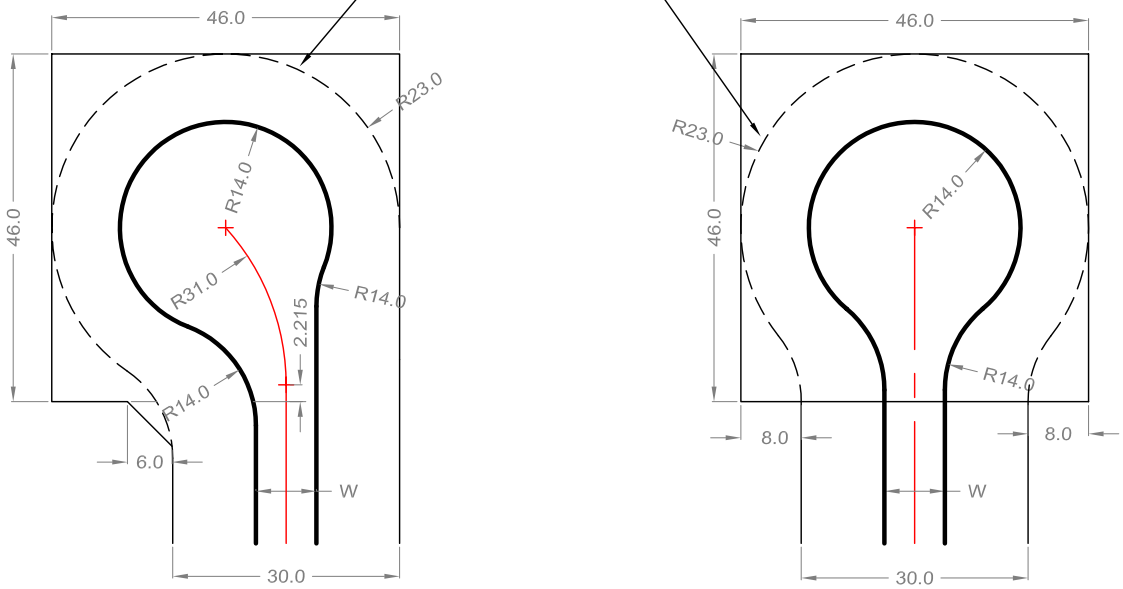
APPROACH REQUIREMENTS		
USE	APPROACH WIDTH	SH. MIN. RADIUS
RESIDENTIAL	6	10
COMMON–RES.	8.5	15
COMMERCIAL	10	15
INDUSTRIAL	10	15
AGRICULTURE	8.5	15

Brazeau County

DATE: 03/02/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.135
TYPICAL RURAL APPROACH
STANDARD PLAN

THE PROPERTY LINE MAY BE SYMETRICAL TO, AND A MINIMUM OF 9 METRES FROM THE ROAD SHOULDER OF THE CUL-DE-SAC.

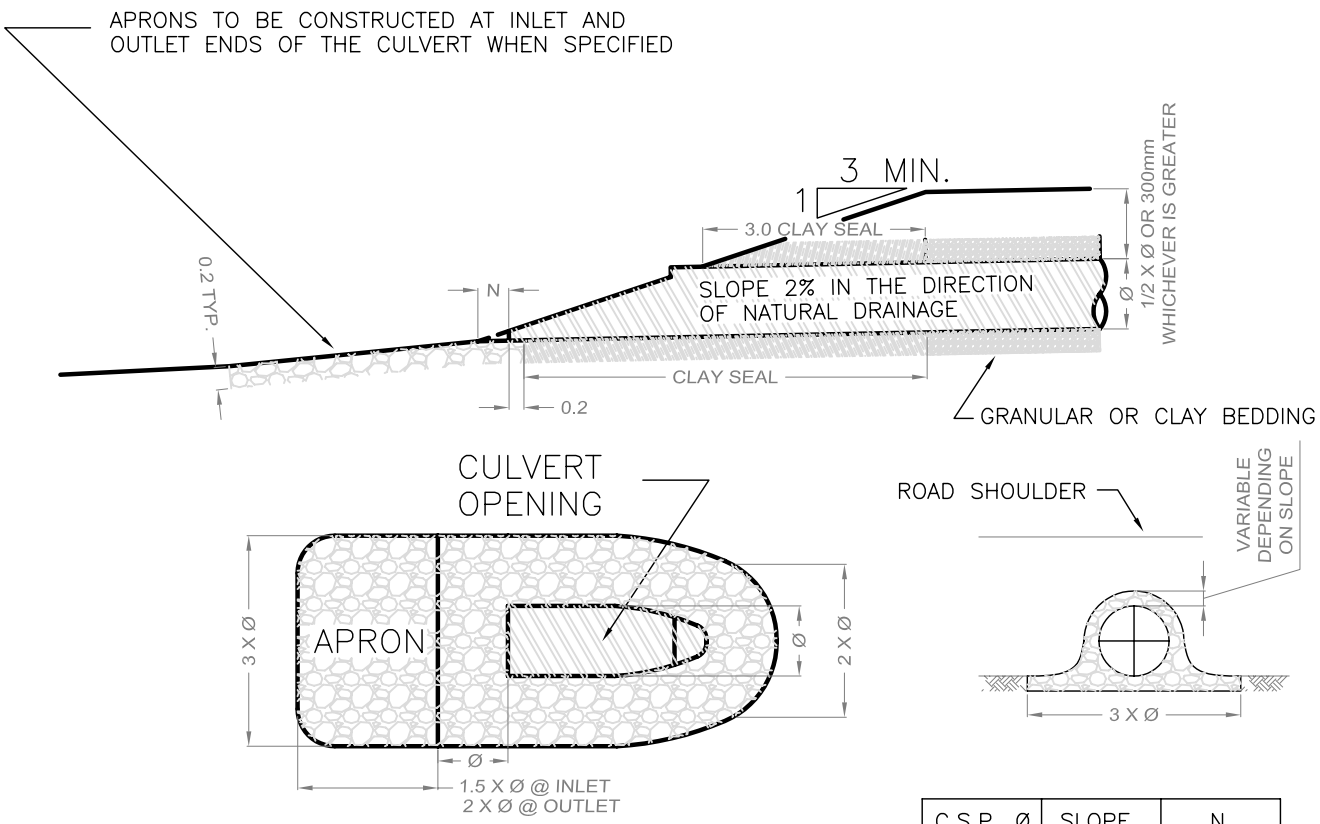


NOTE: THE MINIMUM CROWN WITHIN THE CUL-DE-SAC SHALL BE 4% FOR GRAVEL ROAD AND 3% FOR PAVED ROAD.

Brazeau County

DATE:	03/02/2006
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.137
TYPICAL CUL-DE-SAC (RURAL)
STANDARD PLAN



C.S.P. Ø	SLOPE	N
400–500	3:1	300
600	3:1	300
750	3:1	450
800	3:1	450

NOTES:

1. ROCKS AND BOULDERS SHALL BE SELECTED AS NEARLY CUBICAL IN FORM AS PRACTICAL AND SHALL HAVE A LEAST MINIMAL DIMENSION OF 200mm. THE STONES SHALL BE PLACED WITH THE LARGER STONES BEING USED IN THE BOTTOM COURSES AND THE SMALLER STONES ON TOP. THEY SHALL BE LAID IN CLOSE CONTACT SO AS TO BREAK JOINTS AND IN SUCH A MANNER THAT THE WEIGHT OF THE STONE IS CARRIED BY THE EARTH AND NOT BY ADJACENT STONES. THE FINISHED WORK SHALL PRESENT AN EVEN TIGHT SURFACE, VARYING NOT MORE THAN 75mm FROM THE REQUIRED CONTOUR.

2. WHERE NO SPECIAL TREATMENT IS REQUIRED, CULVERT INVERT ELEVATIONS ARE TYPICALLY SET ABOUT 0.15 X Ø BELOW THE DRAINAGE COURSE ELEVATION.

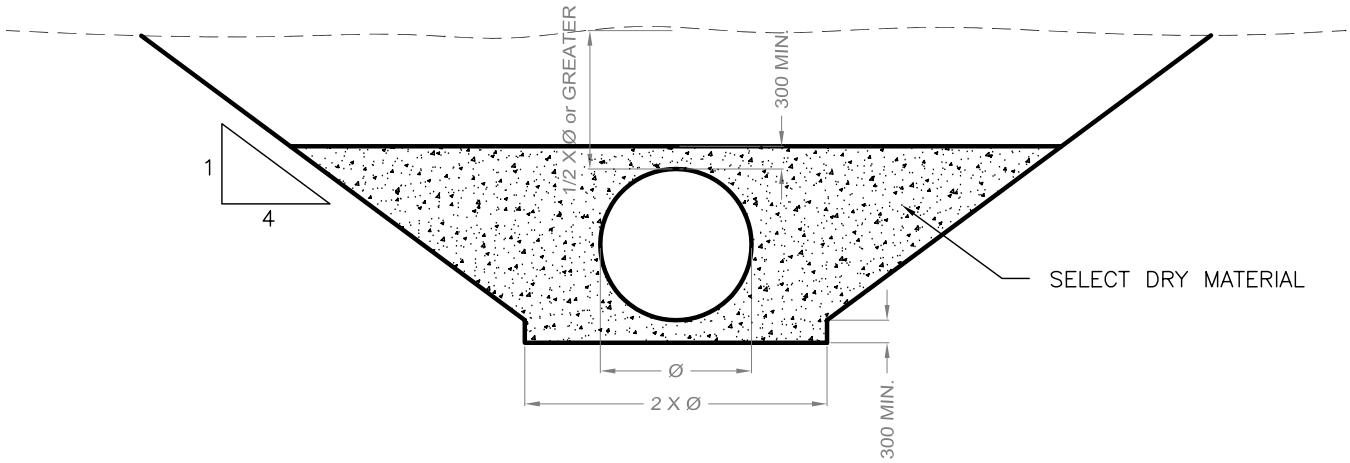
3. A CLAY SEAL IS TO BE PLACED AT BOTH ENDS OF THE CULVERT FOR A LENGTH OF 3m TO CUT OFF SEEPAGE. THE CLAY SEAL SHALL EXTEND FROM THE BOTTOM OF THE EXCAVATION TO 300mm ABOVE THE CROWN OF THE PIPE, AND FOR THE FULL WITH OF THE EXCAVATION.

4. WHERE APRONS ARE REQUIRED DUE TO HIGH VELOCITY FLOW OR EROSION PRONE SOIL, TYPICALLY THE MINIMUM INLET APRON IS 1.5 X Ø LONG. THE MINIMUM OUTLET APRON IS 2 X Ø IN LENGTH.

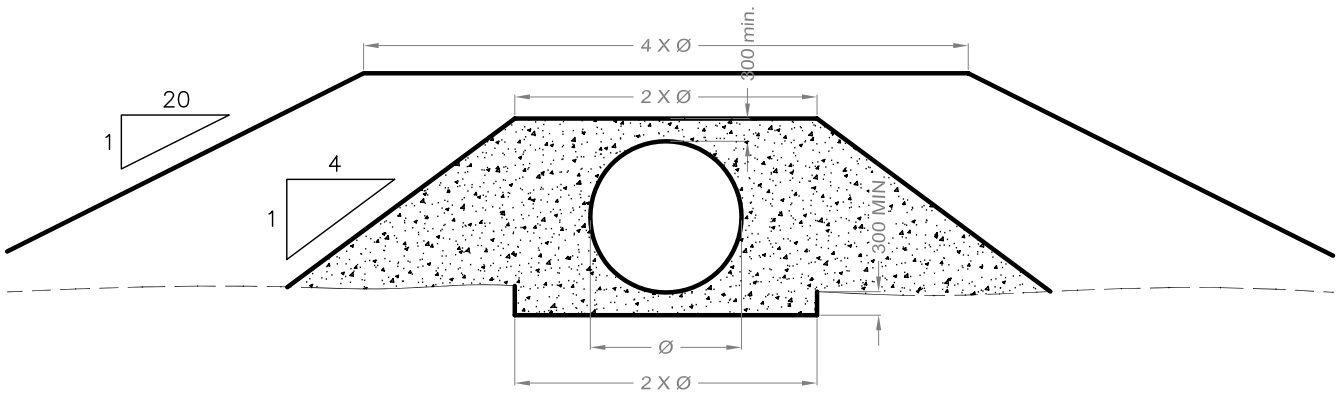
Brazeau County

DATE: 03/02/2006
DRAWN: JE
CHECKED: JE
SCALE: N.T.S.

DRAWING 7.138
TYPICAL CULVERT INSTALLATION
STANDARD PLAN



PLACEMENT IN CUT



PLACEMENT IN FILL

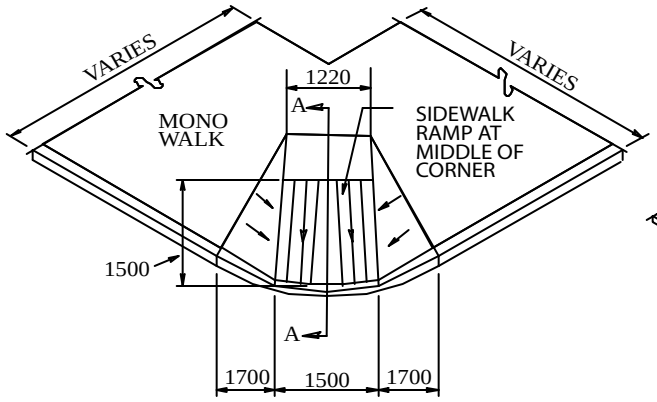
NOTES:

1. SELECT DRY MATERIAL SHALL BE PLACED IN 150mm COMPACTED LIFTS. IF GRANULAR MATERIAL IS USED A 600mm CLAY PLUG SHALL BE COMPACTED AT THE INLET AND OUTLET ENDS OF THE PIPE
2. IN SOFT WET AREAS (i.e. MUSKEG) THE DEPTH OF SUBCUT BELOW THE PIPE WILL BE DETERMINED BY THE COUNTY.
3. WHEN CULVERTS ARE PLACED PRIOR TO CONSTRUCTION, A MINIMUM OF 1000mm OF MATERIAL SHALL BE PLACED OVER THE TOP OF PIPES FOR PROTECTION DURING CONSTRUCTION.

Brazeau County

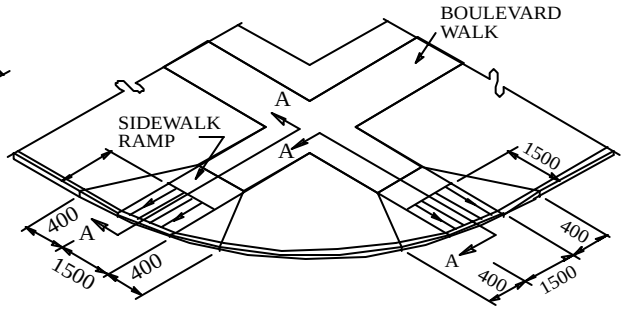
DATE:	03/2006
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 7.139
TYPICAL CULVERT BEDDING
STANDARD PLAN



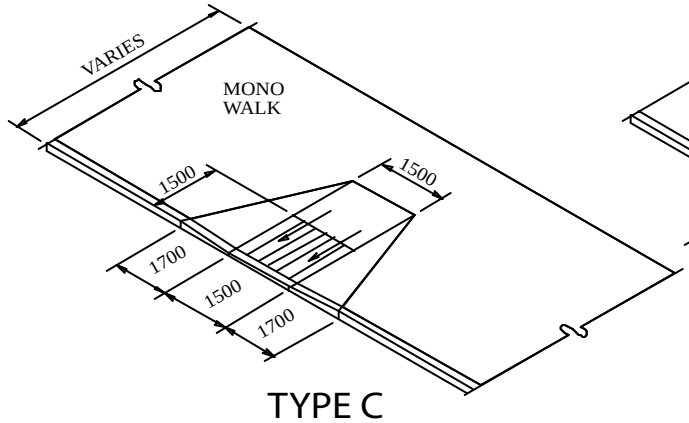
TYPE A

N.T.S.



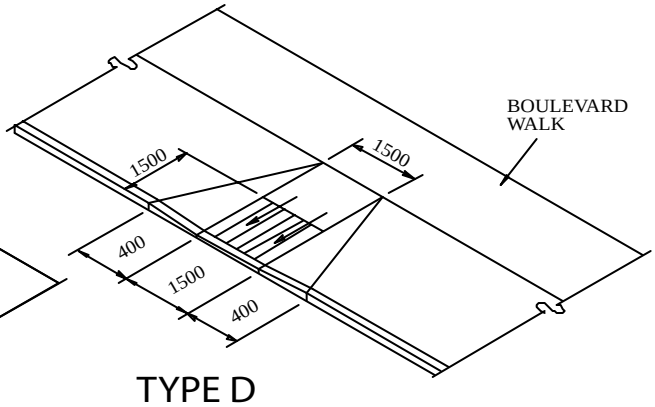
TYPE B

N.T.S.



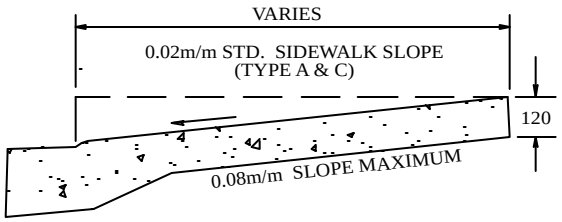
TYPE C

N.T.S.



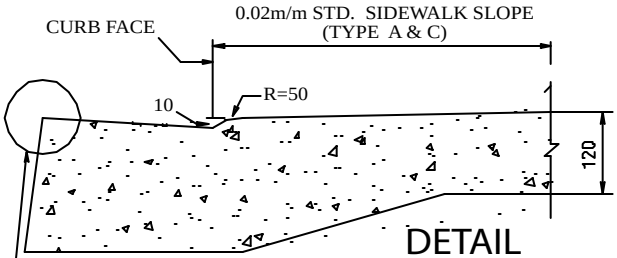
TYPE D

N.T.S.



TYPICAL CROSS SECTION A-A

N.T.S.



DETAIL

N.T.S.

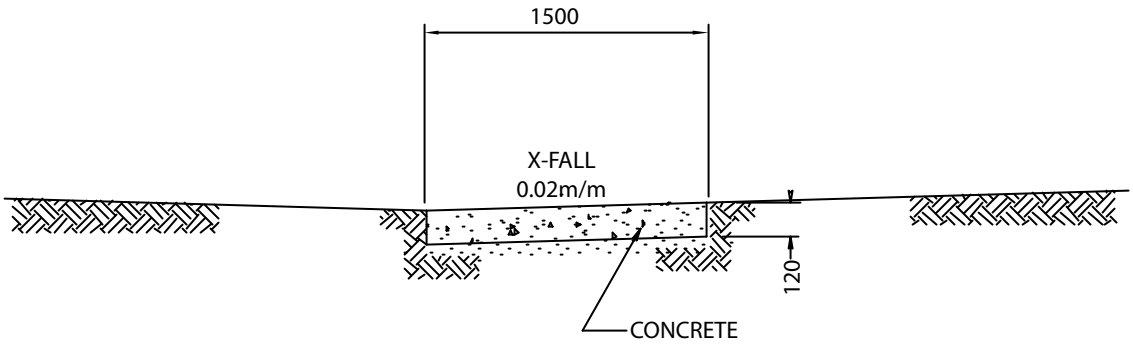
a) MATCH ASPHALT SURFACE TO GUTTER UP WITHIN 3mm ±
b) IF ASPHALT TOP LIFT IS DEFERRED, PLACE ASPHALT RAMP FOR THE WIDTH OF CURB RAMP, AND EXTENDING MINIMUM 1.0m INTO ROAD.

NOTES:

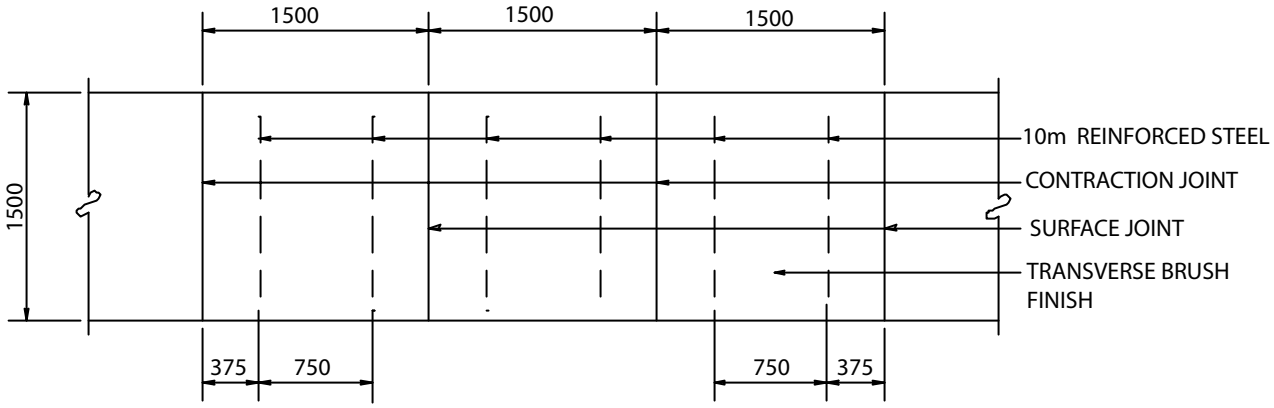
1. TOOLED GROVES 5mm WIDE X 10mm DEEP, BROOM FINISH GROVE SPACING 150mm O.C. ADJACENT TO CURB.
2. WHERE RANP IS TO BE USED AS A TRANSITION, USE THE CENTER OF THE 1500mm RAMP AS THE CENTER OF THE TRANSITION.
3. CURBS AND RAMPS TO BE POURED MONOLITHICALLY.

Brazeau County

DATE: 06/2006	DRAWING 7.20 PARARAMP DETAIL
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	



TYPICAL SECTION

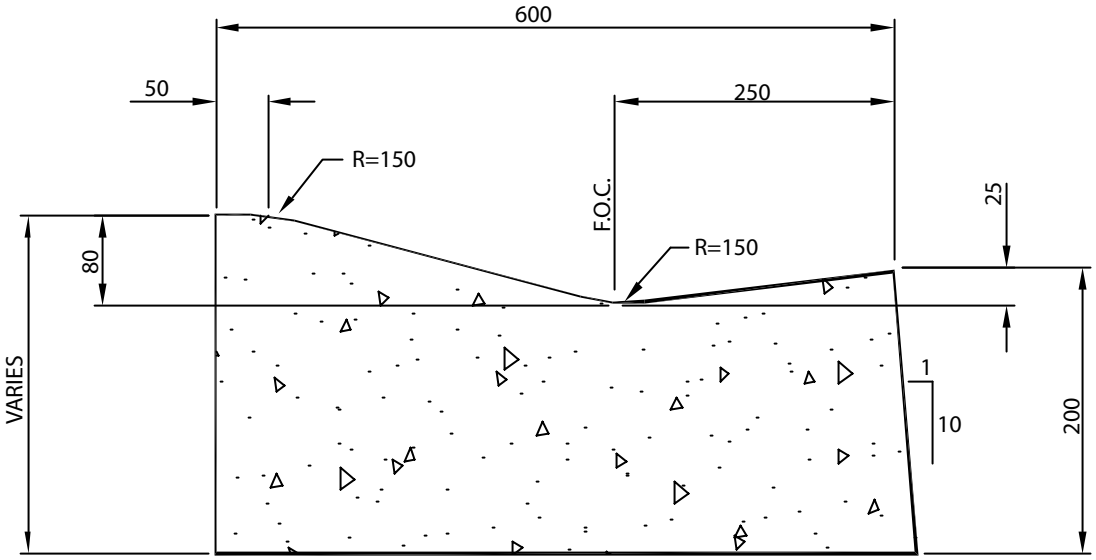


PLAN VIEW

ALL DIMENSIONS IN MILLIMETERS

Brazeau County

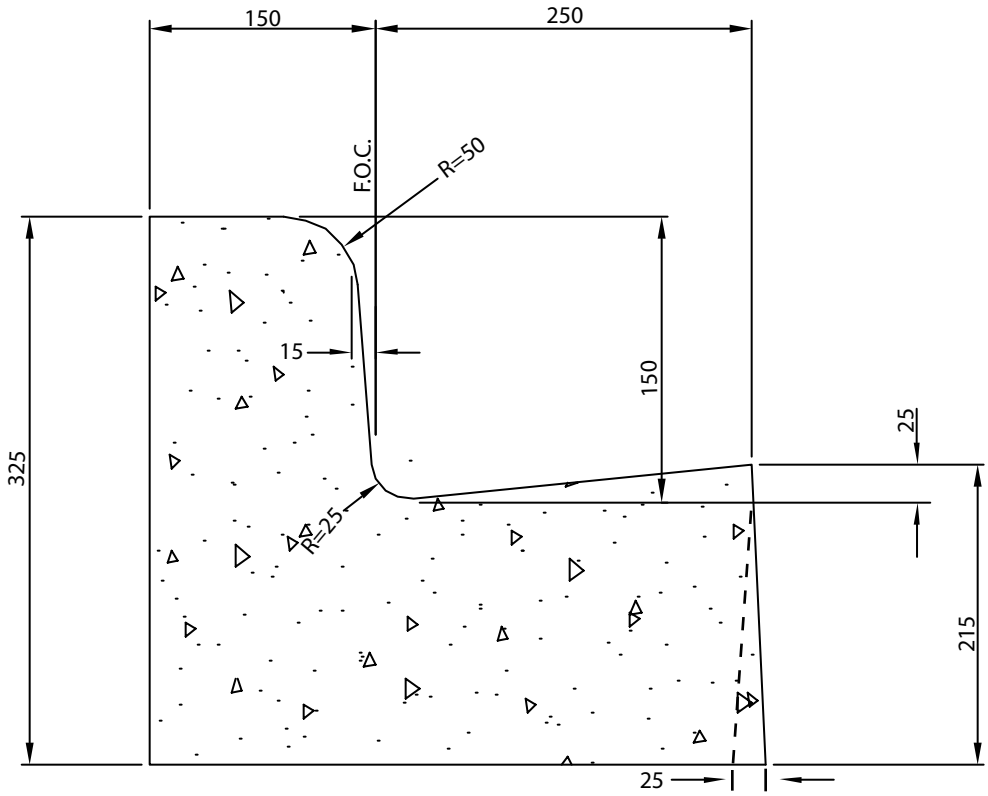
DATE: 06/2006	DRAWING 7.21 1.50m SEPARATE WALK DETAIL
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	



ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE: 06/2006	DRAWING 7.22 ROLL FACE CURB AND GUTTER
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	

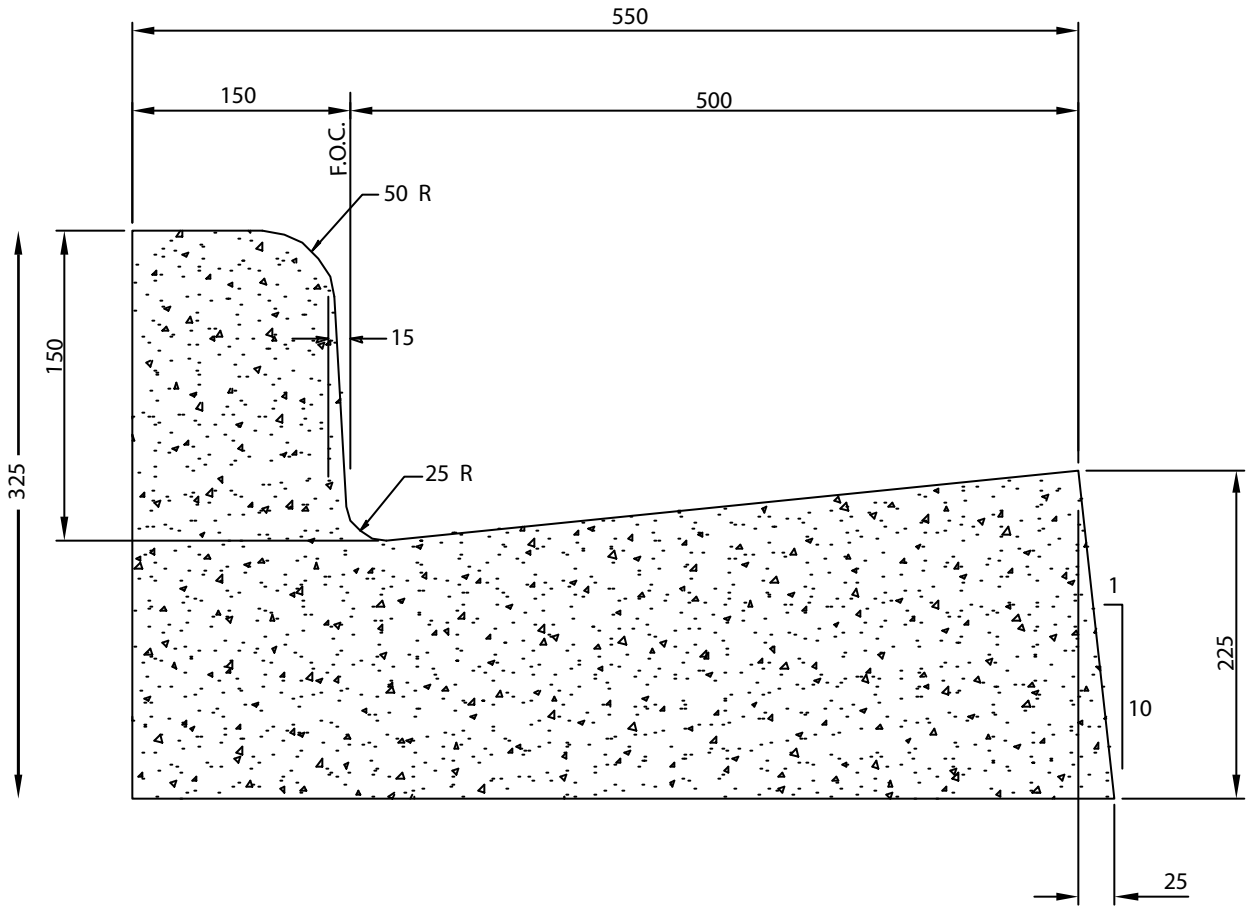


ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	06/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

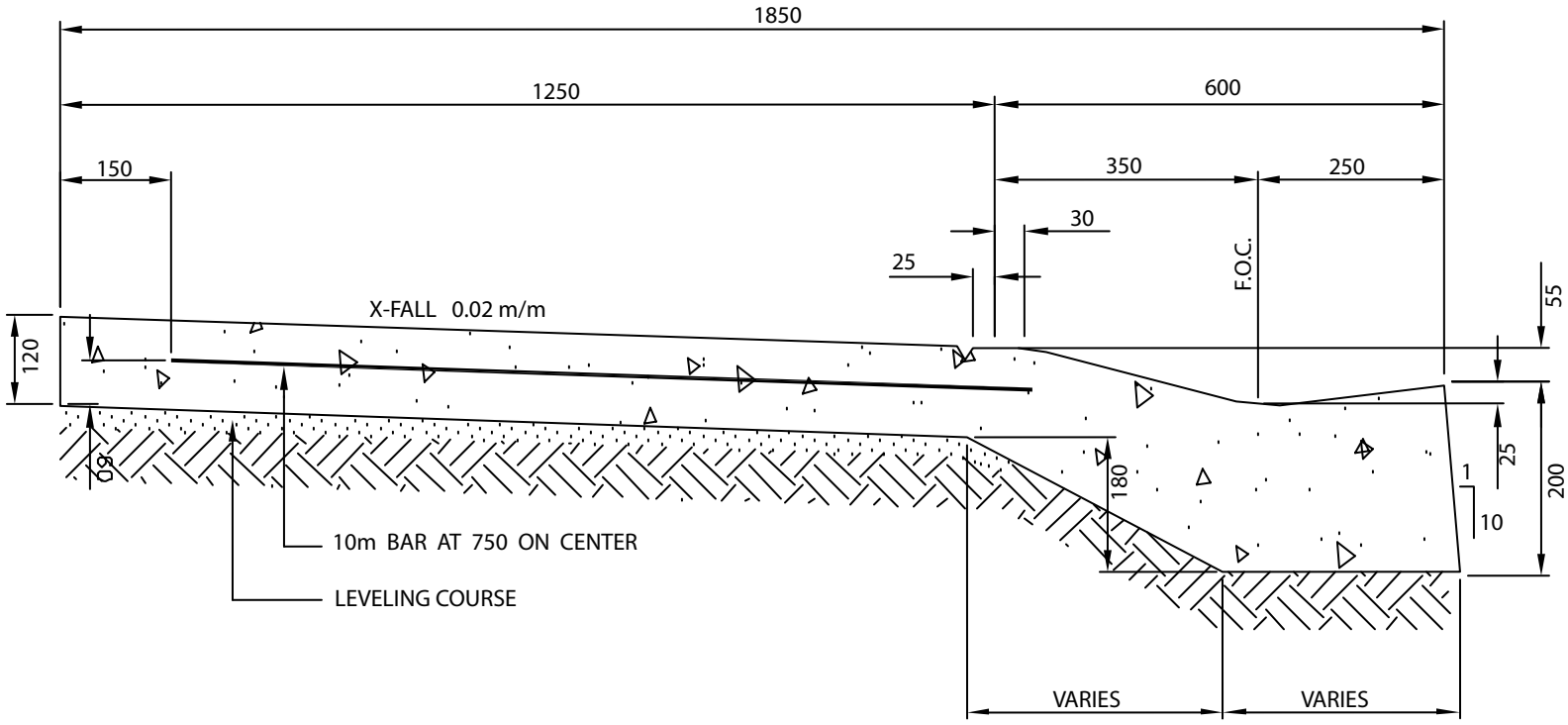
DRAWING 7.23
STANDARD 150mm CURB WITH 250mm GUTTER



ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE: 07/2006	DRAWING 7.24 150mm CURB WITH 500mm GUTTER for use on arterial roadways
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	

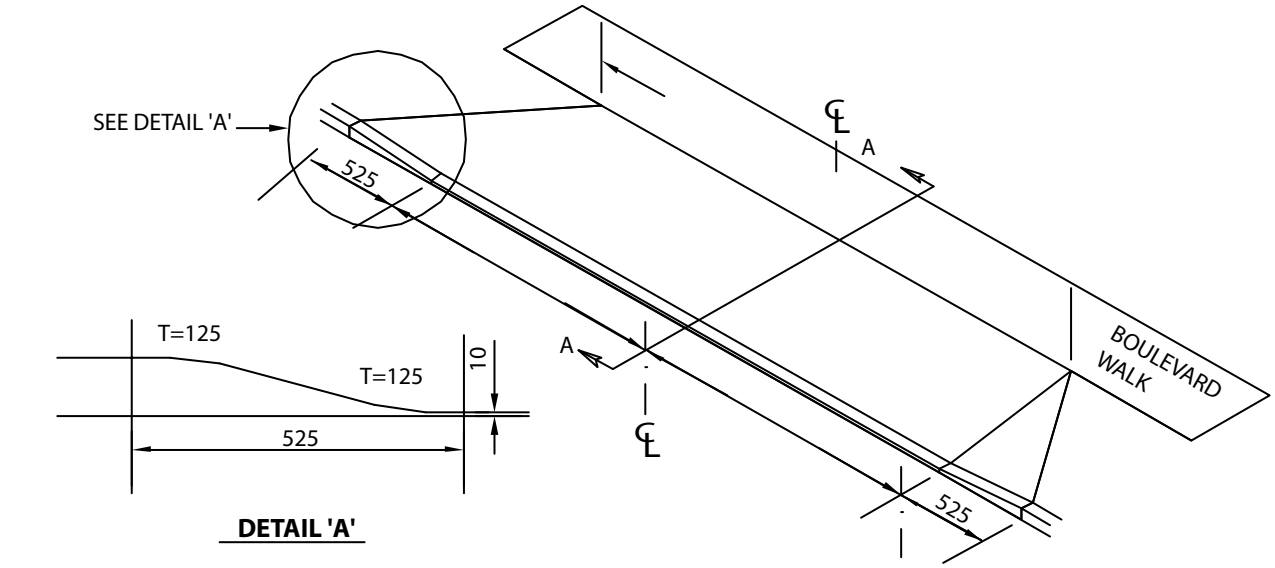


ALL DIMENSIONS IN MILLIMETERS

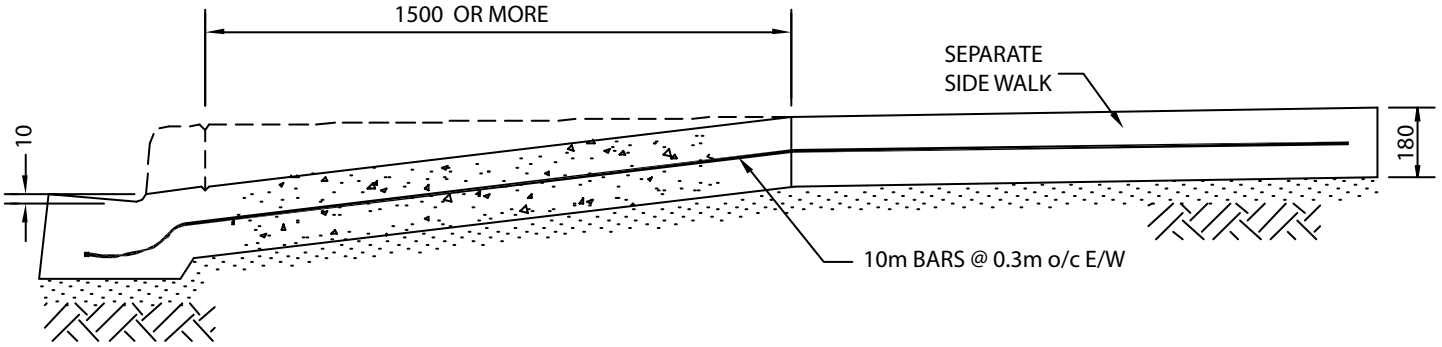
Brazeau County

DATE:	07/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

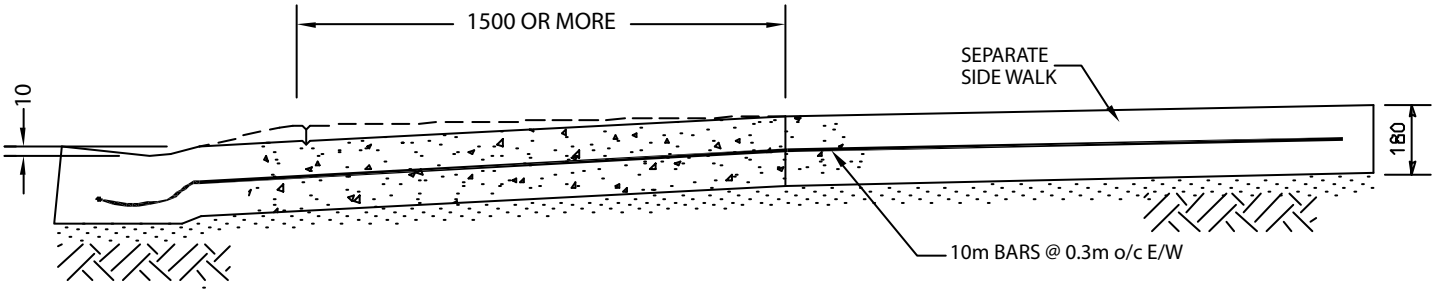
DRAWING 7.25
ROLL FACE MONOLITHIC WALK AND GUTTER



DETAIL 'A'



SECTION A-A STRAIGHT FACE



SECTION A-A ROLLED FACE

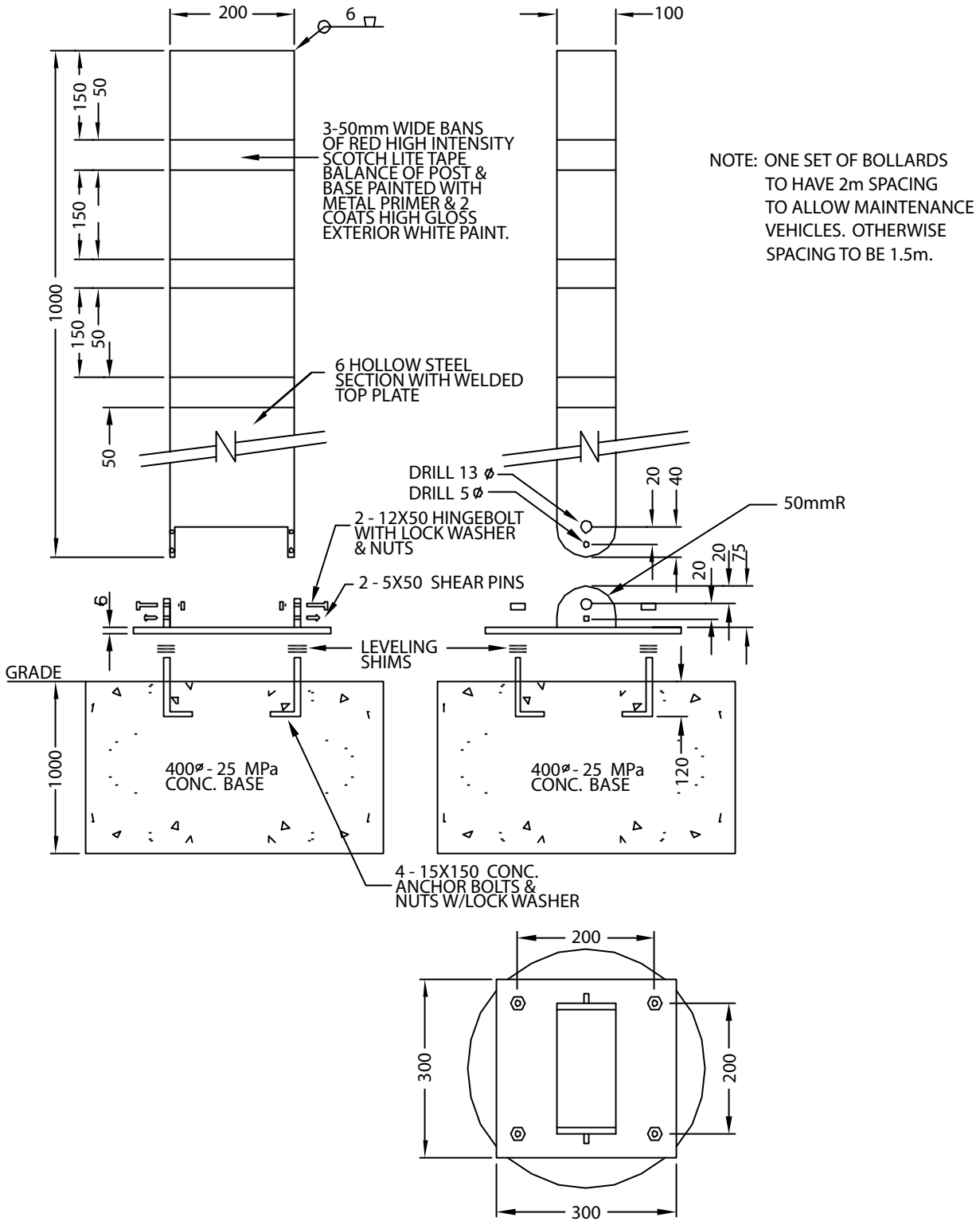
ALL DIMENSIONS IN MILLIMETERS.

NOTES: 1. MAXIMUM SLOPE 8% UNLESS OTHERWISE APPROVED BY PUBLIC WORKS.
2. X-ING TO BE POURED MONOLITHICALLY WITH CURB AND GUTTER

Brazeau County

DATE:	06/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 7.26
COMMERCIAL CROSSING
BOULEVARD WALK AND APRONS
Boulevard greater than 1.5m width

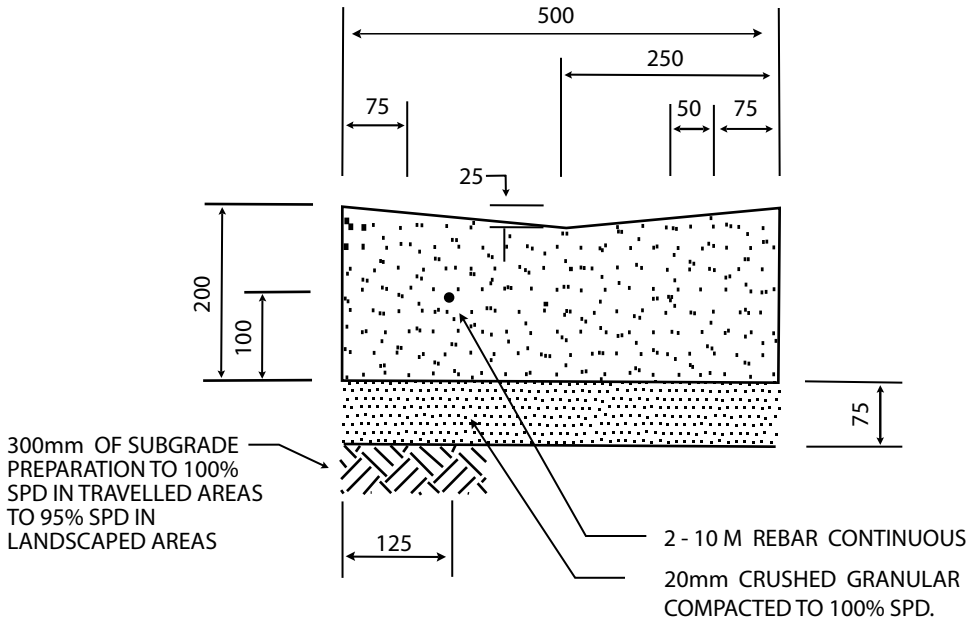


ALL DIMENSIONS IN MILLIMETERS

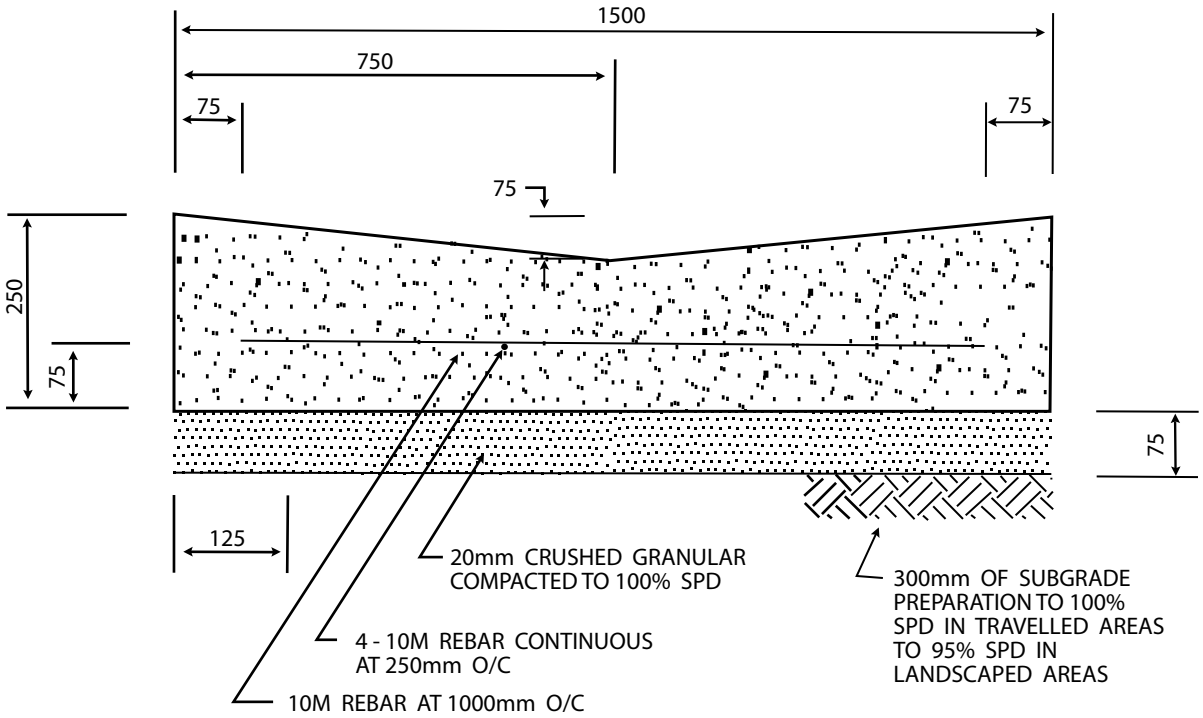
Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 7.27
KNOCK-DOWN BOLLARD DETAIL

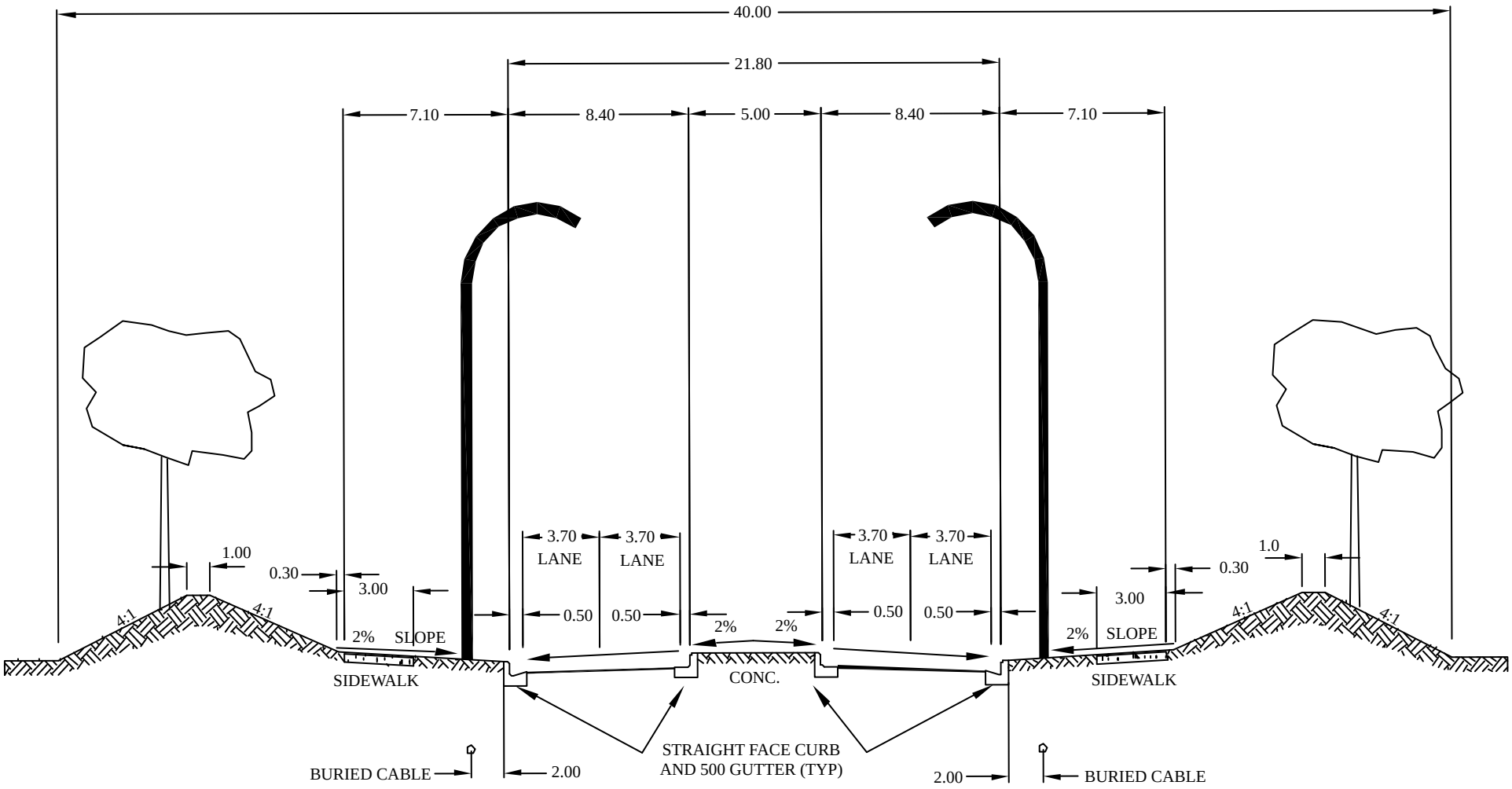


500mm CONCRETE SWALE



1500mm CONCRETE SWALE

Brazeau County	DATE: 10/2006 DRAWN: US CHECKED: JE SCALE: N.T.S	DRAWING 7.29 CONCRETE DRAINAGE SWALES



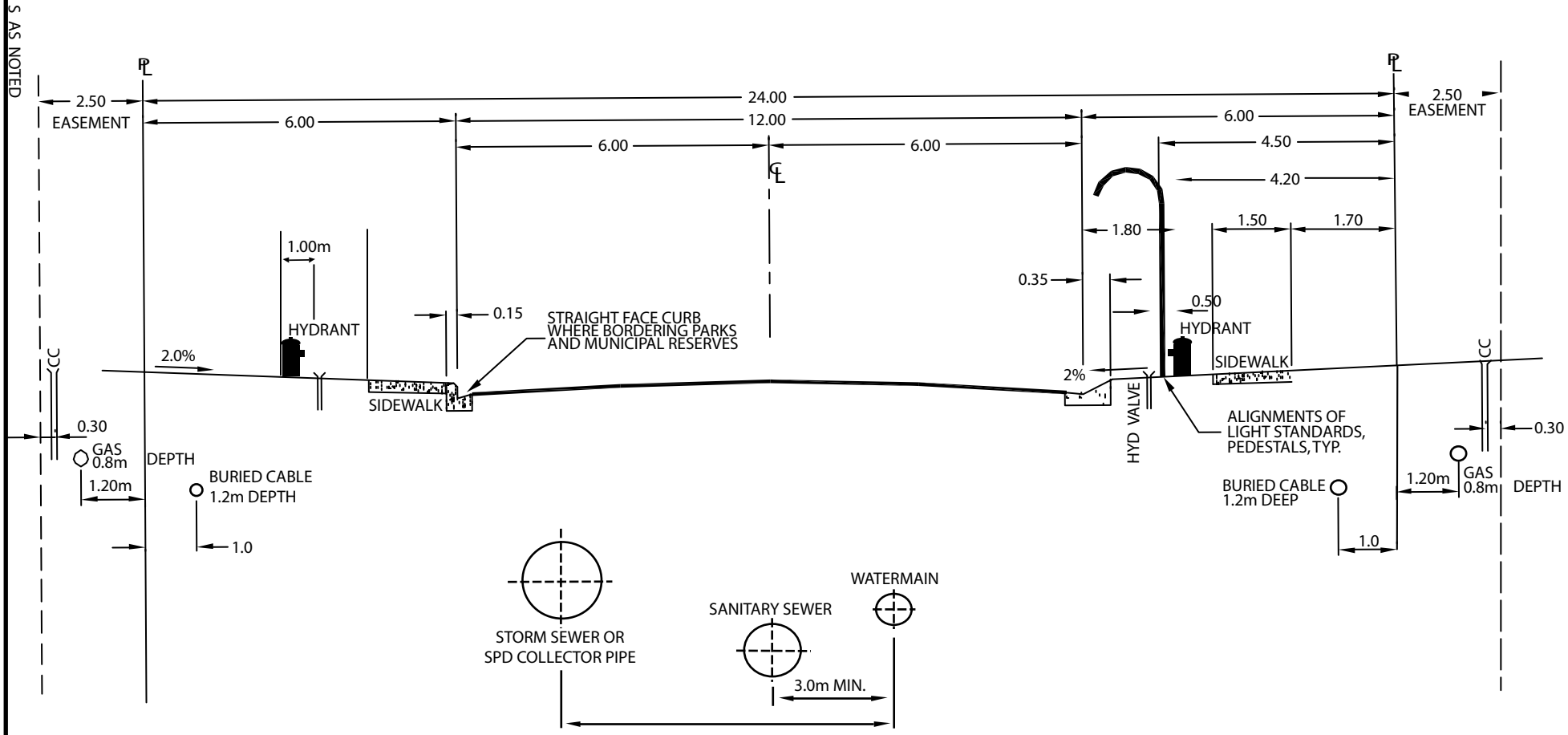
NOTE:

-Landscaping required as per Parks specification.
-Storm sewer and other utilities (if required) to be located within roadway or median.
-Median surface concrete if less than 3m wide; otherwise surface to be grass.
-concrete sidewalk or asphalt path required on both sides of roadway.

Brazeau County

DATE:	07/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 7.40
40.0m R.O.W.
DIVIDED ARTERIAL

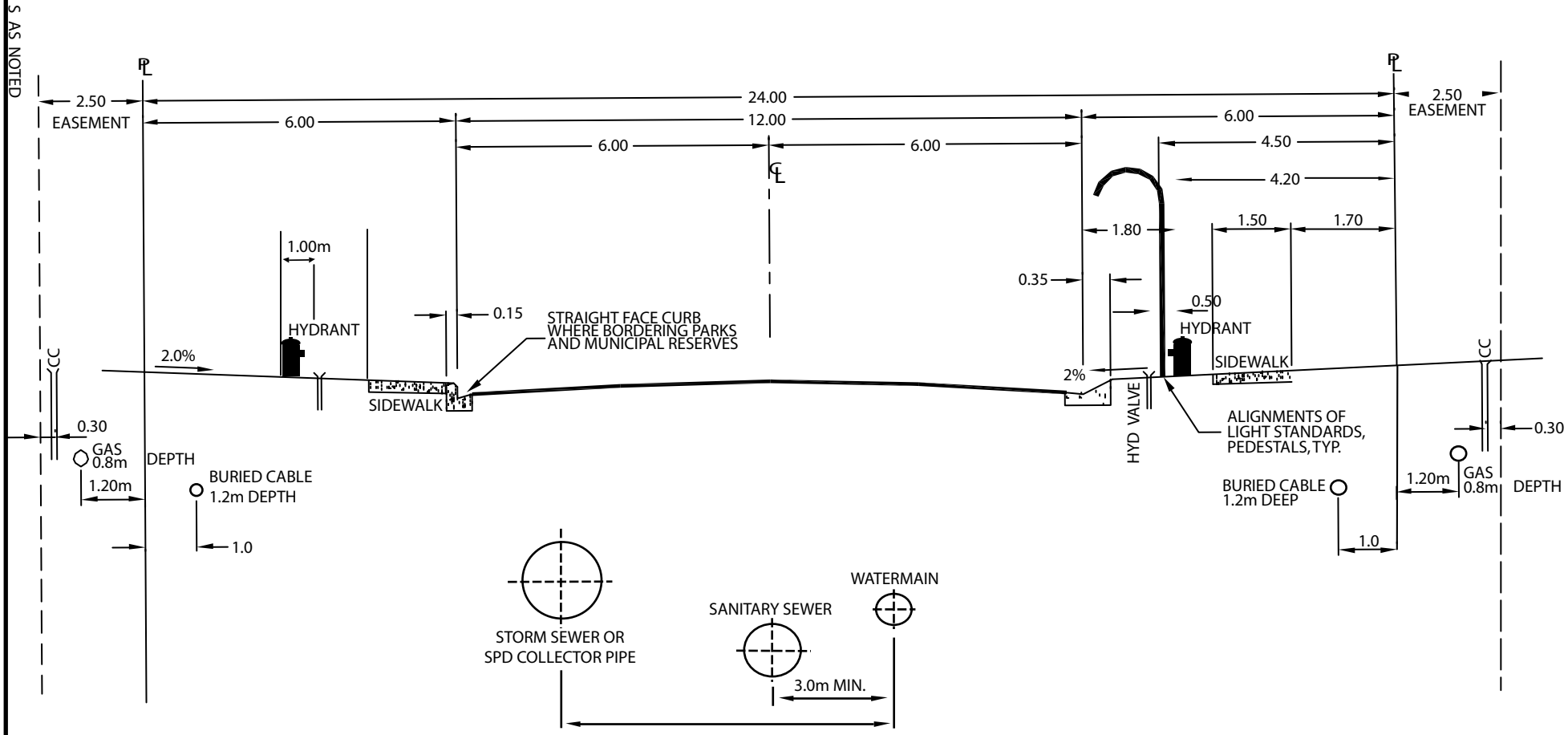


ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	01/2007
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 7.42
MAJOR RES. COLLECTOR

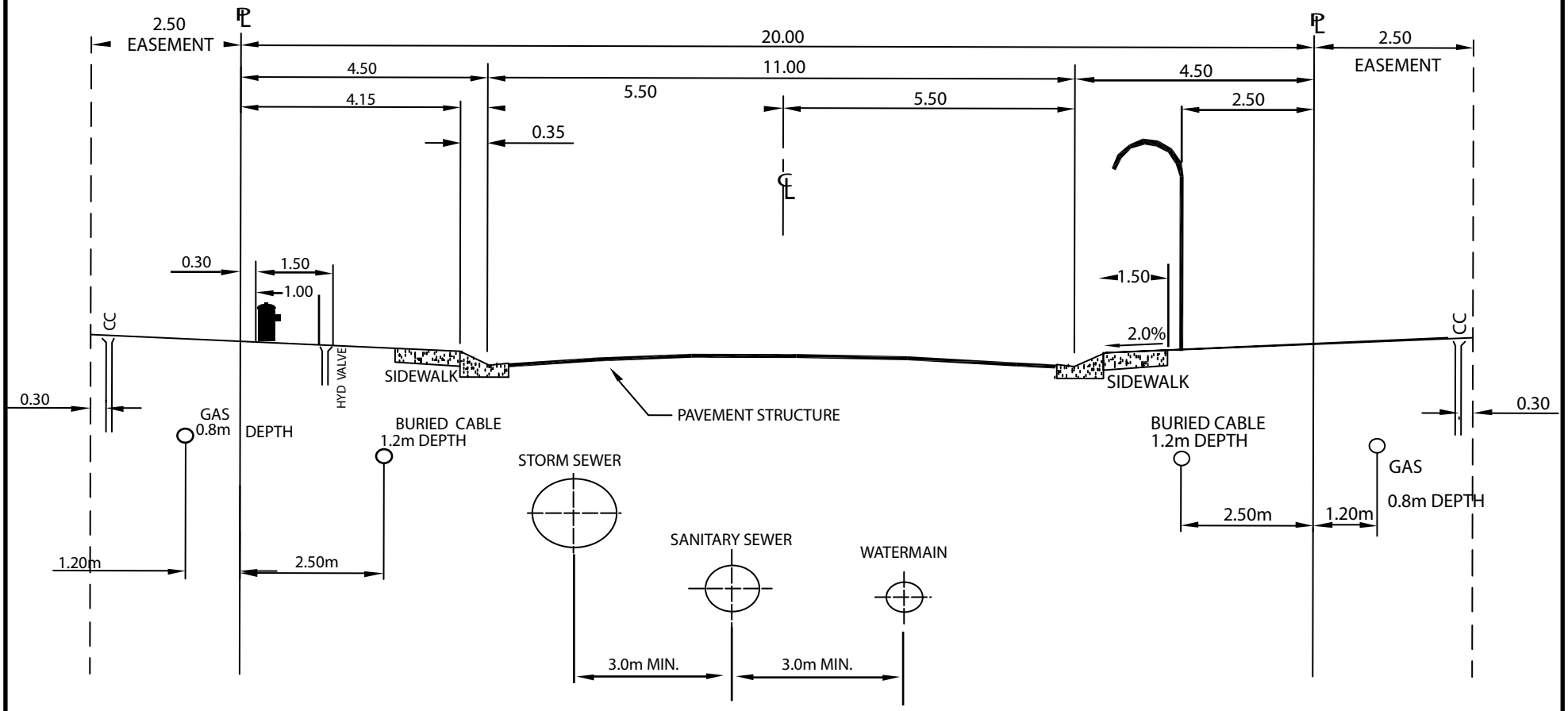


ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	01/2007
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 7.42
MAJOR RES. COLLECTOR

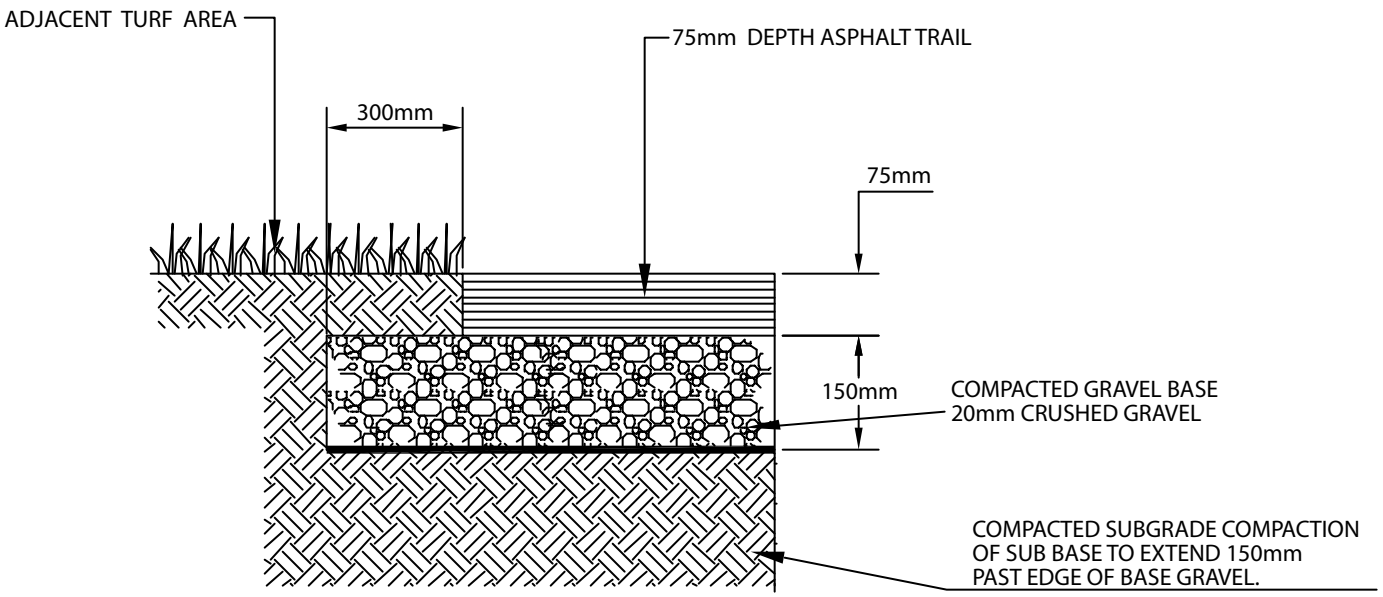


ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	07/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 7.43
MINOR RESIDENTIAL COLLECTOR



NOTES:

CROSS SLOPE TO BE IN DIRECTION OF NORMAL SURFACE DRAINAGE (MIN 2.0%)

SURFACE OF NEW SODDED OR SEEDED EDGE TO BLEND IN NATURALLY WITH EXISTING SURFACE.

REFER TO SPECIFICATIONS FOR ASPHALT TYPE AND DEPTH.

ALL TRAIL EXCAVATION TO MATCH EXISTING NATURAL GRADE.

REMOVE ALL DEBRIS AND EXCESS FILL FROM SITE OR AS DIRECTED.

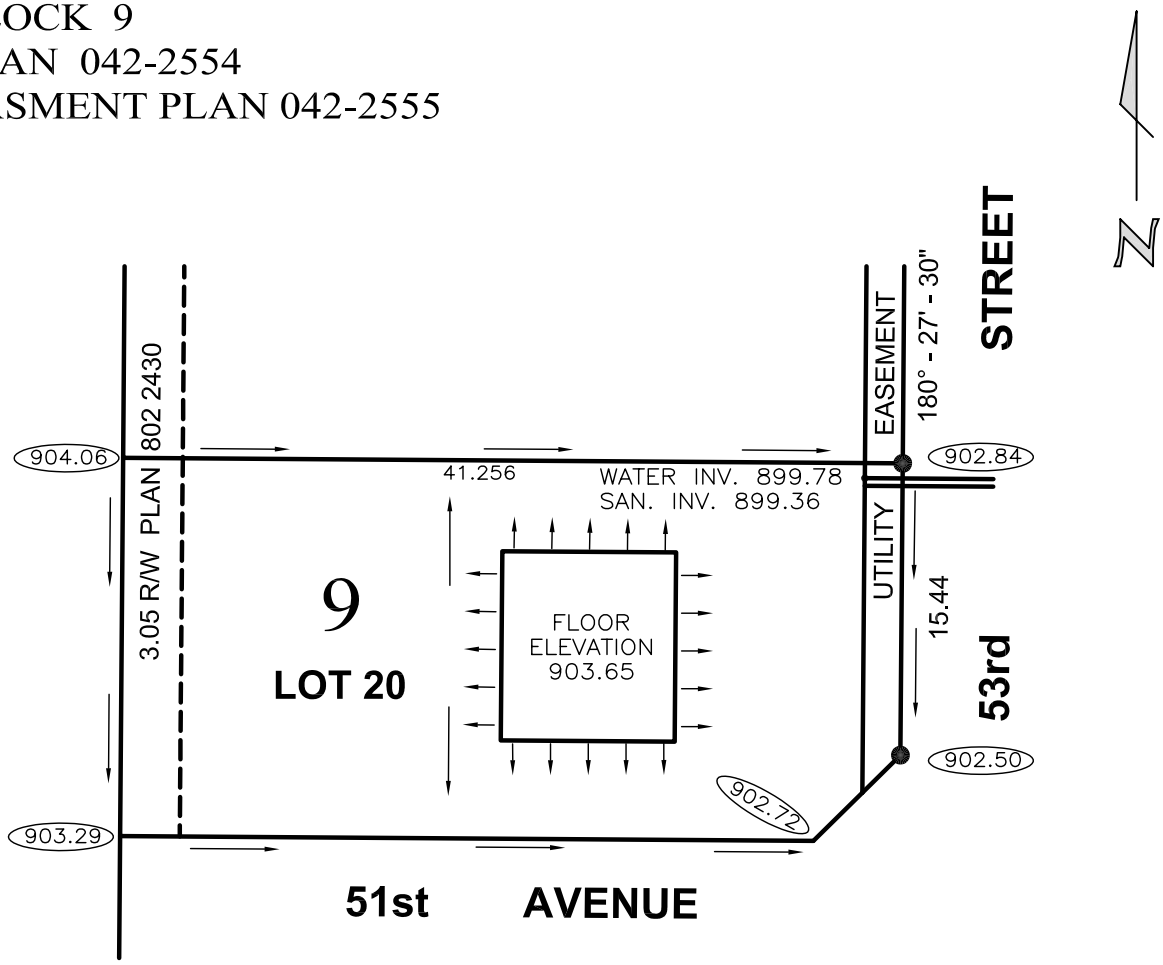
TYPICAL WIDTH IS 1.8m TO 2.8m AND WILL VARY FROM PROJECT TO PROJECT.

ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE: 08/2006	DRAWING 7.45 ASPHALT TRAIL DETAIL
DRAWN: US	
CHECKED: JE	
SCALE: N.T.S	

ROCKY RAPIDS
LOT 20
BLOCK 9
PLAN 042-2554
EASMENT PLAN 042-2555



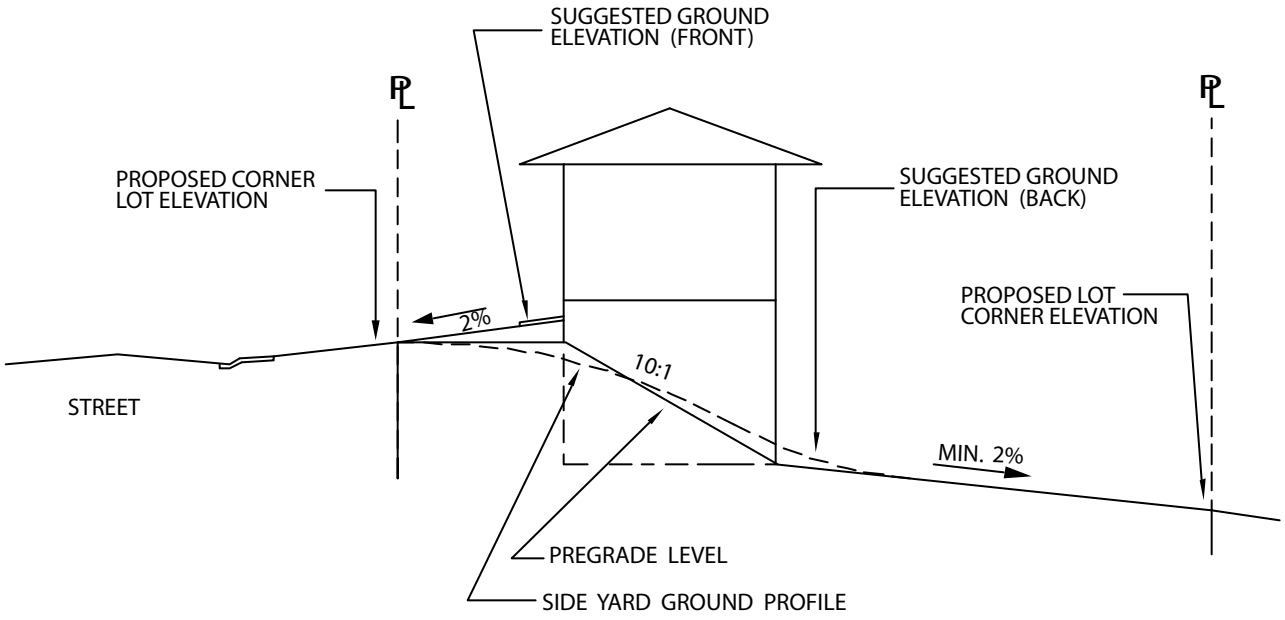
LEGEND

DESIGN LOT ELEVATIONS	822.50
IRON PINS	●
DIRECTION OF DRAINAGE	→
FIRE HYDRANT	⊕
MAIL BOXES	▨
CATCH BASINS	▬
LIGHT STANDARD	☼
POWER PEDESTAL	□

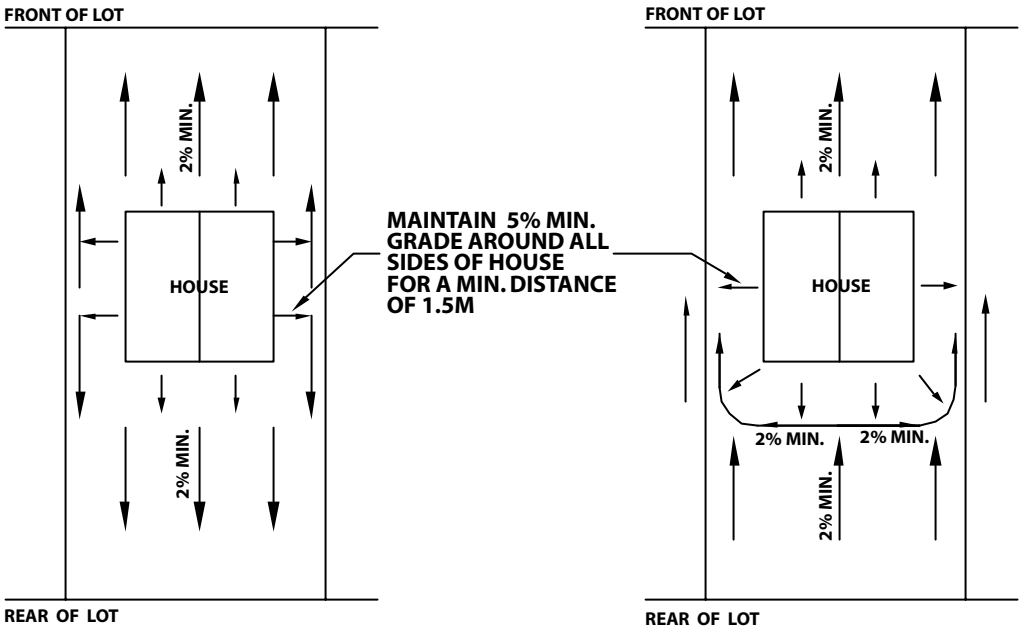
Brazeau County

DATE:	03/2006
DRAWN:	JE
CHECKED:	JE
SCALE:	N.T.S.

DRAWING 8.20
TYPICAL LOT GRADING PLAN
STANDARD PLAN



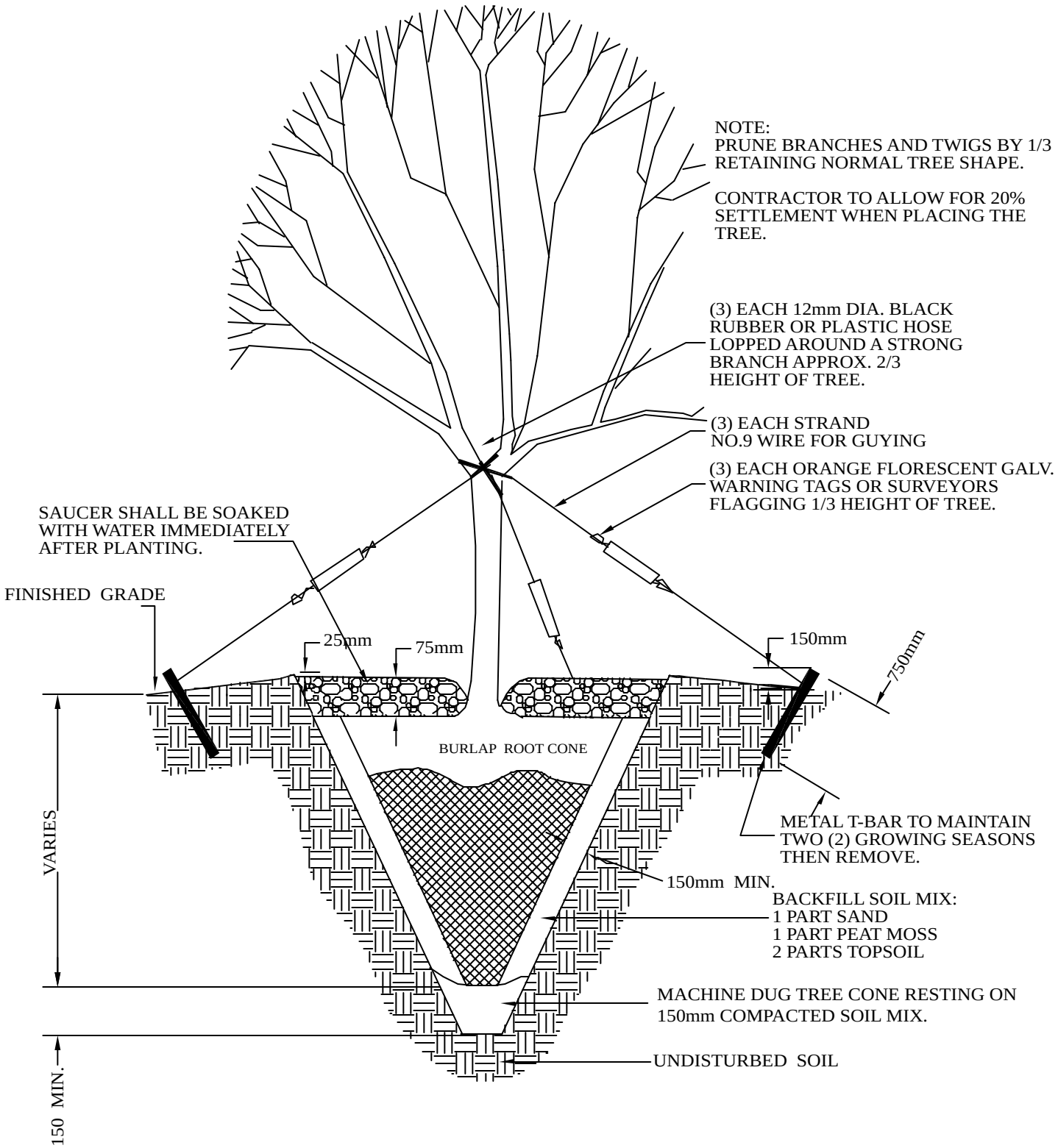
Brazeau County	DATE: 07/2006 DRAWN: US CHECKED: JE SCALE: N.T.S	DRAWING 8.21 TYPICAL WALK-OUT BASEMENT LOT GRADING DETAIL



SPLIT DRAINAGE

BACK TO FRONT DRAINAGE

Brazeau County	DATE: 08/2006 DRAWN: US CHECKED: JE SCALE: N.T.S	DRAWING 8.22 LOT GRADING TYPES

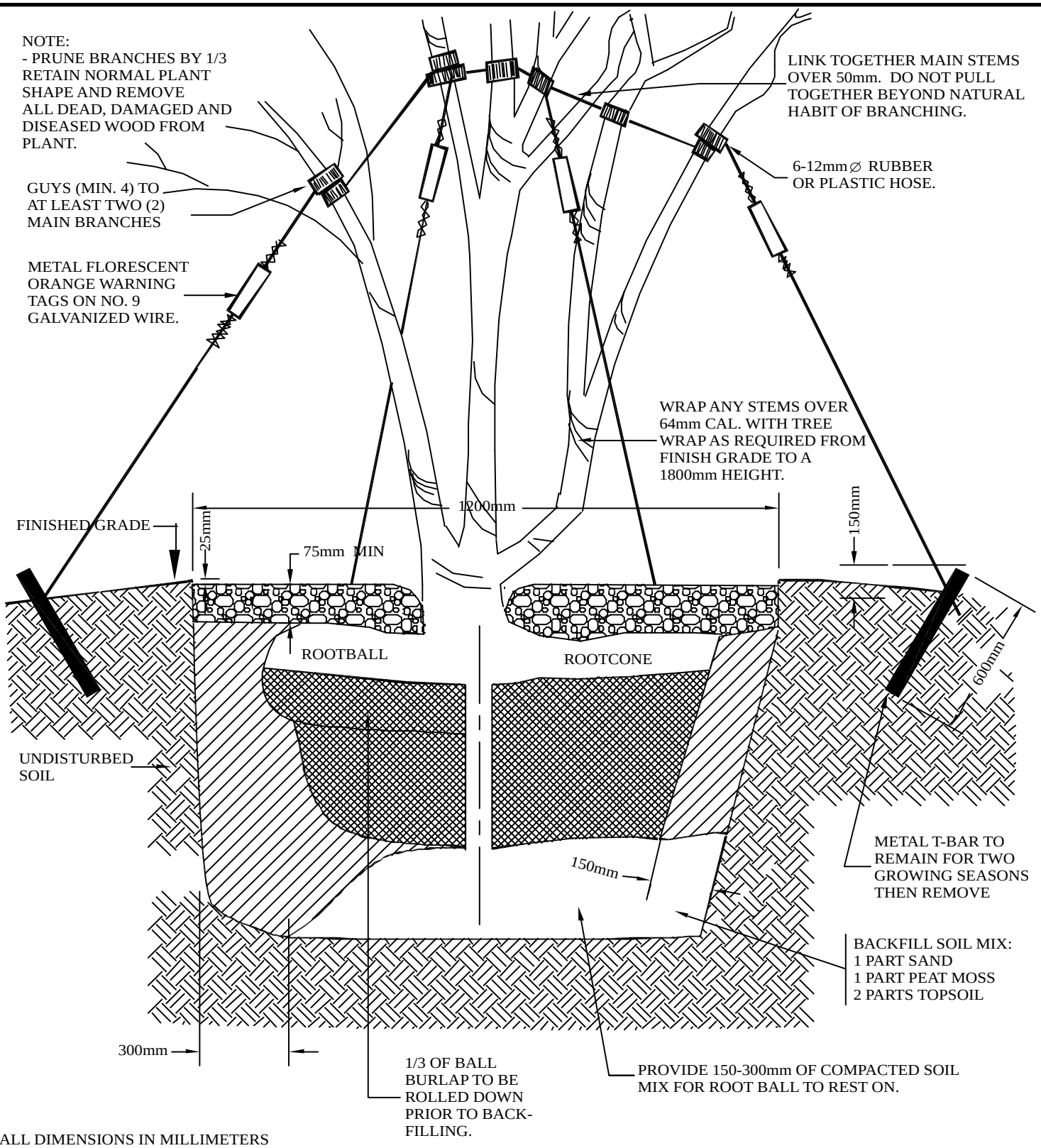


ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 8.23
LARGE TREE INSTALLATION



ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 8.24
MULTI-STEM
TREE PLANTING

NOTE:

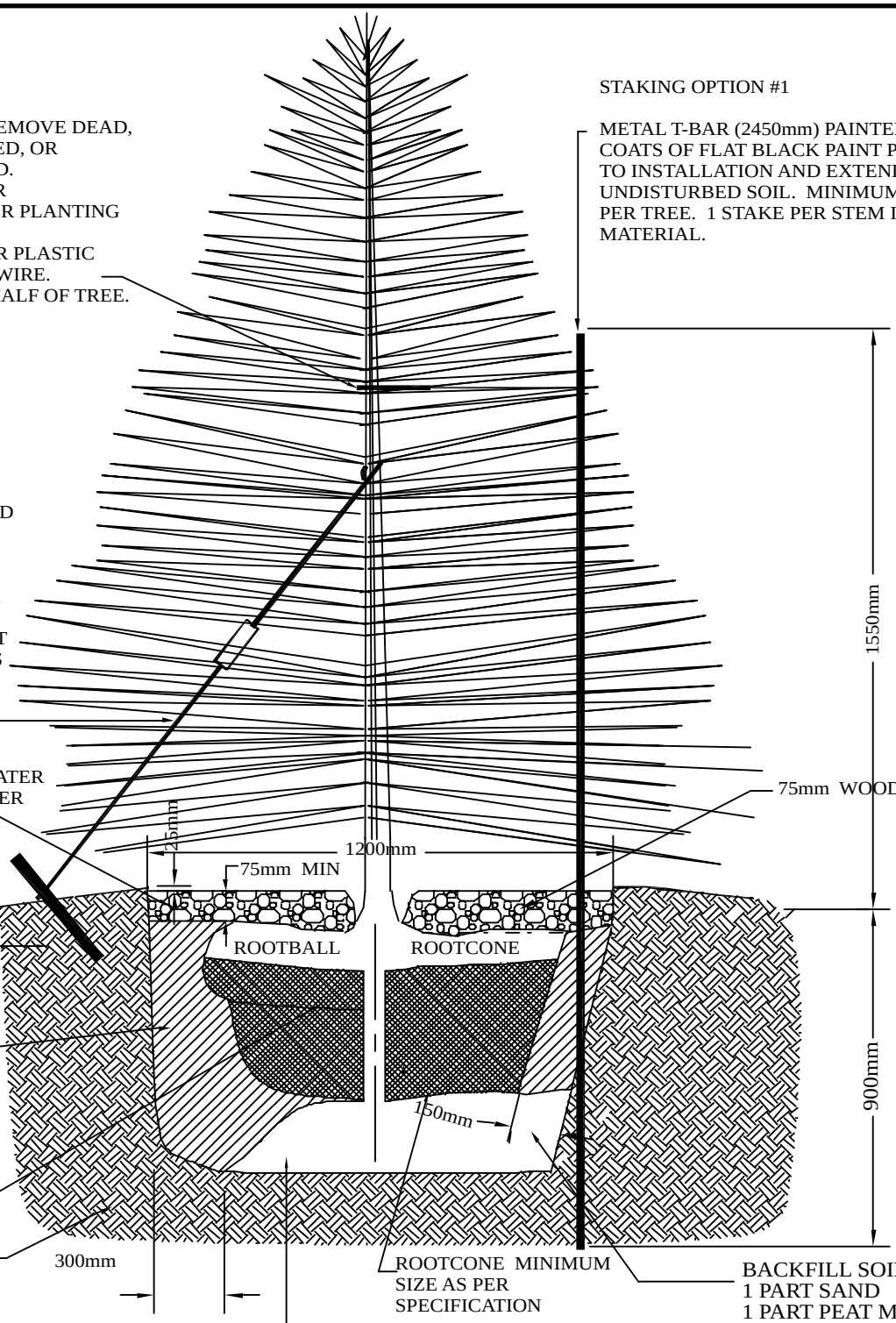
- PRUNE ONLY TO REMOVE DEAD, DAMAGED, DISEASED, OR INTERFERING WOOD.
- SATURATE SAUCER IMMEDIATELY AFTER PLANTING WITH WATER.
- BLACK RUBBER OR PLASTIC HOSE 6-12mm NO. 9 WIRE. ATTACH IN UPPER HALF OF TREE.

STAKING OPTION #1

METAL T-BAR (2450mm) PAINTED 2 COATS OF FLAT BLACK PAINT PRIOR TO INSTALLATION AND EXTENDED INTO UNDISTURBED SOIL. MINIMUM OF 2 STAKES PER TREE. 1 STAKE PER STEM IN CLUMP MATERIAL.

STAKING OPTION #2

(3) EACH 6.35mm DIA. RUBBER' HOSE LOPPED AROUND A STRONG BRANCH APPROX. 2/3 HEIGHT OF TREE. (3) EACH NO. 9 WIRE FOR GUYING (3) EACH ORANGE FLORESCENT GALV. WARNING TAGS 1/3 HEIGHT OF TREE.



PROVIDE 150mm COMPACTED SOIL MIX FOR ROOTBALL TO REST ON.

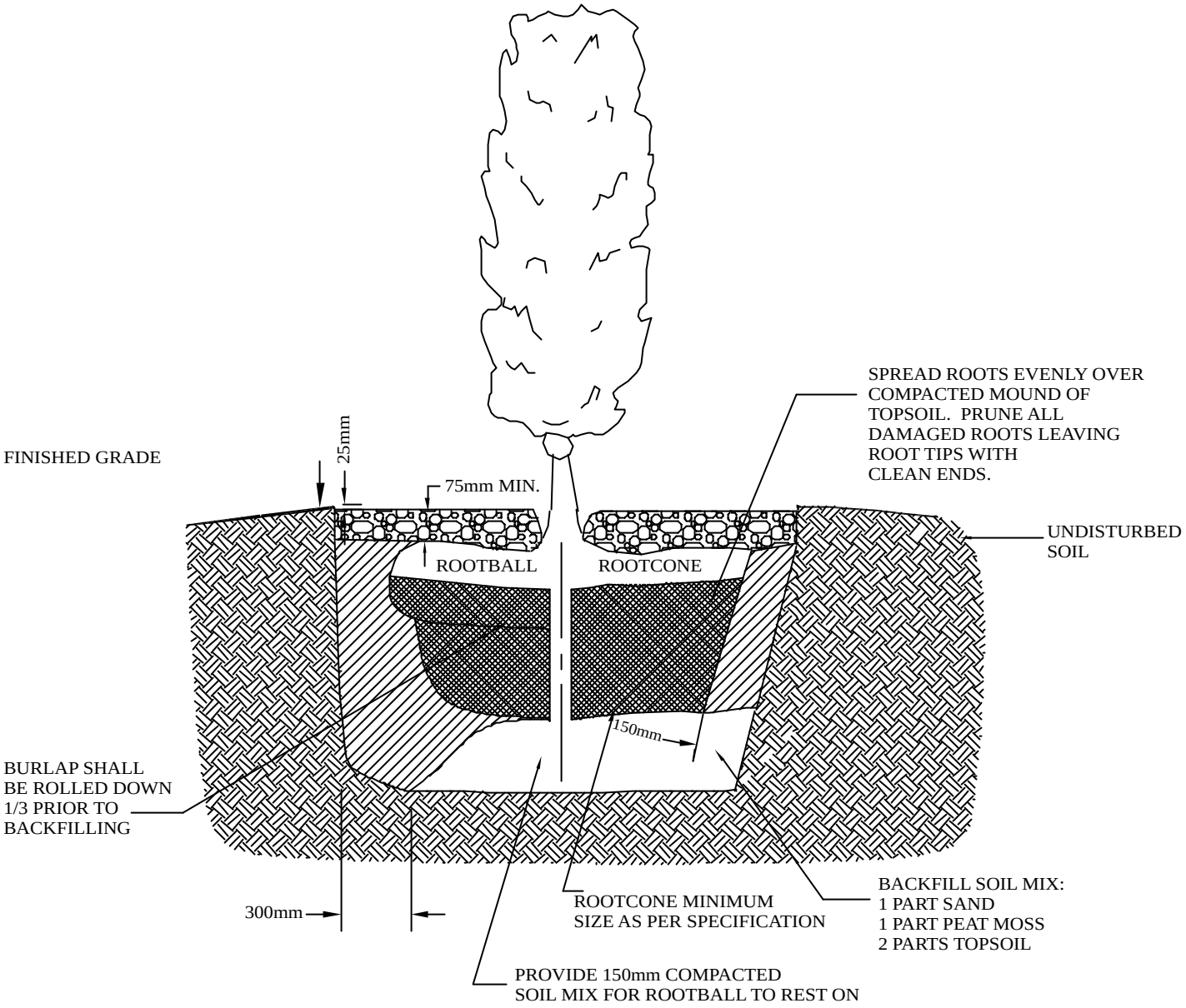
NOTE: RESTRAINING SYSTEM IS EITHER T-BAR OR GUY SYSTEM

ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 8.25
CONIFEROUS TREE PLANTING
64mm CALIPER AND UNDER



NOTE;

-PRUNE BRANCHES BY 1/3 RETAIN NORMAL PLANT SHAPE AND REMOVE ALL DEAD, DAMAGED, AND DISEASED WOOD FROM THE PLANT.

-CONTRACTOR TO ALLOW FOR 20% SETTLEMENT WHEN PLACING SHRUB.

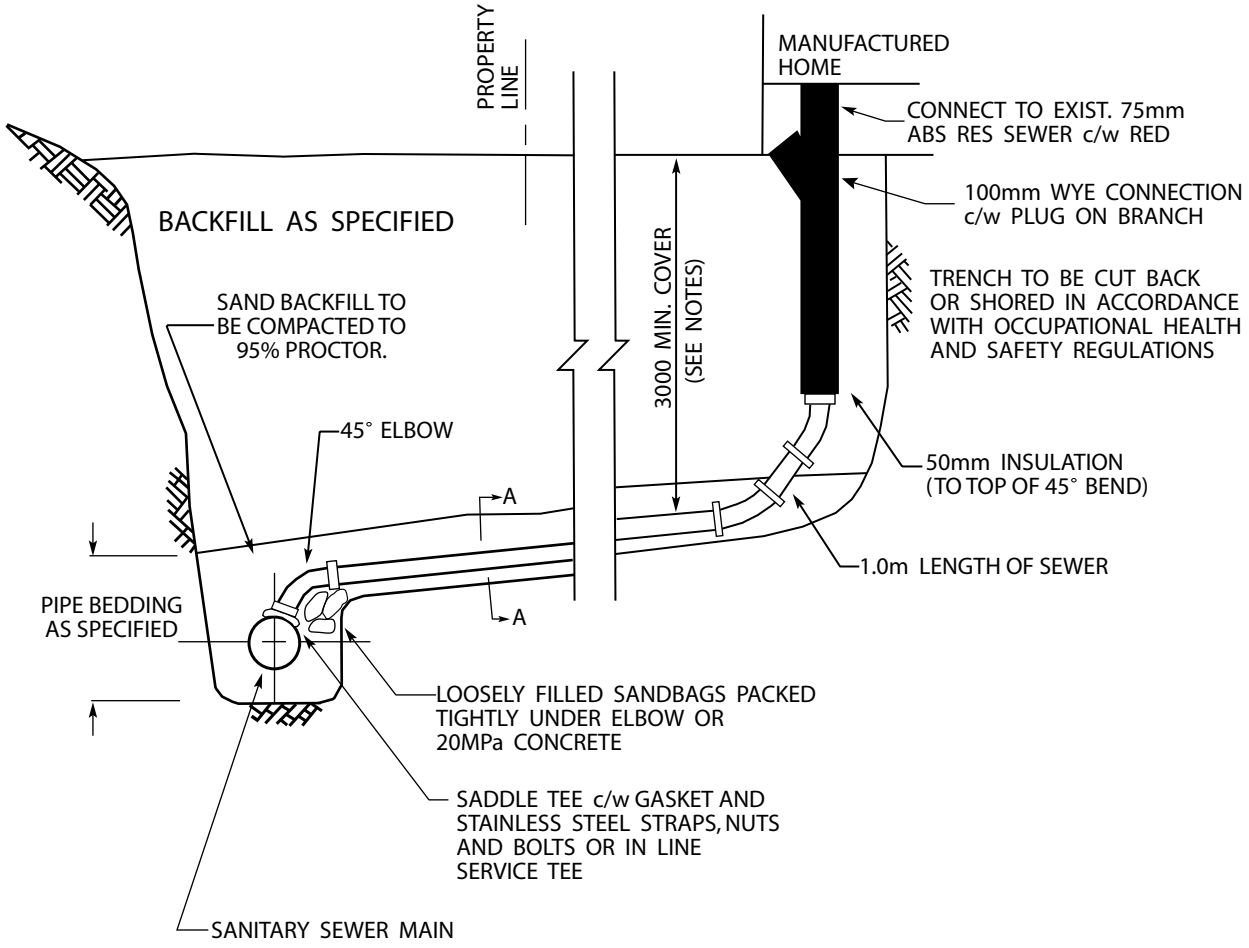
-CONTAINER STOCK PLANTED IN SAME MANNER AS ABOVE DETAIL. CONTAINER IS TO BE CUT CAREFULLY AWAY FROM ROOT SYSTEM SO AS NOT TO DISTURB THE PLANT. SHRUB SHALL NOT BE PULLED FROM CONTAINER.

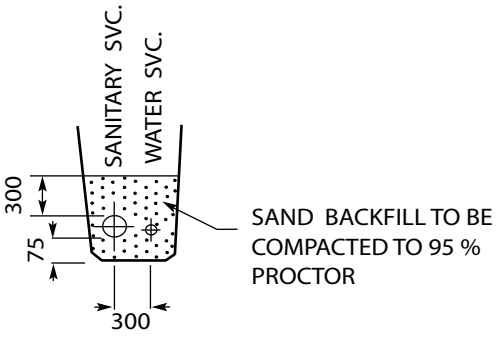
ALL DIMENSIONS IN MILLIMETERS

Brazeau County

DATE:	08/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 8.26
SHRUB PLANTING DETAIL





SECTION A

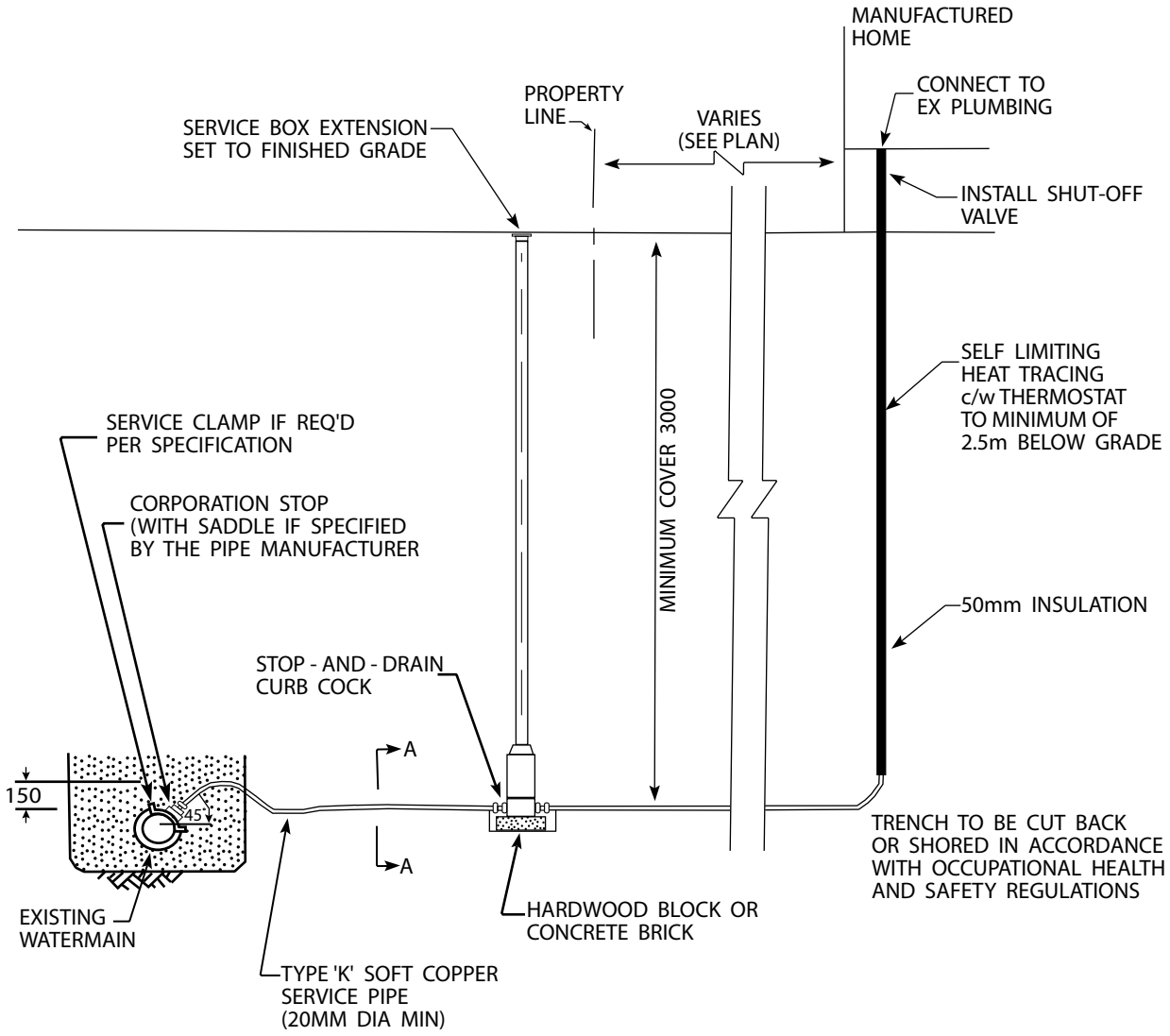
NOTE:

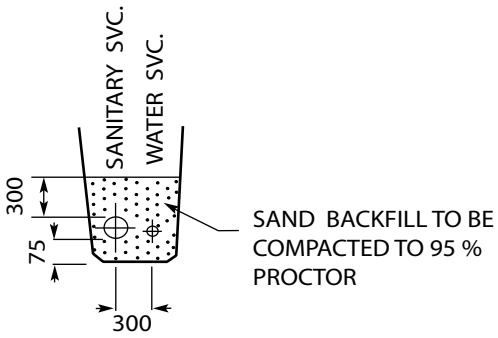
1. MIN. SLOPE FOR 100mm DIA. PIPE IS 2%.
2. SERVICE CONNECTIONS SHALL BE 100mm UNLESS SPECIFICALLY SHOWN OTHERWISE ON THE DRAWINGS
3. 50mm URECON INSULATION WILL BE REQUIRED

Brazeau County

DATE:	12/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

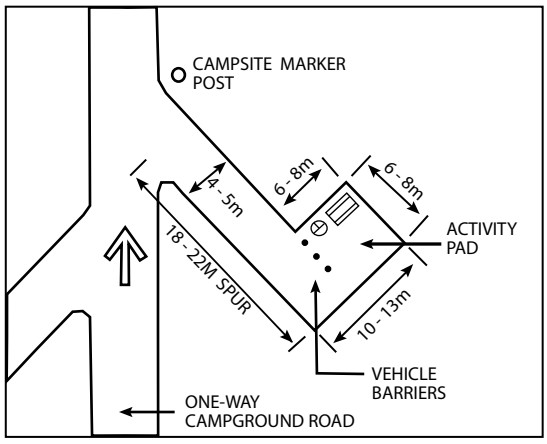
DRAWING 10.010
MANUFACTURED HOME
SANITARY SERVICE CONNECTION



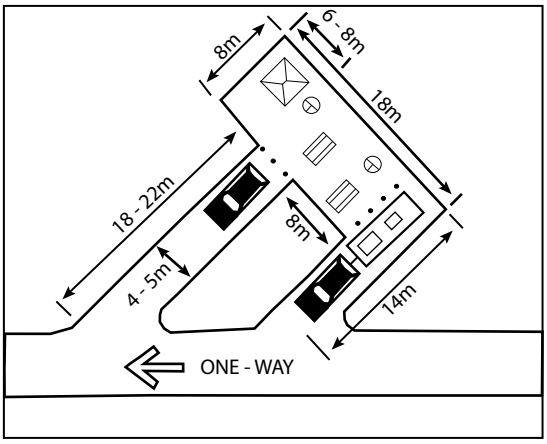


SECTION A

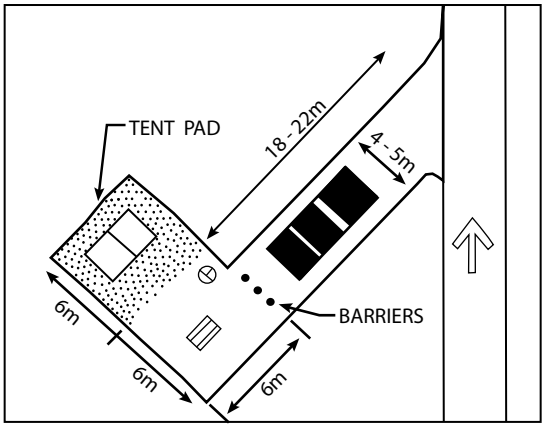
Brazeau County	DATE: 12/2006 DRAWN: US CHECKED: JE SCALE: N.T.S	DRAWING 10.011 MANUFACTURED HOME WATER SERVICE CONNECTION



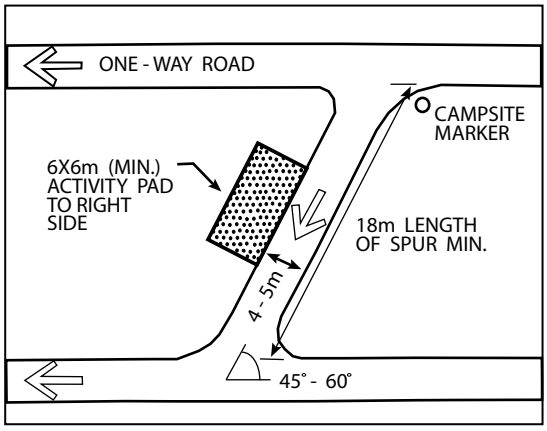
SINGLE BACK - IN CAMPSITE DESIGN



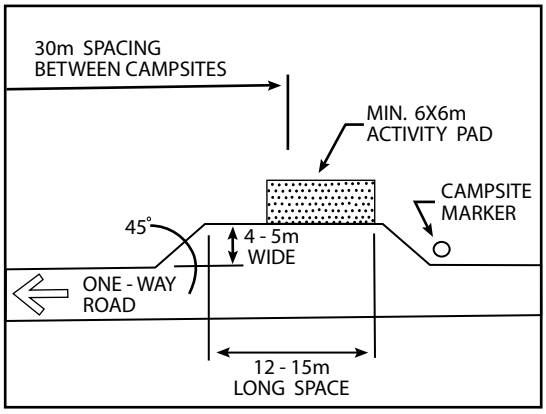
DIMENSIONS OF A DOUBLE BACK-IN CAMPSITE



CAMPGROUND LOCATED AT REAR WITH TENT PAD PROVIDED



DIMENSIONS OF A PULL - THROUGH CAMPSITE

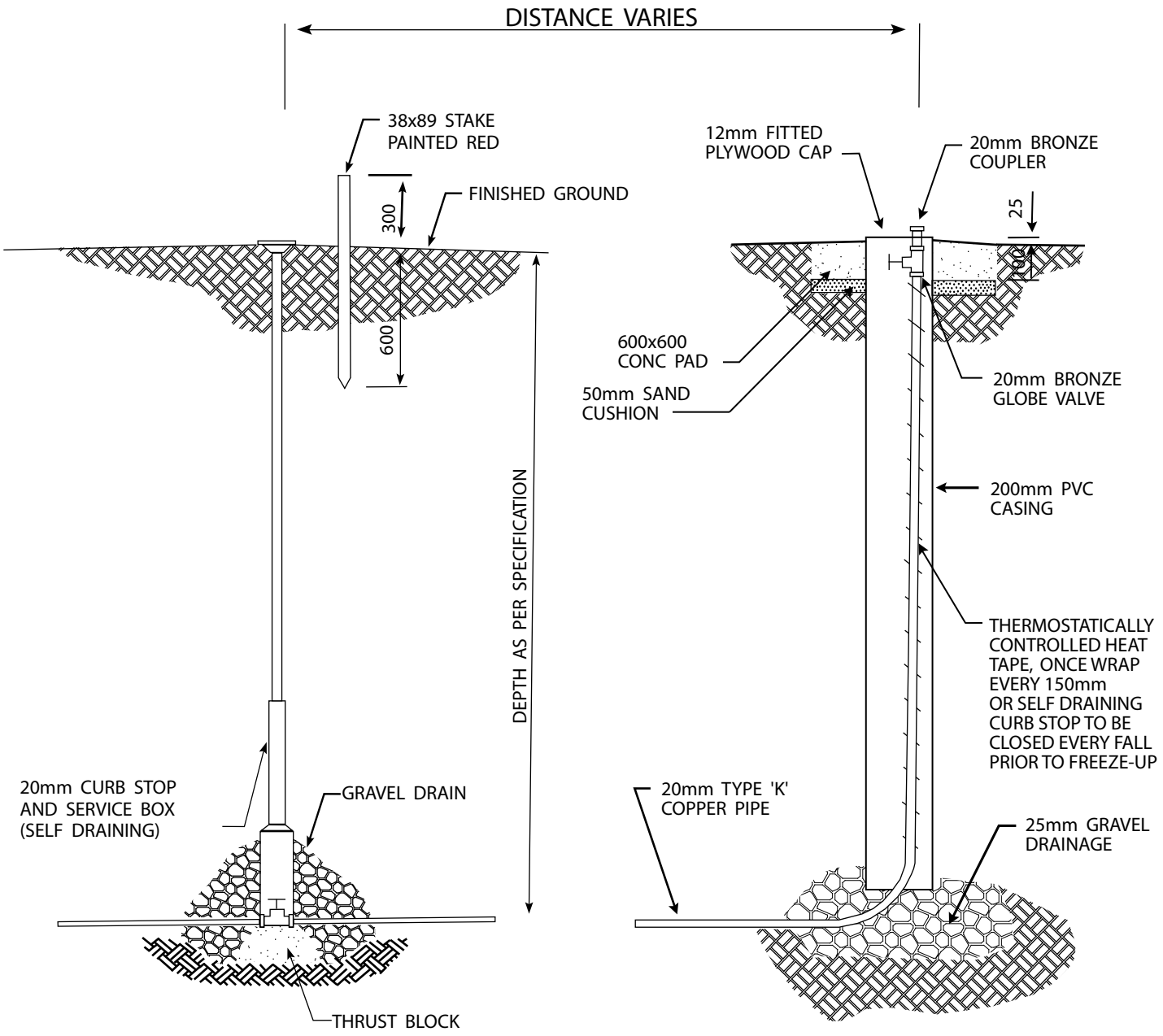


PULL OVER CAMPSITE DESIGN

Brazeau County

DATE:	09/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

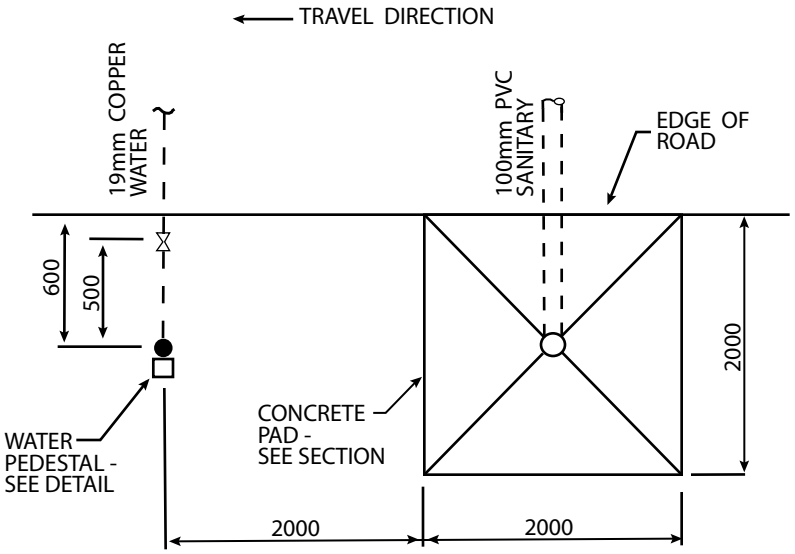
DRAWING 11.10
CAMPGROUND DETAIL



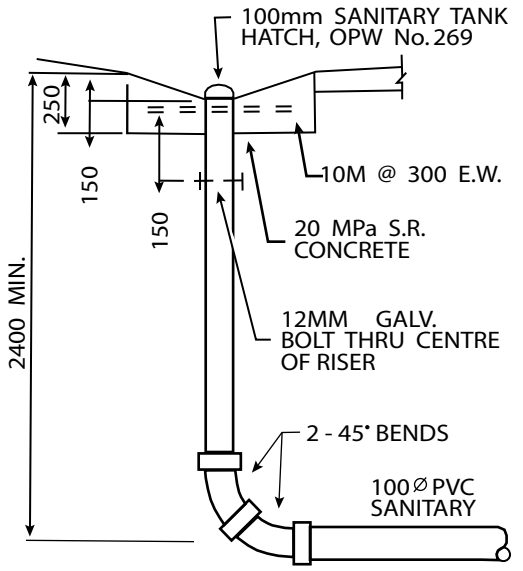
Brazeau County

DATE:	09/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 11.11
WATER RISER FOR
R.V. HOOKUP

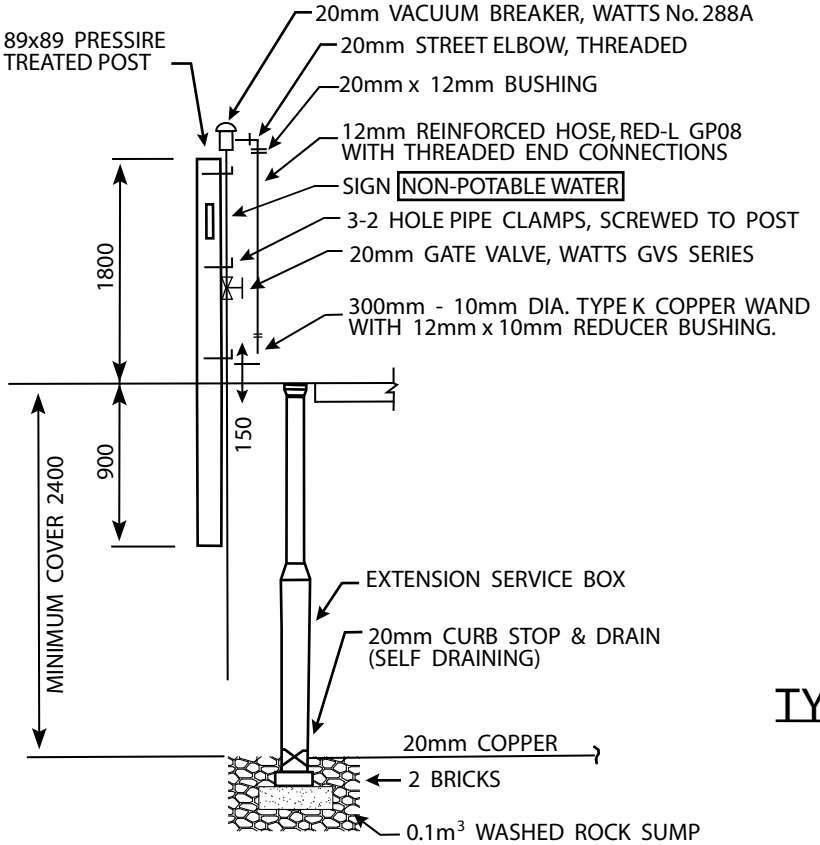


SANI - DUMP SITE

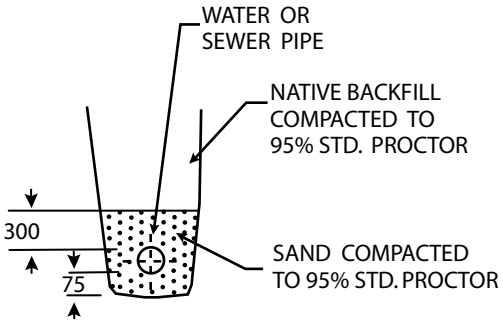


SANITARY PAD SECTION

NOTE: ALL BACKFILL 95% STD. PROCTOR



WATER PEDESTAL DETAIL

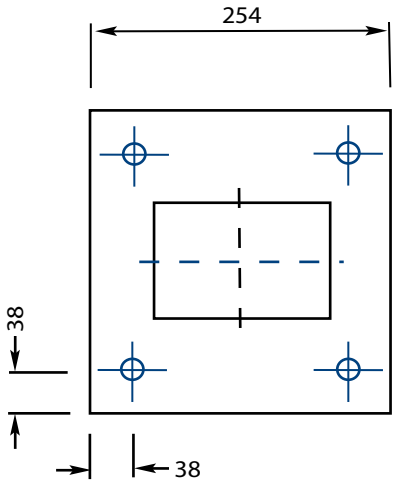


TYPICAL TRENCH SECTION

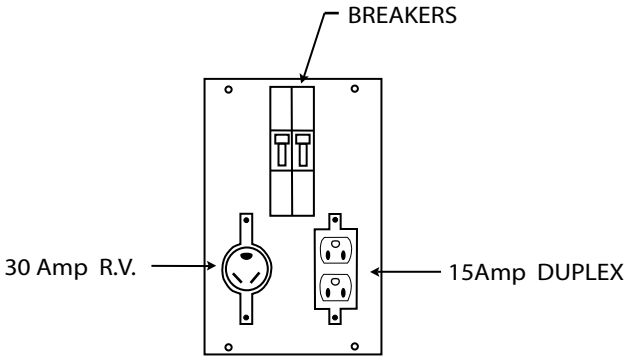
Brazeau County

DATE:	09/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

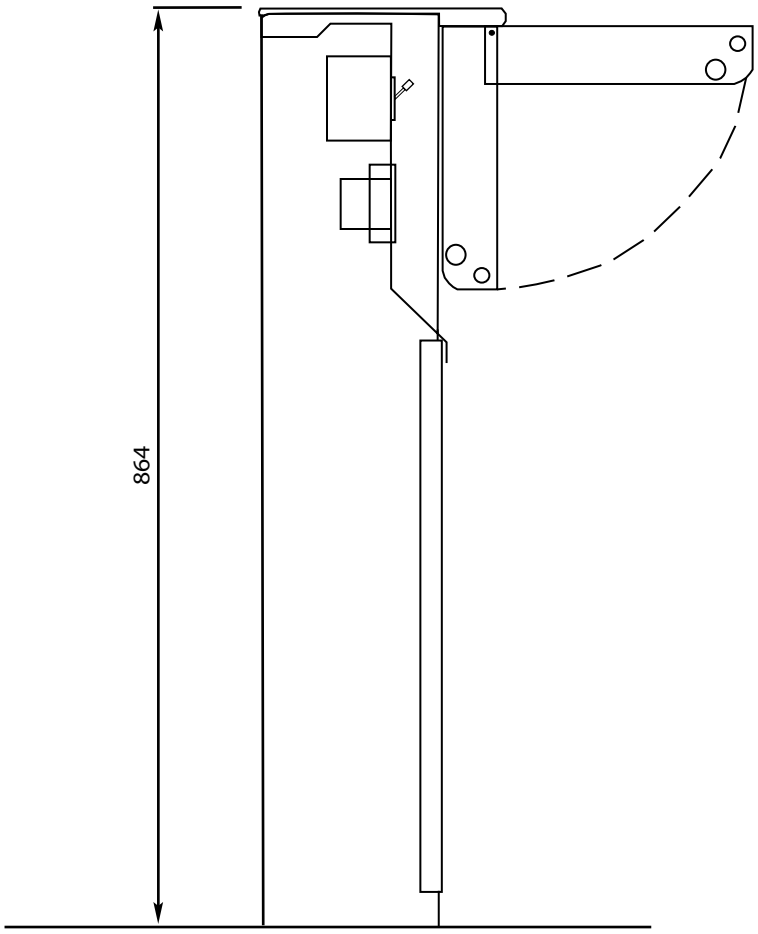
DRAWING 11.12
RV SANIDUMP STATION



TEMPLATE



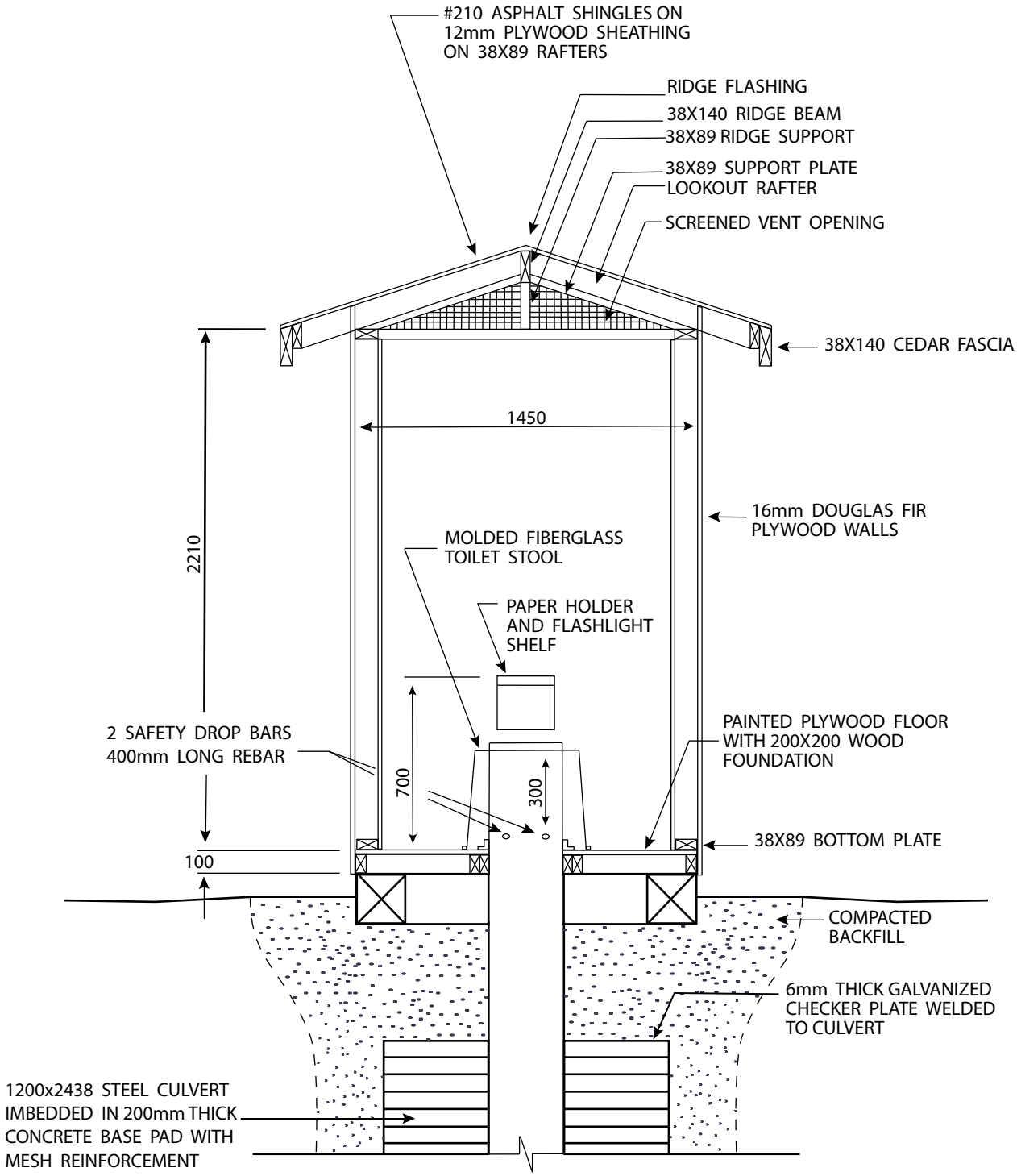
APR - 3 INSERT



SIDE VIEW

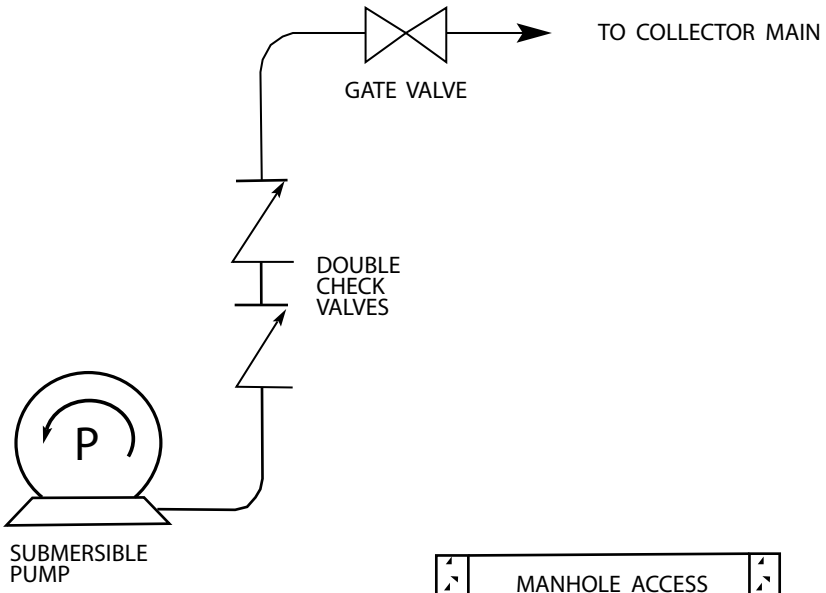
DATE:	06/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 11.13
ELECTRICAL RECEPTACLE

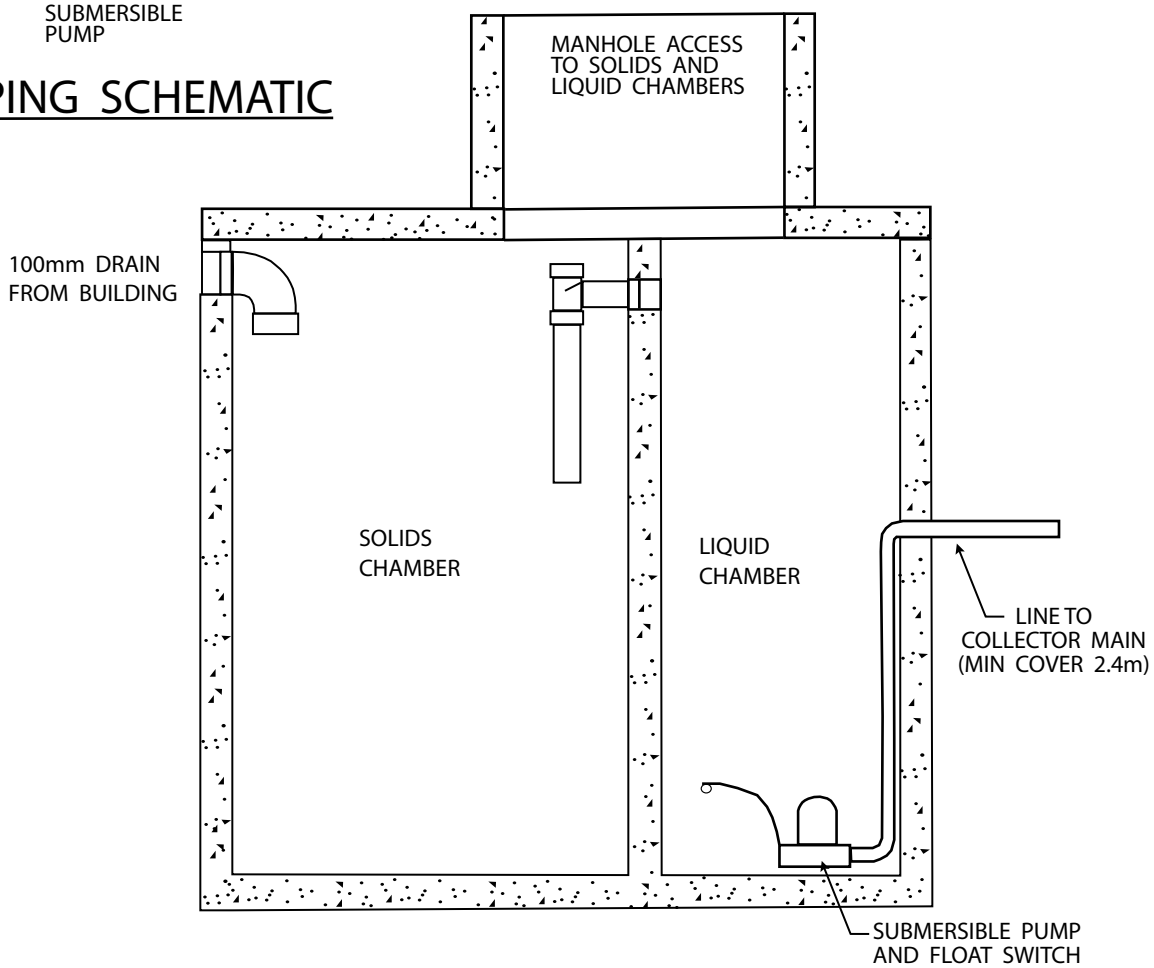


DATE:	01/2007
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 11.14
SINGLE VAULT TOILET



PIPING SCHEMATIC



Brazeau County

DATE:	12/2006
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING 12.10
LOW PRESSURE SEPTIC TANK INSTALLATION

2.4m

BLACK

49006 - RGE RD 73

WHITE

0.0304m

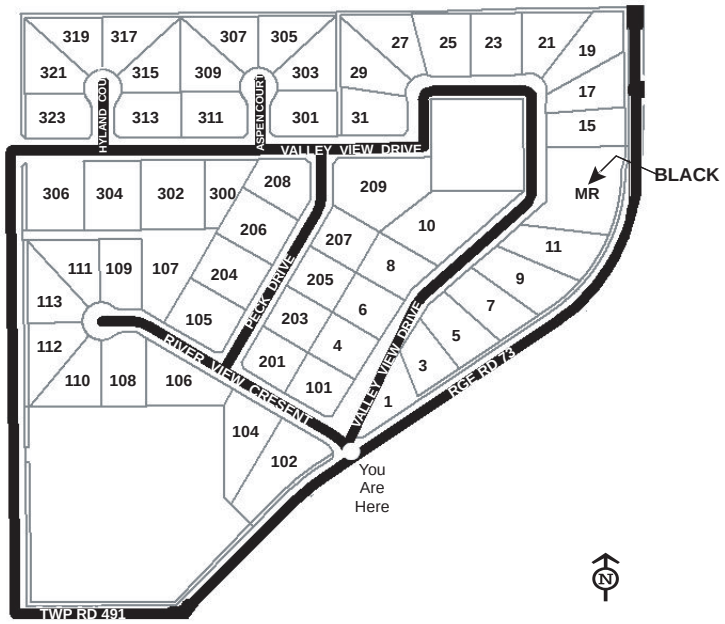
BLACK

VALLEY VIEW ESTATES

YELLOW
BLACK
BLUE
GREEN
YELLOW
BLUE
GREEN
BLACK

LOGO OUTLINED IN BLACK

WHITE



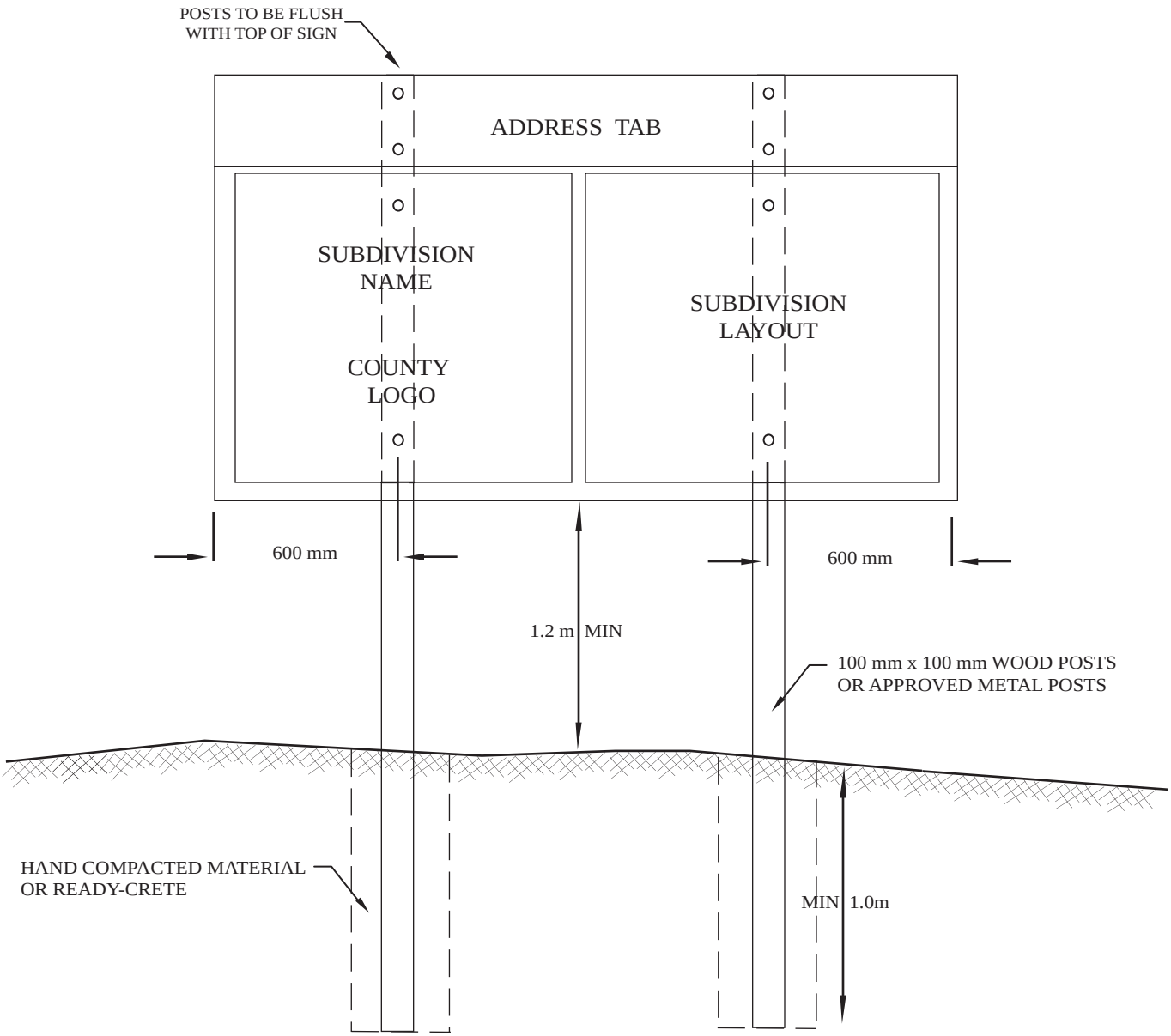
BLACK

1.2m

ALL DIMENSIONS IN METERS

DATE:	01/2008
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING CR-S1
TYPICAL
SUBDIVISION SIGN



ALL DIMENSIONS IN METERS

DATE:	11/2007
DRAWN:	US
CHECKED:	JE
SCALE:	N.T.S

DRAWING CR-S2
TYPICAL
SUBDIVISION SIGN
INSTALLATION