

MINIMUM DESIGN STANDARDS FOR DEVELOPMENT

within the

MUNICIPAL DISTRICT OF BRAZEAU
NO. 77 FRINGE AREA AND HAMLETS

and

THE TOWN OF DRAYTON VALLEY

NOVEMBER 2001



FOREWORD

This manual is intended to provide an information guide and to set standards governing design, preparation and submission of plans and specifications for construction of municipal improvements in the Municipal District of Brazeau No. 77 AND THE Town of Drayton Valley. It is intended for use by Developers, Engineering Consultants, Utility Companies, Municipal District, and Town of Drayton Valley Departments.

These standards are to be applied to development in the Fringe Area surrounding the Town of Drayton Valley, as well as the Hamlets within the Municipal District of Brazeau (including Buck Creek, Cynthia, Lindale, Lodgepole, Rocky Rapids and Violet Grove). The Drayton Valley Fringe Area is as shown on the following plan.

This manual may be purchased from the Municipal District of Brazeau No. 77 or Town of Drayton Valley. The purchase price includes updates and revisions for a three-year period after the date of purchase. Manual owners must notify the Municipal District of Brazeau No. 77 and/or Town of Drayton Valley of any change in name or address.

All users of this manual should be aware that development within the Municipal District of Brazeau is governed by Land Use Bylaw No. 368-99 and within the Town of Drayton Valley is governed by Land Use Bylaw No. 96-24 or as amended from time to time, which describes the administrative process to obtain Development Permits or Agreements, Land Use Redistricting, and Subdivisions.

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Acknowledgements:

These standards have been developed utilizing the Town of Drayton Valley's "Minimum Design Standards for Development" and the Municipal District of Brazeau No. 77's "Engineering Standards".

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Prepared and recommended by Alberta Transportation & Utilities (December 1995)

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M.D. OF BRAZEAU NO. 77:

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SECTION 1

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1.0.0 PRELIMINARY PROCEDURES**1.1.0 DEFINITIONS**

In 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 who has applied for approval of a proposed subdivision or to service an existing parcel of land, whether as the owner or an agent for the owner of the land included therein.
- .2 "Municipal Engineer" or his authorized representative shall mean a Municipality employee who for the time being is acting for the Municipality in their respective positions, or any person engaged by the Municipal District of Brazeau No. 77 and /or The Town of Drayton Valley to act for the Municipality.
- .3 "Consulting Engineer" shall mean the professional engineer retained by the Applicant to be responsible for the design, layout and supervision of installation, preparing record drawings and performing those duties in connection with the provision of Municipal Services as set out in these design standards. The Consulting Engineer must be licensed to practice in the Province of Alberta.
- .4 "Contractor" shall mean any person, persons or corporation that shall undertake the installation of Municipal Services on behalf of either the Applicant or the Municipality.
- .5 "Developer": shall mean the person or entity that has executed a Development Agreement with the Municipality, in which Agreement the Developer has undertaken to comply with the specified technical standards and requirements of the Municipality.
- .6 "Developer's Responsibilities": any specification statement referring to acts to be performed or materials to be furnished by the Applicant, Consulting Engineer or Contractor shall be construed to be directed to the Developer, who shall in turn ensure that the acts are performed or materials are furnished by the Applicant, Consulting Engineer or Contractor. The Developer shall be responsible to the Municipality for compliance with the Design Specifications by his Contractor.
- .7 "Municipal Improvement": is any addition or modification or proposed addition or modification to a service or facility the Municipality will ultimately be responsible for. These include, but are not necessarily limited to, watermains, sewers, roadways, walkways, park areas, signs, streetlights and fencing.
- .8 "Municipal or Municipality" shall refer to the Municipal District of Brazeau No. 77 and /or the Town of Drayton Valley.

1.2.0 GENERAL**1.2.1 Development Brief:**

Development of new areas requires the subdivision of land in accordance with procedures and requirements set out in the Planning Act, the Municipality General Municipal Plan, Land Use Bylaw and the Subdivision and Development Procedures Manual. The Municipality desires to be kept informed in regard to the proposed development. To this end, the Developer is requested to present his Development Brief to the Municipal Engineer at an early stage so that the proposal can be reviewed and commented on prior to giving approval in principle of the subdivision development.

1.2.2 Developer's Engineer:

The Developer shall engage a qualified Professional Engineer to undertake all phases of engineering, including conceptual design, detailed design, general engineering, construction inspection and preparation of record drawings, for the proposed development. Such engineer shall design these services in accordance with accepted engineering practices and to achieve or exceed the minimum standards as set out herein or established by government bodies. All plans and documents shall utilize the Standard Metric System of Units (SI).

1.2.3 Development Proposal:

Prior to any development taking place, the Developer shall submit a development proposal to the Municipality. The proposal should include all pertinent information as to standards of construction, anticipated types of development, requirements for capacity of water mains, sewer mains, roadways, street patterns, utility easements and other significant aspects relating to the proposed development.

The development proposal shall include drawings at a scale of 1:1000 m or of the proposed development outlining the concept of lots, blocks and street patterns. The following information shall be included on one or more copies of the above 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 water mains.
5. Location and size of sanitary sewer mains, liftstations and the like.
6. Location and size of storm sewer mains, and storm water management facilities
7. Curb face to curb face road widths.
8. Impact of servicing requirements on existing facilities.
9. Any other information that the Developer considers necessary to aid the Municipality in assessing and considering the proposed development.

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 Municipality, as well as the General Municipal Plan and the Land Use Bylaw.

.2 Overall Development of the Municipality:

The proposed development shall be laid out and designed having regard to the overall development of the Municipality and possible future expansion of abutting areas. Tie-ins of proposed local improvements into existing development shall not create overloads on existing services.

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

.3 Layout Concepts

The concepts of layout such as size of lots, widths of right-of-way for traffic and other services, park reserves, densities and zoning, should be approved in principle by the Municipality 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:

Subdivisions requiring curves on roads should reflect right-of-ways boundaries with the same curves or sufficient size corner cut-offs to accommodate the curves as well as utilities and municipal services required to be installed in the boulevard.

.5 Right-of-ways and Easements:

Rights-of-way and/or easements shall be provided for all utilities not located on streets, lanes, or utility lots, including rights-of-way for back of lot drainage, ditches or watercourses accommodating surface runoff and shallow utilities.

1.2.5 Municipal Services**.1 Servicing Regulations:**

The type and extent of servicing shall be in accordance with the development agreement and the "Approved" plans, specifications and regulations for each municipal improvement.

.2 Service Connections:

For sanitary, water, and where applicable, storm, service connections will be extended to the property line, or where front gas easements are provided, to the back of the gas easement. For power, telephone and cable T.V., service connections, shall be installed underground from the mains to 3.0 metres into the lot.

.3 Canada Post Mailboxes

The location of Canada Post's "Superboxes" shall be co-ordinated with Canada Post by the Developer.

1.2.6 Existing Improvements

.1 Connections to Existing Facilities:

The Developer shall file a request for a connection to existing facilities with the Town at least 48 hours prior to starting work on this connection. In the event existing services must be cut off, the Developer will notify all affected customers of this fact. The developer must have all material, equipment and labour on hand as necessary to complete this connection in the shortest possible time before he will receive approval to make this connection. Depending upon the length of service interruption, the Developer may have to provide temporary services to the affected customers.

.2 Interference with Existing Services:

Any of the services to be installed by the Developer shall be installed in such a manner as to least interfere with existing services. Any additional cost incurred by the Town on account of the installation of services by the Developer shall be the sole responsibility of the Developer.

.3 Temporary Closing of Roads:

In the event that a road must be partially or fully closed for a crossing or connection, the Developer shall provide all detours, signs, flagmen, barricades, etc. necessary to provide for the orderly control of traffic around the construction area. The Town must be notified at least 48 hours in advance of any road closures and appropriate permits obtained by the Developer, from the Municipal Engineer.

.4 Road Crossings:

Any existing facilities disturbed during construction shall be returned as a minimum requirement to their original condition. Where it is necessary to excavate an existing road or lane for the purpose of providing an open trench crossing (for a water or sewer main, gas main, telephone cable, etc.) such excavation must be backfilled with compacted sand and/or gravel material to the satisfaction of the Municipal District Engineer. Compaction shall be minimum 95% Standard Proctor Density. The Developer shall be responsible to repair any trench settlements that may occur within two years from installation of the service.

.5 Standards:

The standards outlined herein are intended to be the minimum standards. Where conditions dictate and good engineering practice requires higher standards than those indicated, they shall be incorporated into the design. It shall be the Developer's responsibility to develop the subdivision in accordance with standards which are acceptable to the Town and which conform to good engineering and construction practices. If a relevant government body or approval agency has approved standards that exceed the Municipality's minimum standards, the higher standards shall prevail. Generally, no departure from these design standards shall be permitted except with the written approval of the Municipal Engineer (see Section 1.3.2.3).

.6 Materials:

Materials installed within the subdivision shall be tested to confirm compliance with the most recent standard of either AWWA, ASTM, or CSA.

1.3.0 GENERAL CONDITIONS

1.3.1 Scope

1. These design standards shall apply to the design and installation of Municipal Services within the Municipal District of Brazeau No. 77 and the Town of Drayton Valley. They apply to the design and installation of storm and sanitary sewers, watermains and roads, together with their respective connections and appurtenances and any other services that are required to be designed and/or installed.
2. These design standards do not cover the design or installation (other than alignment) of street lighting, ornamental lighting, power, gas, telephone and television services, but do include coordination with the various utility companies.
3. 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 of the respective services:
 - Section 1: General Conditions and Procedures
 - Section 2: Preparation of Engineering Drawings
 - Section 3: Water Distribution System
 - Section 4: Sanitary Sewerage System
 - Section 5: Storm Drainage System
 - Section 6: Sewer and Water Service Connections
 - Section 7: Streets
 - Section 8: Lot Grading & Landscaping
 - Section 9: Franchise Utilities
 - Section 10: Manufactured Homes Subdivision
 - Section 11: Recreational Vehicle Park
 - Section 12: Low Pressure Sewer Systems
 - Section 13: Guidelines for 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 the procedure as set out in this section.
- .3 No departure from these design standards shall be permitted except with the written approval of the Municipal Engineer. The Municipal Engineer may give verbal approval to revisions that he considers to be sufficiently minor. A Change Order shall be issued by the Developer and approved by the Municipality to record such revisions.
- .4 The performance and responsibilities of all parties and persons carrying out the installation of services shall be as set out in Section 1: General Conditions.

1.4.0 PROCEDURE**1.4.1 Engineering Design**

- .1 The Applicant shall retain a Consulting Engineer who shall be responsible for the design and preparation of drawings and specifications for all services (except lighting, telephone natural gas, cable T.V. and power) as required within the Municipality. These services shall be designed in accordance with the Minimum Design Standards for Development.
- .2 The Design Drawings shall show all existing and proposed services. It shall be the Consulting Engineer's responsibility to coordinate with the utility companies to establish the location of their existing and proposed services.

1.4.2 Submission of Engineering Design

- .1 Upon completion of the Design Drawings, the Consulting Engineer shall submit to the Municipal Engineer, together with two complete sets of plans and specifications for the proposed project, the following:

- a) calculations of sanitary and storm sewer capacity and pipe loading, where these services are to be installed;
 - b) water distribution analysis as specified in Section 3;
 - c) a print of the registerable plan of the subdivision (if not already supplied by the Applicant).
- .2 All proposed streets shall be named on the drawings, names to have been approved by the Municipality prior to the submission of drawings.
 - .3 The Consulting Engineer shall bring to the attention of the Applicant and the Municipality the need for any rights-of-way outside the subdivision that the Applicant may have to obtain.
 - .4 The Consulting Engineer shall bring to the attention of the Applicant and the Municipality the need for any oil and gas pipeline Crossing Agreements which the applicant may have to obtain.

1.4.3 Preliminary Design Review

- .1 All design drawings and specifications and relevant data shall be reviewed by the Municipality Engineer. Any revisions requested by the Municipal Engineer shall be incorporated in the final design drawings.

1.4.4 Final Design Review

- .1 Upon completion of all revisions, the Consulting Engineer shall submit four sets of Contract Drawings to the Municipal Engineer for review. The Municipality's review of the Contract Drawings is only for general compliance with the Municipality's Development standards as detailed in this document. Review certification does not, in any manner, imply approval of the technical aspects of the reviewed design.
- .2 Upon completion of design review, the Municipal Engineer shall certify the drawings and return one set to the Consulting Engineer.
- .3 No work will be started within any parcel of land or on any of the services to be provided by the Applicant until the Municipality has certified the Contract Drawings, the subdivision approved and the Development Agreement 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 Applicants expense.

1.4.6 Oil and Gas Pipeline Crossing Agreements

- .1 Where oil and gas pipeline Crossing Agreements are deemed necessary, they shall be obtained from the pipeline owner at the Applicants expense.
- .2 It is the responsibility of the Applicant to complete a title search with the ERCB (Energy Resources Conservation Board) to determine the existence of any pipelines in use or abandoned.

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 Development Agreement or a Development Permit if applicable.
 - b) Subdivision Approval.
 - 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 maintained at the construction site during the installation of services.
- .3 Underground subdivision services shall not be permitted to operate as part of existing Municipal Services until the respective subdivision services have been inspected, tested and approved in writing by the Municipal Engineer. This is generally upon receipt of an approved Construction Completion Certificate by the Developer from the Municipality (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 the supervision of installation of all services which are the responsibility of the Applicant. The Consulting Engineer or his authorized representative shall have a presence at all times on site during the installation of services.
- .2 The Consulting Engineer shall be responsible for maintaining field surveys from which services not the responsibility of the Applicant may be installed if such installations are to be made before the acceptance of work being done by the Applicant.
- .3 In addition to supervision carried out by the Consulting Engineer, the Municipal Engineer may periodically inspect the work and assist in coordinating the subdivision works with any related Municipal works. The Municipal Engineer shall bring the use of any unacceptable materials or practices to the attention of the Contractor and/or the Consulting Engineer. If remedial action is not taken to the

satisfaction of the Municipal Engineer, he may order the work to cease.

- .4 If the Consulting Engineer wishes to make any changes in design either before or during the execution of the work, he shall first submit a marked print showing proposed revisions to the Municipal Engineer. If approval is granted for revision, the original drawing shall be immediately revised and new prints issued. These two operations may be carried out simultaneously.

1.4.9 Survey Control System

- .1 The Developer shall provide a survey control system within and adjacent to the subdivision. The survey control system shall consist of survey monuments of a design mutually acceptable to both the Municipality and Alberta Forestry, Lands and Wildlife. The survey monuments shall be placed so as to be intervisible between adjacent pairs and spaced approximately 300 metres apart. Measurements shall be made between monuments and connection shall be made to existing geodetic monuments to not less than third order specifications as defined by the Geodetic Survey of Canada, to establish vertical and horizontal coordinates based on a three degree transverse mercator projection. The Municipality and Alberta Forestry, Lands and Wildlife shall be provided with the survey measurements, to the satisfaction of the Director of Surveys, Alberta Forestry, Lands and Wildlife, for the survey control system.

The Developer shall undertake to preserve all existing and new monuments and should it be necessary to destroy a monument, the Developer shall establish a new one in lieu thereof and provide the Municipality and Alberta Forestry, Lands and Wildlife with survey measurements for it to the satisfaction of the Director of Surveys.

Any legal pins disturbed or removed during construction must be replaced prior to Final Acceptance by the Municipality. The Developer shall supply certificate from a registered legal surveyor that all lot and corner pins are intact.

1.4.10 Testing

- .1 It shall be the responsibility of the Consulting Engineer to ensure that the Contractor disinfects and tests all watermains and tests all sewers prior to the acceptance by the Municipality. The Municipal Engineer shall be advised at least 48 hours prior to any testing and may witness the test. The results of all tests shall be submitted to the Municipality for their review.

1.4.11 As-Built Drawings

- .1 Within two months of completion of all services to be installed, the Consulting Engineer shall deliver "as-built" drawings to the Municipal Engineer, in a reproducible format.

1.4.12 Municipal Acceptance

- .1 Upon satisfactory completion of the project and after all the deficiencies have been corrected, the Municipal Engineer shall issue a Construction Completion Certificate to the Applicant, notifying:
 - a) Acceptance of the work by the Municipality;
 - b) Commencement date of maintenance period.
- .2 The applicant shall be responsible for, at his own expense to remedy any defect, fault or deficiency in the completed works during a twentyfour (24) month maintenance period. Normally the maintenance period shall commence from the date of issuance of the Completion Certificate.
- .3 Upon completion of the maintenance period and after final inspection and correction of all deficiencies thereof, a Final Acceptance Certificate will be issued by the Municipal Engineer.

1.4.13 Building Permits

- .1 No building permits shall be issued until the subdivision plan is registered, all essential services have been provided, completed and inspected as specified in the Development Agreement or Development Permit, and underground utility services record drawings have been submitted and accepted by the Municipal Engineer. An exception may be considered for the construction of a "show home".

END OF SECTION 1

SECTION 2

PREPARATION OF ENGINEER DRAWINGS

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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 The Standard Drawing size of 559 mm x 864 mm (22" x 34") will be used.
- .2 Originals shall be prepared in ink on mylar base.
- .3 Use plan profile sheets with profile at bottom of sheet. Leave enough clear space in the lower part of plan for title block and legend.
- .4 The plan shall not extend onto the profile section of the drawing. All profiles must be on the profile section of the drawing.

1.3.0 SCALES

Overall plans	1:1000			
Plan/Profile	Horizontal	1:500 m	Vertical	1:50 m
Cross Sections	Horizontal	1:100 m	Vertical	1:50 m

1.4.0 DRAWING TECHNIQUE

- .1 Points of drawing technique that are significant to the preparation of drawings are as follows:
 - a) Care in ensuring balanced distribution of detail throughout the drawing.
 - b) Letters and figures shall be clearly legible, 2 mm size or larger (Leroy or equivalent), well spaced, properly formed and proportioned.
 - c) Lines shall be uniform in weight and density.
 - d) Dimensioning of a drawing is extremely important and should be such that it will not be misinterpreted. Dimensions should be given from an iron pin, lot line, chainage station, a centre line or any other reference that can be readily established. All dimensions shall be in SI System. (Standard Metric System at Units).
 - e) Any computer drafting shall be submitted in AutoCAD format compatible with the Municipality's current version.

1.5.0 GENERAL REQUIREMENTS FOR ALL SERVICES

- .1 Elevations shall be relative to the Alberta Survey Control system. The reference Alberta Survey Control Monument (ASCM) and elevation shall be shown on the design drawing.
- .2 Where there is more than one profile, clearly identify each.
- .3 A north arrow, adjacent lots and plan numbers, street names, and the legal description of the parcel being subdivided, shall be shown on the drawings. In general the north arrows should be orientated towards the top of the plan.

1.6.0 OVERALL PLANS

The following overall plans shall form a part of the whole design drawing set.

1.6.1 Cover Sheet

This will show the name of the subdivision, stage and year of development and names of the developer and consulting engineer.

1.6.2 Index Plan

This plan will be prepared on a scale of 1:1000 or a reduction thereof to fit the standard size sheet and will indicate that portion of the street that relates to a particular plan/profile sheet.

1.6.3 Road, Sidewalk and Walkway Plan

This plan will be drawn to a scale of 1:1000 and will indicate all locations and widths of roads, sidewalks and walkways, and locations of catch basins shall be shown.

1.6.4 Lot Grading Plan

An overall plan shall be drawn to a scale of 1:1000 and will indicate the original contours, proposed finished lot corner elevations at back corners of the lot, proposed top of curb elevations at front corners of the lot, proposed lot grades, sewer connection inverts, directions of surface drainage flows, hydrants, street lighting standards, pedestals, transformers catchbasins, manholes and super mailbox locations.

Individual lot grading plans in 210 mm x 280 mm (8½" x 11") format summarizing the above mentioned information, required for each lot prior to issuance of a Building Permit. See Standard Drawing No. 1 for required format.

1.6.5 Landscaping Plan

The landscape 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 of and name of all trees and shrubs, location of planting beds and any park furniture or playground equipment being installed.

1.6.6 Sanitary Sewer, Storm Sewer and Watermain Overall Plan

This plan will be drawn to a scale of 1:1000 and will indicate the alignments and locations of mains, size of mains, direction of flows and locations of appurtenances. All manholes, fire hydrants and water valves shall be numbered to conform to the Municipality's numbering system.

1.6.7 Power, Gas, Telephone and Cablevision

This plan shall be drawn to a scale of 1:1000 and will indicate the alignments of power, gas, telephone and cablevision.

1.7.0 DETAILED PLAN/PROFILE

- .1 Generally all underground services and surface improvement profiles shall be shown on the same drawing.
- .2 The following information shall be included on the detailed plan/profile drawings.

1.7.1 Water

- .1 Show the location of hydrants, valves, tees, crosses, and other fittings tied to the nearest iron pin.
- .2 Show the offset of the main from the property line and locate the end of the main to the nearest iron pin.
- .3 Indicate extent of work required in making connections to existing watermain.
- .4 Indicate the size, type, class of pipe and class of bedding on the plan.
- .5 A profile of the watermain shall be required showing invert elevations at all grade changes. Storm and sanitary mains shall also be shown on this profile.
- .6 Valves and fire hydrants to be numbered to conform to Municipality standards.

1.7.2 Requirements for Sanitary and Storm Sewer

The following information shall be shown on the profile:

- .1 Size, type, class of pipe and class of bedding.
- .2 Sewer profiles shall be drawn showing length and percent grades between manholes.

- .3 Invert elevations at both inlet and outlet of manholes.
- .4 Pipe capacity and calculated 5 year flow for storm sewer.

The following information shall be shown on the plan:

- .5 Tie location of manholes, cleanouts, and other appurtenances to property lines.
- .6 Pipe offsets from property line.

The following additional information shall also be shown on an appropriate part of the drawing:

- .7 Manholes shall be numbered in accordance with Municipality standards.
- .8 Where the sanitary sewer or water and storm sewer are to be installed in a common trench, detail a typical cross section showing distance between pipes, class of pipe and bedding.

1.7.3 Requirements for Roads

- .1 Both plan and profile must be tied to an iron pin, preferably near or at 0 + 00 chainage. Alternatively, the plan may be referenced to the cadastral coordinate system with appropriate ties to Alberta survey Control Monuments (ASCM) for layout purposes.
- .2 Show the road width and the curb offsets measured from the propertyline to the curb face.
- .3 Chainages of the BC and EC of horizontal curves shall be shown together with the delta angle, radius, tangent length and arc length for each curb. If the plan is referenced to the cadastral coordinate system, coordinates shall be provided for the BC, EL and CC of each curve.
- .4 The percent grade to two decimal places shall be shown on the profile together with the following information on vertical curves.
 - a) The chainage coordinate and elevations of BVC, EVC and PVI;
 - b) K value of vertical curve;
 - c) The length of vertical curve;
 - d) The elevation and chainage of the low spot of sag curves, or the high spot of crest curves.
- .5 Road profiles shall show the centreline pavement elevations.

- .6 The profile shall be shown at true centreline length and projected above or below the plan in as close relationship as possible.
- .7 Locate catch basins (using road chainage) and show leads between the catch basin and the mainline manhole.
- .8 Cross section showing pavement structures.

PART 2 - AS-BUILT DRAWINGS

2.1.0 SCOPE

- .1 This procedure pertains to the as-built drawings of the following services: storm and sanitary sewers, watermains, roads, curbs, sidewalks, culverts and other miscellaneous permanent structures.

2.1.1 General

- .1 The as-built drawings shall clearly show the location of all services as installed using offsets from survey pins.
- .2 On as-built drawings submitted to the Municipality, the following information shall be included on each drawing:
 - a) Date of completion;
 - b) Name of Contractor;
 - c) Date on which 'as-built' details were added.
- .3 The as-built drawings (mylars and two sets of prints) are to be submitted to the Municipal Engineer within two (2) months of the installations.

2.2.1 Storm and Sanitary Sewer

- .1 Size, pipe material, pipe class and location of mains;
- .2 Location of manholes, cleanouts, and other appurtenances numbered in accordance with the Municipality's number system.
- .3 Grades, lengths and inverts of mains.
- .4 Pipe capacity and calculated 5 year flows for each section of storm pipe.
- .5 Design calculations for storm and sanitary sewer flows to be submitted to the Municipality.

2.2.2 Water

- .1 Size, type and location of pipe;
- .2 Location of valves, tees, hydrants and other appurtenances number in accordance with the Municipality's number system.
- .3 Profile of pipe.
- .4 Design flow calculations to be submitted to the Municipality.

2.2.3 Road, Curb, Sidewalks

- .1 Location of curbs, sidewalks and elevations of curbs;
- .2 Lip of gutter profiles for each curb;
- .3 End of curb, sidewalks and pavement;
- .4 Type of road structure.

2.2.4 Water and Sanitary Service Connections

- .1 A table on each plan/profile drawing shall be prepared giving the following information with respect to service connection:
 - a) Lot number;
 - b) Distance of service saddle from the downstream manhole;
 - c) Invert elevation of sanitary service at property line;
- .2 The service connection provided to each lot shall be shown on the plan and the location referenced to the property lot corner.

2.2.5 Individual Lot Plans

- .1 Individual lot plans, as shown in Standard Drawing Number 1, shall be submitted for each lot. Lot plan shall be in 210 mm x 280 mm (8½" x 11") format.

END OF SECTION 2

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WATER DISTRIBUTION SYSTEM

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3.1.0 DESIGN REQUIREMENTS

- .1 The minimum size of distribution main shall be 150 mm diameter for single family residential, 200 mm for multi family development and 250 mm for industrial/commercial. Oversizing may be required as per Municipality's Master Waterworks Plan.
- .2 P.V.C. Pipe shall be used and the value of "C" in the Hazen-Williams formula shall be 140.
- .3 Per capita consumption shall be:

Average Daily Demand	-	454 L/person/d
Maximum Daily Demand	-	1.8 x Average Demand
Peak Hourly Demand	-	3.0 x Average Demand
- .4 The design population 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 Hour Demand and mains shall be sized such that there will be a minimum residual pressure of 275 kPa (40 psi) at ground level at any location in the system.
- .6 Separate analysis shall be made for Maximum Demand plus Fire Flow. The residual pressure at any location at the ground level shall not be less than 140 kPa (20 psi).
- .7 Fire Flow requirements shall be in accordance with the Insurer's Advisory Organization Standards, latest revision thereof. Generally these are:

Single Family Residential	3.64 m ³ /min. (800 igpm)
Town Houses	5.45 m ³ /min. (1200 igpm)
Apartments (walk-up)	9.10 m ³ /min. (2000 igpm)
Schools	5.45 m ³ /min. (1200 igpm)
Commercial	11.40 m ³ /min. (2500 igpm)
Industrial	13.64 m ³ /min. (3000 igpm)
- .8 Where the size of the area to be developed warrants, or if required by the Municipality, a network analysis shall be carried out and all relevant information shall be submitted with the design documents.

3.2.0 WATERMAINS

3.2.1 Watermain - Material

- .1 Pipe for the watermain shall conform to the following:
 - i) Polyvinyl Chloride (PVC) Class 1035 (150) DR 18 A.W.W.A. pressure pipe C900 (CIOD)
- .2 Rubber rings for the couplings shall conform to A.S.T.M. D1869, latest revision thereof. Control lubrication of pipe joints to prevent taste and odour concerns.
- .3 Cast iron fittings shall be in accordance with A.W.W.A. Specification C110, latest revision thereof and shall be cathodically protected. Cast iron tees, elbows and

crosses will only be allowed if the fitting is not readily available in moulded P.V.C.

- .4 Polyvinyl Chloride (PVC) moulded fittings to CSA B137.2 (class 150).

3.2.2 Watermain - Location

- .1 Mains shall be installed to provide a minimum depth of 3.0 m to invert below final finished surface grade.
- .2 Mains shall be located within the road right-of-way in accordance with the Roadway Cross Section Std. Dwg. No.'s T2 to T11.
- .3 A minimum of 3 m separation shall be maintained between a watermain and any sewermain.
- .4 The minimum requirement for pipe bedding shall be Class "B" bedding (Std. Dwg. No. U7).

3.3.0 HYDRANTS

3.3.1 Hydrant - Material

- .1 Hydrants shall be either Canada Valve Darling Century or Concord as presently used in the Municipality.
- .2 Hydrants shall conform to A.W.W.A. Specification C502, latest revision thereof, and shall include the following supplementary requirements:
 - a) four-section breakaway flange
 - b) Stainless steel trim (nuts and bolts)
 - c) compression type shut off
 - d) designed for working pressure of 1035 kPa
 - e) two 65 (2.5 ") mm hose nozzles with Alberta Mutual Aid Fire Thread
 - f) one pumper nozzle with 146 mm (5.745") outside diameter AWWA pumper outlet complete with 100 mm (4') Storz quick-connect fitting installed.
 - g) Number 6 operating nut with 3 curved sides
 - h) self draining hydrants
 - i) a gravel drainage pit (min 0.5 m³) shall be provided at the bottom of the hydrant
 - j) gate valve shall be provided on each hydrant lead
 - k) all hydrant barrels shall be painted Chrome Yellow.
 - l) tops and nozzle caps painted in accordance with the NFPA colour coding system as outlined in Table 3.2
 - m) 150 mm diameter riser barrel with a 125 mm bottom valve

3.3.2 Hydrant - Location and Installation

- .1 The maximum allowable spacing between fire hydrants shall be 150 m in single family residential areas, 120 m in multiple-family residential and school areas and 90 m in industrial/commercial areas.
- .2 Hydrant locations shall be such that the distance to any building shall be not greater than 75 m.

- .3 Hydrants on the distribution mains shall be installed:
 - a) At the projection of property lines except:
 - b) Where the hydrants are installed at the intersections, they shall be installed at the beginning of curb returns
 - c) Where the hydrants are installed on a cul-de-sac, they shall be installed at the intersection of the cul-de-sac and adjacent collector roadway.
- .4 Hydrants shall be located to conform with curb and sidewalk design and shall be located as follows:
 - a) Areas with no sidewalk - hydrant is to be no more than 2 m from back of curb.
 - b) Areas with monolithic sidewalk - hydrant is to be no more than 0.75 m from back of walk.
 - c) Areas with separate sidewalk - hydrant is to be no less than 1.0 m and no more than 1.8 m from back of curb.
 - d) Hydrants shall be no closer than 0.30 m and no more than 3.0 m from back of curb.
- .5 Additional hydrants shall be installed at high value properties if deemed necessary by the Municipality Fire Services.
- .6 All hydrants shall be on a minimum of 150 mm feeder line. Such feeder line shall be a maximum length of 7.5 metres from the main, otherwise a larger diameter line shall be considered.
- .7 Hydrants shall be installed in accordance with Standard Drawing Number U5 with the following requirements:
 - a) Ground flange to be no less than 100 mm and no more than 200 mm above final grade.
 - b) Minimum 0.5 m³ washed gravel drainage sump adjacent to hydrant base. Top of sump to be 150 mm above hydrant drain holes and covered with 2 mm polyethylene sheet to prevent intrusion of clay or silt into the gravel.
 - c) Cathodically protect with a 11 kg zinc anode.
 - d) Paint top and nozzle caps in accordance with NFPA colour coding as outlined in Table 3.2.
 - e) Paint hydrant number in 100 mm high block lettering.
 - f) Place sign on hydrant to indicate if it is out of service.

3.4.0 VALVES**3.4.1 Valve - Materials**

- .1 Gate valves shall conform to A.W.W.A. Specification C500, latest revision thereof, and shall include the following supplementary requirements:
 - a) Iron body.
 - b) Bronze mounted with grade of bronze used completely resistant to de-zincification by water having a pH of 9.0.
 - c) Operating pressure shall be 1,200 kPa.
 - d) 51 mm square operating nut.
 - e) Type 304 stainless steel stem for valves 250 mm and larger. 150 mm and 200 mm valves may be supplied with either bronze or type 304 stainless steel stems.
 - f) "O" - ring stem seal.
 - g) To open by turning counter clockwise direction.
 - h) Non-rising stem.
 - i) Double-disc or solid wedge type.
 - j) Resilient Seated
 - k) External epoxy coating
 - l) Stainless steel trim (nuts and bolts)

3.4.2 Valve Boxes

- .1 Valve boxes shall be a two section, bituminous coated, Type A, cast iron adjustable type complete with a cast iron lid. An internal operating rod and rock nut are required.
- .2 Valve boxes shall be of sufficient length to provide for adjustments of 300 mm in up or down direction.
- .3 Valve box extensions shall be cast iron suitable for use with the valve boxes to be installed.

3.4.3 Valve - Location

- .1 Valves on the distribution mains shall be installed:
 - a) At the projection of property lines at mid-block.
 - b) At the projection of property lines at intersections.
- .2 Distribution main valves shall be located such that during a shutdown:
 - a) No more than one hydrant is taken out of service.
 - b) No more than three valves are required to effect a shutdown.
 - c) No more than one standard block is taken out of service by a shutdown.
 - d) Valves shall be installed in accordance with Std. Dwg. No. U6.

3.5.0 TRENCHING AND BACKFILLING

- .1 Trenching and Backfilling shall be done in accordance with Occupational Health and Safety Guidelines.
- .2 Minimum trench width - outside diameter of pipe plus 450 mm.
- .3 Type B bedding as per Standard Drawing No. U7.
- .4 Backfilling shall be carried out with selected native material in 300 mm layers to a minimum of 98% Standard Proctor Density.
- .5 Backfilling in existing hard surfaced areas shall be carried out with granular material in 150 mm layers compacted to a minimum of 95% Standard Proctor.

3.6.0 THRUST BLOCKS

- .1 Thrust blocks shall be provided as per Std. Dwg. No. U8.

3.7.0 DISINFECTION

- .1 All the watermains shall be disinfected in accordance with A.W.W.A. Specification C651, latest revision thereof.
- .2 The Municipal District shall be notified at least 24 hours prior to testing so they may witness the residual chlorine test and the sampling for the bacteriological test.
- .3 Minimum residual chlorine after 24 hours shall be 25 mg/L.
- .4 The line shall be flushed and the chlorine residual of the water being disposed neutralized prior to discharge.
- .5 The bacteria test results must be reviewed and approved by the Municipal District Engineer prior to the waterline being placed into service.

3.7.1 Testing

- .1 The Developer shall employ a CSA approved material testing firm to complete the tests as outlined in Table 7.2. One copy of the results shall be submitted to the Municipality for their review.
- .2 All watermains shall be tested in accordance with A.W.W.A. C603, latest revision thereof. Hydrostatic test pressure shall be 1035 kPa (150 psi) or 1.5 times the normal operating pressure based upon the elevation of the lowest point in the main and corrected to elevation of the test gauge, for a period of two hours. For P.V.C. pipe, the overall leakage for the section of line tested shall not exceed the rate of leakage specified in Table 3.1.

TABLE 3.1 Maximum Allowable Leakage (L/100 Joints/Hour) For P.V.C. Pipe

	Test Pressure								
	345	515	690	860	1035	1380	1550	1724	Kpa
Pipe Dia.	50	75	100	125	150	200	225	250	psi
100 mm (4")	1.46	1.77	2.00	2.28	2.46	2.90	3.07	3.28	
150 mm (6")	2.17	2.65	3.07	3.43	3.76	4.34	4.60	4.82	
200 mm (8")	2.90	3.54	4.09	4.57	5.02	5.79	6.14	6.46	
250 mm (10")	3.62	4.42	5.12	5.71	6.27	7.34	7.67	8.10	
300 mm (12")	4.34	5.30	6.14	6.86	7.52	8.69	9.20	9.7	
350 mm (14")	5.07	6.19	7.16	8.00	8.77	10.13	10.74		
400 mm (16")	5.79	7.07	8.19	9.14	10.03	11.58	12.27		
450 mm (18")	6.51	7.96	9.21	10.28	11.28	13.03	13.80		

Allowable leakage calculation is based upon the following formula:

- a) PVC pipe $L = \frac{ND(p^{0.5})}{128,320}$
- L - allowable leakage in litres per hour
 N - number of joints
 D - nominal diameter (mm)
 P - test pressure (kPa) (1.0 PSI = 6.9 kPa)

**Table 3.2
National Fire Protection Association
Recommended Practice for Colour Coding Hydrants**

- Barrel - Chrome Yellow
- Tops and Nozzle Caps

Class AA	- Flow > 90 l/s (> 1200 l/gpm)	- Lt. Blue
Class A	- 60 l/s < Flow < 90 l/s (800 l/gpm < Flow < 1200 l/gpm)	- Green
Class B	- 30 l/s < Flow < 60 l/s (400 l/gpm < Flow < 800 l/gpm)	- Orange
Class C	- Flow < 30 l/s (400 l/gpm)	- Red

END OF SECTION 3

SECTION 4

SANITARY SEWERAGE SYSTEM

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4.1.0 DESIGN FACTORS

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

a) Residential

Population Density (based upon zoning)	-	R1 - 95 people/hectare R2 - 105 people/hectare R3 - 230 people/hectare R4 - 250 people/hectare
Average Sewage Flow	-	350 L/persons/d
Peaking Factor (Harmon's Formula)	-	$1 + \frac{14}{4 + (p)^{1/2}}$

Where p equals the tributary population in 1,000's

Infiltration	-	0.20 L/s/ha
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b) Commercial, Industrial and Institutional:

Average Sewage Flow	-	Commercial: 40,000 L/ha/d Industrial: 20,000 L/ha/d
Peak Flow	-	3.0 x Average Flow
Infiltration	-	0.20 L/s/ha (17,000 L/ha/d)

- .2 Minimum Velocity - 0.61 m/s
- .3 Pipe sizing shall be determined by utilizing the Manning's Formula using "N" value of 0.013.
- .4 Minimum pipe slopes shall be as recommended by Alberta Environment.
- .5 Sanitary sewers may have to be oversized to conform to the Municipality's Master Sanitary Sewer Plan.

4.2.0 SANITARY SEWERMAINS - MATERIALS

.1 Sewer mains

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

Material Class

- b) All sanitary sewer pipe and fittings shall be PVC to A.S.T.M. D3034 - minimum Class DR35

.2 Manholes - Materials

- a) Manhole section shall be precast reinforced concrete sections conforming to A.S.T.M. C478, latest revision thereof.
- b) All manholes shall be 1200 mm inside diameter for all pipe 900 mm diameter and less. For pipe exceeding 900 mm diameter, manhole diameter shall be pipe diameter plus 600 mm.
- c) Manhole frames and covers shall be cast iron conforming to Class 20 A.S.T.M. A48, latest revision thereof. Manhole frame and covers to be type NF-39 in landscaped areas, type NF-80 in paved areas and type NF-90 gasketed in sags.
- d) Manhole steps shall be standard safety type, of hot dipped galvanized iron or epoxy coated extruded aluminum.
- e) Manhole bases shall be precast slabs, concrete poured bases, vaults or precast tees.
- f) Refer to Std. Dwg. No's. U1 and U3.

.3 Concrete for Manholes and Appurtenances

- | | |
|---------------|--|
| Cement | - 25 MPa sulphate resistant cement (Type 50) |
| Maximum Slump | - 75 mm |

4.3.0 SEWERMAIN INSTALLATION AND LOCATION

- .1 Mains shall be installed to provide a minimum depth of 3.0 m to obvert below final finished grade at the surface or shall be insulated to the satisfaction of the Municipal Engineer.
- .2 Mains shall be installed to provide adequate sewer service connection depth at the property line.
- .3 Mains shall be located within the road right-of-way in accordance with the Roadway Cross Section Std. Dwg. No.'s T2 to T11.
- .4 Pipe bedding shall be provided for all mains in accordance with Std. Dwg. No. U7.

4.4.0 MANHOLE INSTALLATION AND LOCATION

- .1 Manholes shall be located at the end of each line, at all changes in pipe size, grade and alignment.
- .2 The maximum distance between manholes shall not exceed 120 m.
- .3 Inverts in manholes at changes in direction shall have at least 60 mm fall across manhole.

- .4 Manholes shall be installed as shown on Standard Drawings U1 and U3.
- .5 All joints shall be watertight.
- .6 Compact backfill around manholes with mechanical tampers to at least 98% of the Standard Proctor Density.

4.5.0 CURVED SEWERS

- .1 Curved sewers will be permitted with the following restrictions:
 - a) The sewer shall be laid as a simple curve with a radius equal to or greater than 90 m or the manufacturers minimum recommended radius, whichever is larger.
 - b) Manholes shall be located at the beginning and end of the curve.
 - c) Manholes shall be located at intervals not greater than 90 m along the curve.
 - d) The main shall run parallel to the curb or street centreline.
 - e) The minimum grade for sewers on curve shall be 50% greater than the minimum grade required for straight runs of sewers.

4.6.0 TRENCHING AND BACKFILLING

- .1 Trenching and backfilling to be carried out in accordance with Occupational Health and Safety Guidelines.
- .2 Minimum width - single pipe

<u>Pipe Diameter</u>	<u>Minimum Trench Width</u>
Less than 750 mm diameter	O.D. + 450 mm
750 mm diameter or larger	O.D. + 600 mm
- .3 Backfilling shall be carried out with selected native material in 300 mm layers to a minimum of 98% Standard Proctor Density.
- .4 In existing hard surfaced areas backfilling shall be carried out with granular material in 150 mm layers to a minimum of 95% Standard Proctor.

4.7.0 INSPECTION AND TESTING

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

- .2 Prior to initial and final acceptance of the project, all sewer mains shall be tested as follows:

a) Leakage Test:

The Municipality may require each section of sewer main and service connections to be tested for watertightness by an exfiltration test and/or infiltration test.

Infiltration or exfiltration shall not exceed following limits in litres per hour per 100 m of pipe, including service connections.

Nominal Pipe Diameter in mm	Allowable Leakage Plastic Pipe
100	3.88
125	4.62
150	5.51
200	7.45
250	9.39
300	11.33
350	13.27
400	14.91
450	16.84
500	18.78
550	20.72
600	22.80

Values shown in column 2 are in litres per hour per 100 metres of pipe.

b) Light Test:

Each section of sewer shall be subjected to a light test where a light is shone into the pipe at one manhole and the light itself is visible at the other end. If a light test is unsuccessful, then the section shall be subjected to a "pill test" where a ball or similar object, of a diameter 50 mm less than the diameter of the pipe shall be successfully pulled through encountering no obstructions.

c) Closed Circuit Television Inspection

All sections of sanitary sewers shall be inspected with closed circuit television camera equipment. A written report and a video tape in VHS format shall be submitted to the Municipality for their approval and records.

END OF SECTION 4

SECTION 5

STORM DRAINAGE SYSTEM

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5.1.0 DESIGN FACTORS

- .1 The storm sewers shall be designed as a separate system and shall be of sufficient capacity to carry storm sewer runoff from the ultimate development the area is zoned for. The storm sewer should be designed considering both the minor and major drainage systems.
- .2 The minor system comprises piping, manholes, catch basins and outfall structures. The minor system shall convey runoff from snowmelt and rainfall events to an adequate receiving water (river, stream, lake or pond) without sustaining any surface ponding or excessive surface flows for events up to and including a 1 in 5-year return period. Where required by the Municipal Engineer, high value commercial areas shall have their minor systems designed to accommodate the 1 in 10-year return period event.
- .3 The major system comprises the street system, detention facilities, parkland and any other land required to convey runoff from events up to and including a 1 in 100-year return period to the receiving water. The major system shall be evaluated in a manner sufficient to determine that no flooding that may cause significant property damage (e.g. flooding of buildings) occurs during the 100 year event.
- .4 Effluent from sanitary sewers and any drainage from industrial, agricultural or commercial operations that may potentially be contaminated shall not be discharged to the storm sewers. Roof leaders of residential buildings shall be splashed on the surface and shall not be connected to the storm sewer system.
- .5 Roof drainage from one-family and two-family dwellings shall discharge to grassed or pervious areas. The point of discharge shall be a sufficient distance (i.e. at least 1.0 m) to ensure the water flows away from the building. Roof drainage from apartment buildings, commercial areas, and industrial areas may discharge to the storm sewer if approved by the Municipal Engineer.
- .6 Ponding of runoff on roofs, parking lots or landscaped areas to reduce runoff rates must be approved by the Municipal Engineer.
- .7 Control shall be provided to minimize sediment discharge to the storm sewers. This shall be in the form of properly graded and surfaced streets and lanes, landscaping, sediment control structures at pond and lake inlets, or other means where appropriate.
- .8 All developments shall provide sump pumps to discharge weeping tile water to the surface.

.9 The following criteria shall be used in the design of the minor storm sewer system:

a) For areas less than 65 ha the Rational Method of storm sewer system i.e.

$$Q = 2.78 CIA$$

Where Q = the design peak flow rate in litres per second

I = the intensity of rainfall in millimetres per hour corresponding to the time of concentration

A = the contributing area in hectares

C = the runoff coefficient

b) The five year rainfall intensity table shall be used as shown on Table 5.1

c) Runoff coefficients shall be according to Table 5.2.

d) The weighted average of pervious and impervious area runoff coefficients shall be estimated from the following equation:

$$C = \frac{C_p A_p + C_i A_i}{A_p + A_i}$$

Where the subscripts p and i indicate the pervious and impervious surfaces, respectively. In these standards $C_p = 0.15$ and $C_i = 0.90$.

e) The duration of rainfall used to determine the intensity is equal to the time of concentration. The time of concentration is comprised of the overland time to the storm sewer inlet and the time of travel in the conduit. The overland flow time to curbside in residential and commercial areas shall not exceed 10 minutes in duration (specific overland flow times shall be computed separately for industrial and undeveloped areas). Gutter flow time shall not exceed 5 minutes and shall be estimated based on methods outlined in "Modern Sewer Design" (AISl, 1980). The time of travel in the conduit shall be based on the pipe flow velocity.

.9 For areas greater than 65 ha:

a) Computer models shall be used to determine design flows and the sizing of systems which contain non-pipe stormwater management facilities (e.g. detention ponds) or systems that include a significant amount of undeveloped land.

b) The selection of an appropriate computer model shall be based on an understanding of the principles, assumptions, and limitations in relation to the system being designed. Acceptable computer models are ILLUDAS, USEPA, SWMM, OTTSWM, HVM, HYMO and OTTHYMO.

- c) Wherever possible, the computer model shall be calibrated. In all analyses, the parameters used, the drainage boundaries, the pipe network and its connectivity shall be clearly identified on an overall drawing, computer printouts and a design summary report.
 - d) The design storm hyetograph shall be the 30% distribution for the Prairie Provinces developed by Hogg of Atmospheric Environment Services of Environment Canada (Table 5.3). Alternatively, the Chicago method may be used to generate a synthetic design storm (using a time to peak ratio of 0.30 and a ratio of maximum 5 minute intensity to maximum one hour intensity of 3.0).
 - e) The duration of event that is critical for systems comprised of pipes only shall be one hour. The duration of the design rainfall event for the systems with storage shall be at least 12 hours. Longer durations shall be used, if necessary, to properly assess the post-event drainage of the detention facility.
- .10 The minimum velocity shall be 1 m/s. Where velocities in excess of 3 m/s are attained, special provisions shall be made to protect against displacement by erosion or impact.
 - .11 Pipe sizing shall be determined by utilizing the Manning's Formula, using "n" value of 0.013.
 - .12 Storm sewer pipe shall be designed to convey the design flow when flowing full with the hydraulic gradeline at the pipe crown. All pipe crown elevations shall match at manhole junctions.
 - .13 Surface water shall not be permitted to run a distance greater than 250 m along local roadways without provision for interception by the first catch basin. Within the piped drainage system, or on Collectors or Arterial roadways, surface runoff shall not run a distance greater than 120 m without interception.
 - .14 Surface water shall be intercepted with a sufficient number of catch basins such that the inlet capacity is sufficient to receive the design stormwater flow. Catch basin capacity shall be considered as shown on Table 5.4 where values are given for sag conditions and on slope conditions based upon inlet grate type.
 - .15 Minimum gutter grade shall be at least 0.50%.

5.2.0 STORM SEWERMAINS - MATERIALS

.1 Sewermains

- a) The minimum size of storm sewermain shall be 300 mm diameter.
- b) Pipe for storm sewermain may be:
 - reinforced sulphate resistant concrete pipe to ASTM C76
 - PVC pipe conforming to ASTM F794 minimum Class DR35
 - Ultra Rib PVC pipe to ASTM D3034 minimum Class DR35
- c) Pipe joints shall be rubber ring conforming to CSA A257.3 and/or ASTM C443 for concrete and ASTM 03212 for PVC Pipe.
- d) Pipe classes shall be determined to withstand subsequent superimposed loadings.
- e) Various factors affecting the pipe class shall be taken into account, and pipe class shall be evaluated as per standard engineering practice.

.2 Manholes

- a) Refer to Section 4.2.0.2 (Sanitary Sewer) and Std. Dwg. No.'s U1 to U3.
- b) Safety platforms at intermediate levels are required for manholes greater than 5.0 m in depth.

.3 Catchbasins

- a) Catchbasin barrels with precast base and precast slab top shall be:
 - i) 900 I.D. pipe barrel conforming to A.S.T.M. C478 (Std. Dwg. No. U4)
 - ii) Catchbasin manholes shall be in accordance with Std. Dwg. No. U2.
 - iii) Catchbasin manholes shall be used in place of a catchbasin when the lead exceeds 30 m in length.
 - iv) Catchbasins are to have 500 mm deep sumps.
- b) Catchbasin frames and covers shall be:
 - i) Standard inlet for rolled curb and gutter equal to Norwood F35A.

- ii) Standard frame, grate and side inlet for use with 900 mm barrel equal to Norwood F51 for straight faced curb and gutter.
- iii) Top inlet standard round top equal to Norwood F38 for swales or lanes.
- iv) Top inlet standard round top equal to Norwood F39 Grate for landscaped areas.
- c) Catchbasin leads:
 - i) Shall be non-reinforced concrete pipe A.S.T.M. C14 - Class 3 or approved PVC pipe.
 - ii) The minimum size of catchbasin lead shall be 250 mm diameter with a minimum grade of 2.0%.
 - iii) The minimum grade on a 300 mm catchbasin lead shall be 2.0%.
 - iv) Two catchbasins may be connected in series. The catchbasin lead connecting to the storm sewer manhole shall be 300 mm at a minimum slope of 2.0%.
 - v) The maximum length of a catchbasin lead shall be 30 m.
 - vi) If a lead of over 30 m in length is required, a catchbasin manhole shall be installed at the upper end.
 - vii) Catchbasin leads shall have minimum cover of 1.5 m to invert.

5.3.0 STORM SEWER INSTALLATION AND LOCATION

- .1 Mains shall be installed to provide a minimum depth to pipe obvert of 1.85 m below final finished grade.
- .2 Mains shall be located within the road right-of-way in accordance with the Roadway Cross Sections Std. Dwg. No.'s T2T11.
- .3 Pipe bedding shall be provided for all mains in accordance with Std. Dwg. No. U7.

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 in diameter may exceed 120 m if approved by the Municipal Engineer.
- .3 Benching in manholes shall be provided to minimize hydraulic losses. The downstream invert in a manhole shall be a minimum of 30 mm lower than the lowest upstream invert. At a change in direction, the drop shall be at least 60 mm. If an influent pipe diameter is greater than 525 mm and the bend is greater than 45° or if the outflow pipe velocity exceeds 1.5 m/s, then minor losses shall be considered (see AISI, 1980).
- .4 Tee riser manholes may be utilized on lines 900 mm diameter and larger. Tee riser manholes must be bedded in concrete to the springline of the pipe.

5.5.0 CURVED SEWERS

Refer to Section 4.5.0 (Sanitary Sewer).

5.6.0 TRENCHING AND BACKFILLING

Refer to Section 4.6.0 (Sanitary Sewer).

5.7.0 INSPECTION AND TESTING

Refer to Section 4.7.0 (Sanitary Sewer).

5.8.0 DETENTION FACILITIES

- .1 Detention facilities shall be designed as part of both the minor and major drainage systems. They must control the peak runoff conditions for events up to the 100-year return period.
- .2 Detention facilities and the entire area that would be submerged by the 100-year event shall be contained on Municipality property. The need for a specific detention facility shall require the approval of the Municipal Engineer. In assessing the need for specific detention facilities, the applicant must consider the impacts of uncontrolled drainage as well as the capital and operating costs of providing control.
- .3 Soils investigation specific to the detention facility shall be undertaken to determine appropriate design factors. Where the facility is sited above a shallow aquifer the potential for groundwater contamination must be minimized.

aquifer the potential for groundwater contamination must be minimized with methods as approved by the municipal engineer.

- .4 Wet pond detention facilities shall be constructed in impervious soils to minimize water losses during dry weather periods. Intruding silt or sand seams shall be sealed off.
- .5 Where a detention facility is to have multiple functions, its design shall consider the aesthetic implications of shape, grading and landscape features.
- .6 An emergency overflow system shall drain to a receiving stream, if possible, for storms greater than the 100-year event.
- .7 The effects of the maximum pond water levels shall be considered in the design of the minor system and lot grading. The hydraulic gradeline elevations for the minor system piping shall be calculated starting from the maximum pond level during the 5-year storm event.
- .8 The maximum water level fluctuation for detention ponds in residential areas during the 100-year storm event shall be 2.0 m. The pond's outlet capacity shall be that the pond shall drain and reach normal water level within 72 hours of reaching maximum water level during the 100-year event. All inhabited building space, including basements, shall be constructed above the 100-year flood level.
- .9 An overflow channel and overland drainage route must be provided to the satisfaction of the Municipal Engineer and the design of the pond and permitted water level fluctuations must ensure that:
 - a) The lowest basement weeping tile of any building on a lot adjacent to the pond shall be a minimum of 300 mm above the 1:100 year high water level.
 - b) The lowest manhole invert shall be at or above the normal water level elevation.
 - c) The pipe obvert at the lowest manhole immediately upstream of the pond shall be above the high water level during a one in five year storm event.
 - d) A minimum distance of six metres shall be maintained from any basement wall to the 1 in 100 year high water level.
 - e) The inlet to the pond must be above the normal water level or below ice level.
 - f) The minimum surface area at normal water level shall be 2 hectares.
 - g) The minimum depth of the pond, at normal water level, will be 2 metres.
 - h) The pond bottom and side slopes will be composed of an impervious material.
 - i) No dead bay areas will be permitted.

- j) Shoreline improvements and erosion protection will be subject to review and approval by the Development Officer and Municipal Engineer.
- k) Any property situated below the 1:100 year high water level shall become the property of the Municipality.
- l) The design will incorporate a semi-annual turnover at average annual precipitation.
- m) Pond geometrics will be as shown on Standard Drawing Number U11.
- n) Submerged inlets/outlets are preferred and will be constructed such that the tops are a minimum of 0.6 m below normal water level.
- o) Inlets/outlets not submerged will require fencing along adjacent shoreline for 5.0 m in each direction from the centre line of pipe. All inlets/outlets will be provided with a grate permanently fixed to the structure.
- p) Every pond will be sterilized during construction to prevent weed growth.
- q) Minimum width of the water surface at the normal water level will be 25 metres.
- r) A silt trap will be provided at the inlet of each pond.

.10 In design, dry ponds shall:

- a) not exceed 1.5 m depth of water for the 1 in 100 year event,
- b) have flow bypass for flows from minor events,
- c) have a bottom with a minimum longitudinal slope of 1%,
- d) have a bottom with a minimum lateral slope of 1.0%,
- e) have a French drain where longitudinal slopes are less than 2%,
- f) have side slopes flatter than 7 (horizontal) to 1 (vertical),
- g) have length, width and depth dimensions that are acceptable to the Municipal Engineer,
- h) have the bottom and sides sodded or grassed as per Section 8,
- i) have trash bars on inlets and outlets to preclude access by children,
- j) address all safety issues (particularly during operation), and
- k) have pond geometrics in accordance with Standard Drawing Number U12.

.11 Underground storage tanks shall be considered only if no other economical alternative means of storage is feasible.

.12 Parking lot and rooftop storage shall be considered only for developments where the facilities are part of the project and must be approved by the Municipal Engineer. Proposals which rely on third party implementation will not be accepted.

.13 Infiltration and evaporation facilities require studies which involve site specific measurements of infiltration, knowledge of the groundwater regime, and an evaluation of the water balance for the system.

5.9.0 OUTFALLS

- .1 Outfall structure shall be placed at the end of all storm sewers discharging to an open channel, watercourse, river or other receiving water body such as a lake. The purpose of the structure is to reduce velocities and prevent erosion. All outfall structures must receive approval of Alberta Environment, Water Resources and Forestry. It is the responsibility of the Developer to obtain the necessary approvals and permits from the above-mentioned Authorities.
- .2 The outfall structure may be a chute, spillway, stilling basin or plunge pool with headwall. A cut off wall is required at the end of the outfall apron to prevent undermining of the structure.
- .3 Obverts of outfall pipes shall be at least 150 mm above the 5-year flood level in the receiving stream. Inverts of outfall pipes shall be above winter ice level. Otherwise, outfall pipes shall be submerged below the bottom of ice level. In addition, outfalls shall be located to avoid damage from moving ice during breakup.
- .4 If the downstream channel is relatively flat, the apron shall be 150 mm to 225 mm above the channel invert to prevent collection of debris on the apron.
- .5 Rip-rap and a filter layer shall be placed downstream of the outfall structure where required to prevent erosion.
- .6 Weeping tile shall be placed under the structure to reduce any water pressure behind the headwall.
- .7 Grills shall be placed over all storm sewer outlets to prevent access.
- .8 Railings shall be placed along the headwall and wingwalls of the outfall structure.
- .9 Outfalls shall be landscaped to blend in with surrounding areas.

5.10.0 RECEIVING WATERS

- .1 Measures shall be incorporated in new developments to prevent any increase in the amount of downstream erosion.
- .2 If a development will cause downstream erosion despite the use of on-site peak run-off rate controls, appropriate measures shall be constructed in the downstream areas.
- .3 Preservation of watercourse aesthetics and wildlife habitat shall be considered in erosion and bank stability work.

5.11.0 CULVERTS AND BRIDGES

Culverts and bridge design should consider backwater effects over a range of flows. The design of a hydraulic structure requires assessment of both its nominal design "capacity" and its performance during the 100-year event.

5.12.0 SURFACE DRAINAGE SWALES

Drainage swales, whether on municipal or private property (through drainage easements), shall be constructed completely prior to any development of subdivision lots. Drainage swales running between adjacent private lots shall be constructed of concrete to ensure lots are graded to the correct elevation.

Design and construction shall be of an acceptable quality to Municipality requirements. A detailed design shall be submitted to the Municipality including a brief explaining:

- a) materials to be used
- b) design calculations
- c) explanation of design features which eliminate or minimize the possibility of damage to the drainage swale by activities within the subdivision.

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.
- .2 The grading of streets and the layout of the major drainage system shall be assessed, relative to the following guidelines, during the 100-year event:
 - a) No building shall be inundated at its ground line.
 - b) Continuity of the overland flow routes between adjacent developments shall be maintained.
 - c) Arterials should have at least two lanes which are not inundated parallel with the direction of flow. Where the major system crosses an arterial, the depth of flow should be less than 0.05 m.
 - d) Collectors should have at least one lane which is not inundated parallel with the direction of flow. Where the major system crosses a collector; this depth of flow should be less than 0.10 m.

- e) Local roads should have a depth of water no more than 0.05 m above the crown. Where the major system crosses a local road, the depth of flow should be less than 0.15 m.
 - f) The depth of water at curbside should be less than 0.50 m for all roadways.
 - g) The velocities and depths of flow 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:
- .1 The minimum slope in the back and front yards shall be 2%.
 - .2 If the back yard area slopes toward the house, provision must be made to keep the runoff at least 3 m from the house and direct it to the street.
 - .3 Reverse driveways shall not be permitted unless the runoff can be directed away from the structure and off the property in a controlled fashion.
 - .4 Lot grading must not direct drainage onto adjacent lots.

TABLE 5.1
INTENSITY DURATION FREQUENCY DESIGN INTENSITIES
DRAYTON VALLEY, ALBERTA

Duration (minutes)	Rainfall Intensity (mm/hr.)		
	5 Year	10 Year	100 Year
10	67.80	82.50	129.00
11	64.20	78.10	122.00
12	61.00	74.30	116.00
13	58.30	70.90	110.00
14	55.80	67.90	106.00
15	53.60	65.10	101.00
16	51.50	62.70	97.60
17	49.70	60.40	94.00
18	48.00	58.40	90.80
19	46.50	56.50	87.90
20	45.10	54.80	85.20
21	43.70	53.20	82.60
22	42.50	51.70	80.30
23	41.40	50.30	78.10
24	40.30	49.00	76.10
25	39.30	47.80	74.20
26	38.40	46.60	72.40
27	37.50	45.50	70.70
28	36.70	44.50	69.10
29	35.90	43.60	67.60
30	35.10	42.60	66.20
60	22.70	27.50	42.50
120	14.50	17.00	27.10
360	7.13	8.60	13.20
720	4.54	5.46	8.36
1440	2.89	3.47	5.29

Notes:

1. Based on AES data at Edmonton Municipal Airport for period 1914 to 1995 (63 years).
2. Maximum Initial Time of Concentration is 10 minutes.

TABLE 5.2

RECOMMENDED MINIMUM RUNOFF COEFFICIENTS

Land Use or Surface Characteristics	Rainfall Event Return Period		
	5 Year	10 Year	100 Year
Residential	0.40	0.40	0.60
Apartments ²	0.70	0.70	0.80
Downtown Commercial ²	0.85	0.85	0.90
Neighbourhood Commercial ²	0.65	0.65	0.80
Light Industrial ³	0.60	0.65	0.70
Lawns, Parks, Playgrounds	0.20	0.20	0.30
Undeveloped Land (Farmland)	0.10	0.15	0.20
Paved Streets	0.90	0.90	0.95
Gravel Streets	0.30	0.35	0.65

Notes:

1. Values are recommended minimum for use in the Rational Method.
2. Where specific land surfaces are known for Apartment and Commercial areas, the runoff coefficient may be determined based on the surface characteristics for the ultimate development conditions.
3. Runoff coefficients for industrial land use must be estimated based on 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 (L/s)

Catch Basin	Flow Condition	
	Continuous Slope	Sag Condition
F35A	10	23
F38, F39	20	38
F51 (base and curb inlet)	40	80

Note:

1. Capacities can be considered to be double those shown in the table when assessing the 100 year event.

TABLE 5.5
PERMISSIBLE DEPTHS FOR SUBMERGED OBJECTS

Water Velocity (m/s)	Permissible Depth (m)
0.5	0.80
1.0	0.32
2.0	0.21
3.0	0.09

Note: Based on a 20 kg child and concrete lined channel. Larger persons may be able to withstand deeper flows.

END OF SECTION 5

SECTION 6

SEWER & WATER SERVICE CONNECTIONS

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6.1.0 SERVICE CONNECTIONS - MINIMUM REQUIREMENTS

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

Sanitary Sewer	100 mm diameter
Water Service	25 mm diameter
- .2 The minimum grade on a sewer service shall be 2.0%.
- .3 Connection to a main sewer line shall be by means of a saddle at the top quadrant of the main.
- .4 Where bends are utilized, the long radius type or a combination of 22½ bends and straight pipe shall be used.
- .5 For water services size 50 mm and smaller, the tapping shall be at the 2 to 3 o'clock position on the distribution main.
- .6 Watermains shall be tapped under pressure.
- .7 All water services must utilize service clamps.
- .8 In areas where the water pressure exceeds 625 Kpa (90psi), pressure-reducing valves shall be installed before the water meter in a building or home, by the Owner.

6.2.0 SANITARY SEWER SERVICE - MATERIALS

- .1 Service pipe shall be:
 - a) PVC SDR 35 building service pipe conforming to CSA Specification B 182.1, latest revision thereof.
- .2 Service fittings shall be either in line tees or saddle tees c/w gasket and stainless steel straps and nuts.

6.3.0 WATER SERVICE - MATERIALS

- .1 Water service pipe shall be:
 - a) Copper pipe Type K soft copper.
 - b) Couplings - Standard Brass compression type.
- .2 Water service fittings:
 - a) Corporation Cocks - Compression type, Ford or approved equal, AWWA thread.
 - b) Curb Stops - Ford or approved equal, Copper to copper, ball valve without a drain. Curb stops 38 mm or larger shall be ball bearing type.

- c) Service Boxes - Epoxy coated extension type for maximum extension of 3.5 m c/w stainless steel operating rod, brass clevis and key. Service box to be supported on a cast iron foot piece nailed to a pressure treated preserved wood plank.
- d) Service Clamps - Bronze double strap conforming to Smith-Blair 323 or approved stainless steel AWWA Boss.

6.4.0 SERVICE CONNECTIONS - INSTALLATION REQUIREMENTS

- .1 Where the water service is 50 mm or smaller in size, the water and sanitary services shall be installed in a common trench to the middle of each lot.
- .2 The services shall be installed so that, when facing the lot being served, the water service is on the right of the sanitary service.
- .3 The minimum depth of cover over the water and sanitary services at the property line shall be 2.80 m and shall be in accordance with Std. Dwg. No's. U9 and U10.
- .4 Where the sewer services are required to connect to mains in excess of 4.50 m deep, risers shall be installed to within 3.60 m of finished surface in accordance with Std. Dwg. No. U9.
- .5 Corporation stops and curb stops shall be installed in accordance with Std. Dwg. U10.
- .6 Where a copper service is installed, there shall be a horizontal bend near the corporation stop. Water service is NOT to be goose-necked. Service shall be snaked in the trench to allow for thermal contraction.
- .7 Curb stops shall be installed at property or easement line as shown on Std. Dwg. No. U10 and T2 to T11.
- .8 Sewer services shall be extended to the property or easement line as shown on Std. Dwg. No. U9 and shall be properly capped.
- .9 All services shall be laid on 75 mm of granular bedding and the bedding material shall be placed up to a level of 300 mm above the crown of the highest service in the trench.
- .10 Blue/Green painted stakes of size 50 mm x 100 mm shall be extended from the end of the service connections to a minimum of 0.50 m above the ground level.
- .11 The Developer shall employ a CSA approved material testing firm to complete the tests as outlined in Table 7.2. One copy of the results shall be submitted to the Municipality for their review.

END OF SECTION 6

SECTION 7

STREETS

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7.1.0 GEOMETRIC DESIGN STANDARDS

- .1 The following design standards shall be utilized for all development within Drayton and the Drayton Valley Fringe Area under the authorization of the applicable Municipality. All specifications shall be pre-approved by the Department of Public Works prior to being utilized.

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

- .2 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. T2 through T11.

Standard Cross-Sections Figure 9 through 10 and 13 through 22.

- .3 Concrete curb and gutter shall be constructed on designated streets in accordance with Std. Dwg. No.'s T14 and T15.
- .4 Separate sidewalks shall be 1.5 m wide and shall be constructed in accordance with Std. Dwg. No. T20. Monolithic curb, gutter and sidewalks shall have a 1.5 m sidewalk width in accordance with Standard Drawings T16 and T17. Sidewalks shall be clear of all obstructions including surface utilities. Sidewalk locations shall be in accordance with Standard Roadway Drawings No. T2 through T11. Wider sidewalks may be required in areas of high pedestrian activity, as determined by the Municipal Engineer.
- .5 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 Municipal Engineer.
- .6 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 T19 and T20.
- .7 Paraplegic Ramps shall be constructed in accordance with Standard Drawing No. T18.

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	60 - 70	30.0	14.8	4 - 3.7 m	outside lanes none	5	.04 - .06
Divided Arterial (Dwg. No. T10 & T11)	60 - 90	33.0 ^b	20.3	4 - 3.7 m		4	.04 - .06
Major Residential Collector (Dwg. No. T4)	60	23	12.0	2 - 3.5 m	2 - 2.50 m	7	.025 - .04
Minor Residential Collector (Dwg. No. T3)	60	20	11.0	N/A	N/A	7	.025 - .04
Local Residential (Dwg. No. T2)	60	18.5 ^a	11.0	N/A	N/A	8	.025
Local Industrial (Urban)	60	18.5 ^d	11.5	N/A	Optional	6	.025
Local Industrial (Rural) (Dwg. No. T5 & T6)	60	29.4	11.0	N/A	Optional	6	.025
Urban Industrial Collector	60 - 70	23	13.0	N/A	Optional	6	.025
Rural Industrial Collector (Dwg. No. T7 & T8)	60 - 70	30	12.5	N/A	Optional	6	.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. 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 Public 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)	150	30 m Radius	Separate, 1 or 2 sides	2.5 m min. from face of curb or behind sidewalk	Restricted	Restricted ^a
	190 (70 kph max)	200		Separate, 1 or 2 sides	2.5 m min. from face of curb or behind sidewalk	Prohibited	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) Local Industrial (Rural) (Dwg. No. T5 & T6)	90 (50 kph max - Both)	60 60	10 m 15 m	Optional Optional	1.65 m min. from face of curb 2.0 m from edge of pavement	Optional Optional	Permitted Permitted
	150 (60 kph max - Both)	60 60	10 m 15 m	Optional Optional	2.25 m min. from face of curb 2.25 m from edge of pavement	Optional Optional	Some Restrictions (Both)
Urban Industrial Collector Rural Industrial Collector (Dwg. No. T7 & T8)	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 Public 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 ^b (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
Paved 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	30	7.0	N/A	N/A	6	.06

Classification	Minimum Radius of Curvature (m)	Minimum Intersection Spacing (m)	Minimum Corner Cuts at Intersections	Sidewalks	Lighting Poles and Other Obstructions	Parking	Access
Arterial (Fig. 9)	440 (100 kph max)	200	15 m	Required	5 m from edge of Pavement	Prohibited	Restricted
Collector Road (Fig. 10)	440 (100 kph max)	200	15 m	Required	5 m from edge of pavement	Prohibited	Restricted
Local Road 2 (Fig. 13)	300 (90 kph max)	200	15 m	Required	5 m from edge of pavement	Restricted	Permitted
Local Road 1 (Fig. 14)	300 (90 kph max)	200	15 m	Required	5 m from edge of pavement	Prohibited	Permitted
Paved Country Residential 3 (Fig. 22)	150 (60 kph max)	60	10 m	Recommended	2 m from edge of pavement	Restricted	Permitted
Country Residential 2 (Fig. 16)	150 (60 kph max)	60	10 m	Recommended	2 m from edge of pavement	Restricted	Permitted
Country Residential 1 (Fig. 17)	150 (60 kph max)	60	10 m	Recommended	2 m 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.
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 Public Works prior to being utilized.

TABLE 7.1D
SUMMARY OF RECOMMENDED DESIGN STANDARDS FOR STREETS
HAMLETS

Classification	Design Speed ^a (km/h)	Right-of-Way Width (m)	Pavement Widths ^b (m)	Travel Lanes ^c	Parking Lanes	Maximum Gradients (%)	Maximum Superelevation (m/m)
Hamlet Local 2 (Fig. 18) (Rural)	60	30	13.0	2 - 3.5 m	2 - 3.0 m	6	.06
Hamlet Local 1 (Fig. 19) (Rural)	60	30	10.5	2 - 3.5 m	1 - 3.0	6	.06
Hamlet Local 2 (Fig. 20) (Urban)	60	25	13.0	2 - 3.5 m	2 - 3.0 m	6	.06
Hamlet Local 1 (Fig. 21) (Urban)	60	25	10.0	2 - 3.5 m	1 - 3.0	6	.06

Classification	Minimum Radius of Curvature (m)	Minimum Intersection Spacing (m)	Minimum Corner Cuts at Intersections	Sidewalks	Lighting Poles and Other Obstructions	Parking	Access
Hamlet Local 2 (Fig. 18) (Rural)	120 (60 kph max)	60	10 m	Recommended	2.0 m min. from face of curb	Permitted	Permitted
Hamlet Local 1 (Fig. 19) (Rural)	120 (60 kph max)	60	10 m	Recommended	2.0 m min. from face of curb	Permitted	Permitted
Hamlet Local 2 (Fig. 20) (Urban)	120 (60 kph max)	60	10 m	Required	2.0 m min. from face of curb	Permitted	Permitted
Hamlet Local 1 (Fig. 21) (Urban)	120 (60 kph max)	60	10 m	Required	2.0 m min. from face of curb	Permitted	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.
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 Public Works prior to being utilized.

7.2.0 QUALITY CONTROL TESTING

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

7.3.0 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%.

7.4.0 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 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.

7.5.0 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 Municipal Engineer 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.

The design parameters such as traffic count, percentage of trucks, California Bearing Ratio (CBR), etc., are to be outlined to the Municipal Engineer. The Municipality 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.

- .3 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 100 mm Asphaltic Concrete Surface Note: 2 lifts - 50 mm / 50 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 mm 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 380 mm Aggregate Base Course 125 mm Asphaltic Concrete Surface (Heavy Duty)

* Note: The final 50 mm lift of Asphalt Concrete Pavement shall be placed in the second year of the maintenance period.

- .4 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 50 mm.
- (b) the maximum thickness of any lift shall be 100 mm.
- (c) the minimum thickness of all lifts shall be 40 mm or greater.

- .5 Alternative pavement designs, such as soil cement base, may be approved by the Municipal Engineer. Approval of alternate pavement designs must be obtained in writing from the Municipal Engineer 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.

7.6.0 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) im	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.

7.7.0 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) im	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 an recognized Professional Engineering Firm and shall be submitted to the Municipal Engineer 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.

7.8.0 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 - (51o C - 68o C)

M.C. 70 - (74o C - 88o C)

M.C. 250 - (100o C - 110o C)

Emulsified Asphalt:

SS-1 - (24o C - 54o C)

Special Emulsified Primer:

S.E.P.1 (15o C - 50o 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:

R.C. 30 - (51o C - 68o C)

R.C. 70 - (74o C - 88o C)

Emulsified Asphalt:

SS-1 - (24o C - 54o C)

SS1H - (24o C - 54o C)

7.9.0 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, suitable means shall be provided for maintaining the concrete at a temperature of at least 10 for seven days after placing of concrete.

7.10.0 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 Municipality for their review.

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

7.11.1 General

- .1 Plans shall be provided to the Municipal Engineer 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 Raul addressing requirement shall obtained by the applicable Municipal 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 Municipal Engineer.
- .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 Municipal Engineer.
- .2 All signs shall be mounted to provide a minimum of 0.3 m of horizontal clearance from curb face.

7.12.0 STREET LIGHTING

7.12.1 General

- .1 The following standards are applicable to all types of development in the Municipal District of Brazeau except for industrial developments. Standards for industrial development shall be determined by the Municipal District during the initial planning stages of the proposed development.
- .2 All street lighting cables 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 Town for the several types of streets.
- .2 The location and density of street lights shall be such to provide the following minimum lighting levels.

<u>Roadway</u> <u>Class</u>	<u>Area Class</u>	<u>Illuminance</u> <u>Average</u> (lux)	<u>Criteria</u>	<u>Maximum</u>
			<u>Uniformity</u> <u>Maximum</u> <u>Avg/Mm Ratio</u>	<u>Max/Mm</u> <u>Ratio</u>
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

<u>Roadway Class</u>	<u>Area Class</u>	<u>Illuminance Average (lux)</u>	<u>Criteria Uniformity Maximum Avg/Mm Ratio</u>	<u>Maximum Max/Mm Ratio</u>
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 design shall be approved by Utilicorp.

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 Municipal District.

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 Town will assume payment of operation and maintenance charges to the utility company.

END OF SECTION 7

TABLE 7.2 / FREQUENCY

Specification	Type of Test	Minimum Test Frequency	Remark:
Trenching, Backfilling Trenching, 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 sq.m of compacted lift 1 density test per 1000 sq.m 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 m ³) of asphalt aggregate for crushing control 1 sieve analysis per 2500 (1250 m ³) tonnes of base and subbase aggregate 1 density test per 1500 sq.m of compacted granular lift of road Entire project	Required 2 weeks prior to commencing work
Stabilization: Lime	Source Sampling: Test Area: Proof Rolling:	400 sq.m 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 m ³) 1 core sample per 1000 sq.m of soil cement in place 1 density test per 1000 sq.m 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	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
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 Engineer at least 24 hours notice
Storm Sewer Sanitary Sewer	Television and Photographic Inspections:	Upon completion of storm sewer installation, after backfilling	
Force mains	Hydrostatic/Leakage Test:	Test section not to exceed 365 m in length	Provide Engineer 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 cu.m for each class of concrete poured, min. 1 per day 1 per 20 cu.m for each class of concrete poured, min. 1 per day 1 per 20 cu.m 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

SECTION 8

LOT GRADING & LANDSCAPING

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PART 1 - LOT GRADING**8.1.0 SUBDIVISION GRADING****8.1.1 Plans**

The Developer shall submit plans indicating the following information:

- a) Existing contours
- b) Proposed gutter elevations and grades.
- c) Location of all proposed surface drainage swales.
- d) Proposed elevations at lot corners.
- e) Proposed general grading of lots.
- f) Direction of drainage.
- g) The proposed elevations and grades for all Public Lands.

A common drawing (Grading Plan) shall be used to consolidate this information.

8.1.2 Design

The grading design shall compliment the overall design of both the minor and major storm sewer system. In general, the lots shall be graded and sloped in such a manner that a minimum of surface runoff water will be conducted to other properties. Where surface drainage swales direct runoff from one lot to the next, the necessary drainage easements shall be registered concurrently with the plan of subdivision.

Public lands shall be graded to drain towards developed streets and/or storm sewer catchbasins.

Boulevard areas shall be graded to provide a minimum slope of 2% from property line to top of curb.

8.2.0 LOT GRADING**8.2.1 Plans**

The Developer shall submit to the Municipality an overall plan of the area to be developed on which shall be indicated the following information:

- a) Proposed top of curb elevation at each corner of the lot.
- b) Existing and proposed lot corner elevations.
- c) Invert and location of sanitary sewer service and water service.

- d) Direction of drainage including a proposed grading plan showing final contours of the subdivision. Such contour plan shall have a 0.5 meter contour interval.

The Developer shall also submit an individual lot plan in accordance with Standard Drawing Number 1.

8.2.2 Retaining Walls

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

8.2.3 Design

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

In cases where the backyard slopes towards the building, provisions are required to keep the runoff at least 3.0 m away from the building with the possibility of draining the surface water along the lot lines onto the streets.

Reserves and public lands shall be graded to drain towards developed streets, lanes, and/or storm sewer catchbasins.

8.2.4 Surface Drainage

Where surface drainage swales are required they are to be constructed as outlined in Section 5.12.0.

PART II - LANDSCAPING

8.3.0 DESCRIPTION

- .1 The work under landscaping includes 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 Developer.
 - Plant material as per Section 8.4.0.
 - b) Buffer Strip
 - Areas separating arterial roads from residential property.
 - To be topsoiled and sodded by Developer.
 - Plant material as per Section 8.4.0.
 - c) Utility lots and/or walkways.
 - To be topsoiled and seeded by Developer.
 - Plant material as per Section 8.4.0.
 - d) Median strips and traffic islands.
 - To be topsoiled and seeded by Developer.
 - e) Public Service and Recreation lands.
 - To be topsoiled and seeded by Developer.
 - Plant material as per Section 8.4.0.
 - Municipality may accept cash in lieu of additional park development (\$300 per lot)
- .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 planting beds, location and type of fencing and any park furniture or playground equipment being installed. This plan shall utilize the overall road, sidewalk and walkway plan as a base.
- .2 The Developer shall submit detailed drawings of proposed park furniture or playground equipment for approval by the Municipal Engineer.
- .3 No landscaping shall commence until the landscaping plan has been approved by the Municipality.

8.4.0 LANDSCAPE DESIGN REQUIREMENTS**8.4.1 General Requirements**

- .1 Landscape specifications for rough site work, topsoil, seed and sod, trees, shrubs and ground covers, mulches, see: Section 8.5 through 8.9.
- .2 Where possible, trees will be set back a minimum distance from above and below grade utilities and property lines as specified in this section.
- .3 Trees will be set back a minimum of 1.0 m from back of curb, walk or verge.
- .4 Shrub will be set back a minimum of 450 mm from back of curb, walk, verge or back of turf landscape edging.
- .5 All plant materials shall be as specified on the approved plant list on landscape drawings.
- .6 Planting bed layouts to be designed to facilitate easy maneuverability of large turf maintenance and cutting equipment.
- .7 Uniform or screen fences will be positioned wholly on adjacent privately-owned lands.
- .8 The screen and uniform fencing to meet Leisure Services standards. See Section 8.10.
- .9 Furniture may be provided by the Developer and placed at strategic locations. The following set backs to be respected:

Benches - 1.0 m back of walkway
Waste Receptacles - 250 mm back of walkway
Picnic Tables - designed in clusters to the satisfaction of the Municipal Engineer
- .10 Furniture to meet Leisure Services Standards. All furniture will be anchored to concrete bases.
- .11 No annual plantings will be approved in planting beds to be maintained by the Municipality.

8.4.2 Residential Boulevards

- .1 Boulevards separated by a walk must be graded, topsoiled, and sodded between the back of curb and the walk by the Developer to the satisfaction of Leisure Services.
- .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 Minimum deciduous tree calliper 60 mm.

8.4.3 Collector Roadways

- .1 Collector boulevards must be graded, topsoiled, sodded, and landscaped by the Developer to the satisfaction of the Municipal Engineer.
- .2 Boulevards shall be designed with a minimum of one tree every 8 - 10 linear meters depending on tree species as specified by the "Boulevard Trees and Spacing Guidelines". See Section 8.4.5.
- .3 Minimum deciduous tree calliper 60 mm. Minimum coniferous tree height 2.5 m. Tree mix 60% coniferous and 40% deciduous suggested.
- .4 Boulevards may be designed to include planting beds, shrubs and ground covers.
- .5 Minimum shrub size five gallon potted and planted 1.0 m o.c.. Minimum shrub height and spread will be 600 mm, subject to availability.

8.4.4 Major Entrance Routes to the Municipality / Hamlet

- .1 Boulevards shall be designed with a minimum of one tree every 8 - 10 linear meters depending on tree species as specified by the "Boulevard Tree Spacing Guidelines". See Section 8.4.5.
- .2 Boulevards shall be designed to include continuous large planting beds with trees, shrubs and ground covers.
- .3 Minimum deciduous tree calliper 80 mm. Minimum coniferous tree height 3.0 m. Tree mix 60% coniferous and 40% deciduous required.
- .4 Minimum shrub size five gallon potted. Minimum shrub height and spread will be 600 mm - 1200 mm, subject to availability.

8.4.5 Development Permit Landscaping on Municipality 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 Leisure Services prior to the issuance of a development permit.

BOULEVARD TREES AND SPACING GUIDELINES

<u>Common Name</u>	<u>Minimum Spacing (Metres)</u>
American Elm (NOT Recommended)	10.0
Poplar Brooks	10.0
Poplar N/W	10.0
Brandon Elm (NOT Recommended)	8.0
Summit Ash	8.0
Patmore Ash	8.0
Black Ash	8.0
Manchurian Ash	8.0
Oak	8.0
Linden	6.0
Birch	6.0
Mountain Ash	6.0
Pear	6.0
Flowering Crab Apple (dependant on species)	4.0 - 6.0
Cherry Trees (dependant on species)	4.0 - 8.0
Pine Species (tree form and dependent on species)	4.0 - 8.0
Spruce Species (dependant on species)	4.0 - 8.0
Swedish Columnar Poplar	3.0 - 6.0
Tower Poplar	3.0 - 6.0

Note: The Developer may suggest other trees for roadway boulevards depending on specific site constraints. Spacing of other trees will be reviewed by Leisure Services on an individual project basis.

8.4.6 Medians and Entry Features

- .1 Landscaped road islands, medians and entry features must be topsoiled, sodded and planted with trees and/or shrubs and ground covers by the Developer to the satisfaction of the Municipal Engineer. All road island, median and entry feature designs must be low maintenance.
- .2 Minimum deciduous tree calliper 60 mm.

- .3 Tree and shrub planting design will consider important vehicular sightlines.
- .4 Shrubs will be massed within planting beds. Minimum shrub size five gallon potted and planted 1.0 m o.c. or appropriate to species. Minimum shrub height and spread will be 600 mm, subject to availability. Suggest trees be positioned within planting beds.
- .5 Planting beds to be designed c/w weed liners and landscape edging. All planting beds to have minimum 100 mm wood chip mulch or, decorative crushed granular, or shale topping.
- .6 If turf areas are designed within road islands and medians, total consolidated turf area to be greater than 75 sq. m.
- .7 No free standing architectural features ie. signs, sculptures, light poles, entry gates will be located within turf areas.
- .8 Paving stone and paving stone header, concrete or other special hard-surfaced verge or walks to the satisfaction of the Municipal Engineer.
- .9 Planting Cross Section Detail of road islands and medians drawn at an appropriate scale showing all underground utilities within 3.0 m of planting root zones, limits to road base and sub bases and the limits of the compacted verge base materials in relation to organic soils, mulches and to the root zones of trees and shrubs.
- .10 Planting Plan Detail of road islands and medians drawn at an appropriate scale showing all underground utility alignments within 3.0 m of road island; curb face; back of curb, verge or walk, tree and shrub set backs; proposed planting and spacing; landscaped edging, mulches and freestanding features i.e. signs, gates, pedestals, sculptures, light poles, etc.
- .11 Planting Cross Section Detail and Planting Plan Detail to be cross referenced to engineering and landscape plans and details which support proposed design solution.
- .12 Lighting, if provided, shall be to the satisfaction of the Municipal Engineer.
- .13 Sewers and other underground utilities should not be aligned under landscaped road islands and medians to avoid conflicts with landscape improvements.

8.4.7 Walkways

- .1 Walkway rights-of-way must be graded, topsoiled, seeded or sodded, and planted with trees and ground covers by the Developer to the satisfaction of the Municipal Engineer.
- .2 There shall be a minimum of four trees per every 35 linear meters of walkway right-of-way. Trees and ground covers as specified by "Plant Materials

Appropriate for 6 m Walkway Rights-of-Way".

- .3 Where possible, trees will be set back a minimum distance of 1.0 m from adjacent private property lines.
- .4 Trees shall be grouped in rows. Tree groupings shall be positioned on the either side of the walk and groupings will be staggered. Minimum deciduous tree calliper 60 mm. Minimum coniferous tree height 2.5 m. Tree mix of 60% coniferous and 40% deciduous required.
- .5 Ground covers will be massed within planting beds. Minimum ground cover size three gallon pot planted 750 mm o.c. Suggest trees be positioned within planting beds.
- .6 Planting beds may be designed c/w weed liners and landscape edging. All planting beds to have a minimum 100 mm wood chip mulch. Decorative crushed granular will not be approved as a substitute for wood mulch.
- .7 Furniture may be provided by the Developer and placed at strategic locations within the walkway.
- .8 Screen and uniform fences if provided by the Developer shall meet the specifications in Section 8.10.
- .9 Walks may be required within walkway or top-of-bank rights-of-way to the satisfaction of the Municipal Engineer.

**PLANT MATERIALS APPROPRIATE FOR 6 M WALKWAY
RIGHTS-OF-WAY**

The following lists a variety of plant materials approved for use by the Municipality in walkway rights-of-way 6 m and wider.

<u>Common Name</u>	<u>Minimum Spacing (Meters)</u>
<u>TREES</u>	
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

<u>Common Name</u>	<u>Minimum Spacing (Meters)</u>
<u>GROUND COVER</u>	
Juniper	-
Periwinkle	-
Phlox	-
Thyme	-
Gout Weed (Not with other shrubs)	-

Note: The Developer may suggest other trees, tree form shrubs and ground covers for walkway rights-of-way depending on specific site constraints. These will be reviewed by Leisure Services on an individual project basis.

The following design issues to be considered by the Developer recommending alternative plant materials:

- i. Maintaining adequate year round sight lines through the walkway rights-of-way for pedestrian safety and security.
- ii. Suggested minimum 2 m (6 ft.) branching height for all trees to allow adequate pedestrian clearance beneath tree branches.
- iii. Low maintenance hardy plant species common to northern Alberta.
- iv. Limited horizontal root growth and no sucker-type roots to avoid encroachment into adjoining privately-owned lands.
- v. Pyramidal/columnar tree forms to avoid tree branches overhanging into adjoining privately-owned lands.

8.4.8 Pipelines and Major Utility Corridors

- .1 Utility corridors must be graded, topsoiled, seeded or sodded and landscaped by the developer to the satisfaction of the Municipal Engineer.
- .2 Utility corridors must be planted with a minimum of 30 trees per acre designed and massed into major groupings. Minimum deciduous tree calliper 50 mm. Minimum coniferous tree height 2.0 m. Tree mix of 60% coniferous and 40% deciduous required.
- .3 Shrubs may be substituted for trees at the rate of 5 shrubs to 1 tree, to a maximum of 15 trees per acre.

- .4 Shrubs will be massed within large planting beds to create major focal areas within the rights-of-way. Minimum shrub size five gallon pot, planted 1.0 m.o.c. Minimum shrub height and spread will be 600 mm, subject to availability. Suggest trees be positioned within planting beds.
- .5 Planting bed layouts will provide a minimum width of turf areas between planting beds of 2.0 m. There will be no requirement for landscape edging.
- .6 Planting beds may be designed c/w weed liners. All planting beds to have minimum 100 mm wood chip mulch. Decorative crushed granular will not be approved as a substitute.
- .7 Healthy or vigorous trees within or abutting the utility corridor shall be preserved wherever possible.
- .8 Furniture may be provided by the Developer and placed at strategic locations within the utility corridor.
- .9 Screen and uniform fences if provided by the Developer shall meet the specifications herein.
- .10 Walks, if provided within the rights-of-way, shall be to the satisfaction of the Municipal Engineer.
- .11 Lighting, if provided, shall be to the satisfaction of the Municipal Engineer.

Utilicorp Corridors/R.O.W. - Plant List (Source: Trans Alta Utilities)

Hedge Material - Suitable for planting near a power line.

<u>Common Name</u>		<u>Height at Maturity</u>	
Caragana	Common	3 m	(10 ft)
	Globe	1 m	(3 ft)
	Pygmy	1 m	(3 ft)
Cherry - Nanking		2 m	(7 ft)
Cotoneaster - Hedge		2 m	(7 ft)
Cranberry	Nannyberry	5 m	(16 ft)
	Wayfaring Tree	3 m	(10 ft)
Dogwood - Red Osier		2 m	(7 ft)
Honeysuckle	Clavey's Dwarf	1 m	(3 ft)
	Tartarian	3 m	(7 ft)
	Zabels	2 m	(10 ft)
Lilac	Common	3 m	(10 ft)
	Late	3 m	(10 ft)
Prinsepia		3 m	(10 ft)
Potentilla		1 m	(3 ft)

Caution - May plant near a power line.

<u>Common Name</u>	<u>Height at Maturity</u>	
Pincherry	5 m	(16 ft)
Western Chokecherry	5 m	(16 ft)
Black Cherry	6 m	(20 ft)
Tartarian Maple	6 m	(20 ft)
Amur Maple	4 m	(13 ft)
Flowering Crabapples	5 m	(16 ft)
Hawthorns	5 m	(16 ft)
Showy Mountain Ash	5 m	(16 ft)
Green's Mountain Ash	5 m	(16 ft)
French Pussy-Willow	5 m	(16 ft)
Mugo Pine	6 m	(20 ft)
Pyramidal White Cedar	5 m	(16 ft)

<u>Common Name</u>	<u>Height at Maturity</u>	
Montgomery Blue Spruce	3 m	(10 ft)
Caragana	3 m	(10 ft)
Hedge Cotoneaster	2 m	(7 ft)
Highbrush cranberry	3 m	(10 ft)
Nannyberry	5 m	(16 ft)
Dogwood	3 m	(10 ft)
Elder	4 m	(13 ft)
Honeysuckle	3 m	(10 ft)
Lilac	5 m	(16 ft)
Saskatoon	4 m	(13 ft)

DO NOT plant within eight meters of a power line.

<u>Common Name</u>	<u>Height at Maturity</u>	
Trembling Aspen	8 m	(60 ft)
Balsam Poplar	20 m	(65 ft)
Northwest Poplar	20 m	(65 ft)
Plains Cottonwood	30 m	(90 ft)
White Spruce	15 m	(50 ft)
Colorado Blue Spruce	15 m	(50 ft)
Manitoba Maple	14 m	(45 ft)
Laurel Leaved Willow	15 m	(50 ft)
Golden Leaved Willow	15 m	(50 ft)
Sharp Leaf Willow	10 m	(35 ft)
Green Ash	15 m	(50 ft)
Patmore Green Ash	15 m	(50 ft)
American Elm	20 m	(65 ft)
Brandon Elm	15 m	(50 ft)
Siberian Elm	12 m	(40 ft)

Paper Birch	12 m	(40 ft)
European White Birch	12 m	(40 ft)
Cut-Leaved Weeping Birch	20 m	(65 ft)
Slender Weeping Birch	12 m	(40 ft)

Pipelines and Other Major Underground Utility Corridors/R.O.W. - Plant List

Trees - Suitable for Planting

<u>Common Name</u>	<u>Planting Size - Height</u>
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Coniferous:

Pines	2.0 m (min.)
Spruce	2.0 m
Fir	2.0 m

Large Deciduous:

Deciduous:	<u>Caliper</u>
Silver Maple	50 mm (min.)
Black Ash	50 mm
Patmore Green Ash	50 mm
Summit Green Ash	50 mm
Larch	50 mm
American Elm	50 mm
Harbin Chinese Elm	50 mm
Linden Laurel Leaf Willow	50 mm

Small Deciduous:

Amur Maple	50 mm
Crabapple	50 mm
Amur Cherry	50 mm
Pincherry	50 mm
Schubert Chokecherry	50 mm
Bur Oak	50 mm
Mountain Ash	50 mm
Lilac	50 mm

8.4.9 Storm Water Management Facilities

- .1 Dry pond and areas surrounding new storm water management lake facilities must be graded, topsoiled, seeded or sodded, and landscaped by the Developer to the satisfaction of the Municipal Engineer.
- .2 Plant materials will be selected to respect hydrological and soil saturation characteristics of the facility.
- .3 Public lands within the facility must be planted with a minimum of 30 trees per landscaped acre above normal water line and designed and massed into major groupings. Minimum deciduous tree calliper 60 mm. Minimum coniferous tree height 2.5 m. Tree mix 60% coniferous and 40% deciduous suggested.

- .4 Shrubs may be substituted for trees at a rate of 5 shrubs for one tree to a maximum of 15 trees per landscaped acre.
- .5 Shrubs will be massed within large planting beds above the 1:5 year flood line to create major focal areas on the slopes of the dry pond. Minimum shrub size five gallon pot planted 1 m o.c. or appropriate to species. Minimum shrub height and spread 600 mm, subject to availability. Suggest trees be positioned within planting beds.
- .6 Planting bed layouts will provide a minimum width of turf areas between planting beds of 2.0 m. Landscape edging may be required in formal shrub beds.
- .7 Planting beds may be designed c/w weed liners. All planting beds to have minimum 100 mm wood chip mulch, or decorative crushed granular or shale in flood prone areas. Use of weed liners for planting beds located in flood prone areas is strongly recommended.
- .8 Major storm sewer outlets/inlets should be landscaped with plant materials and large rockery to provide visual screening and security buffering for pedestrians and dry pond users.
- .9 Where possible, relatively flat open areas should be designed to encourage active recreational uses.
- .10 Furniture may be provided by the Developer and placed at strategic locations within the dry pond.
- .11 Lighting, if provided, to be to the satisfaction of Municipal Engineer.
- .12 Special or unique features i.e. artificially pumped dry streams, special play courts, bridges and architectural and structural features will be designed and sealed by recognized accredited professionals.

8.4.10 Natural Areas

- .1 Existing natural and naturalized areas impacted by the proposed improvements which cannot be protected during construction must be renaturalized with native plant materials having regard for the surrounding environment, new drainage patterns, soil conditions, and ecological rehabilitation. Generally, renaturalization would apply to River Valley and Ravine lands.
- .2 The Developer will determine the level of restoration to be completed in consultation with the Municipal Engineer.
- .3 The Developer will design an appropriate mix of native trees, shrubs, ground covers and wild seed mixes to rehabilitate impacted naturalized areas.

- .4 The Developer will design any required subsurface drainage, surface drainage and erosion control measures in the rehabilitation area.
- .5 The Developer shall, if required, coordinate this rehabilitation with other consultants to implement geotechnical, structural and bioengineering principles and recommendations.
- .6 The landscape drawings will identify all plant communities to be established and all other information necessary to implement the proposed improvements.
- .7 The Developer will specify all tree, shrub and ground cover sizes. No minimum or maximum sizes are specified. Tree mix 60% coniferous and 40% deciduous is suggested.
- .8 Forestry stock, seedlings, deciduous tree whips, and propagated and rooted cuttings are acceptable for use.
- .9 All plant materials to be nursery stock or obtained from Provincial Government sources.
- .10 The Landscape Architect to identify appropriate planting installation specifications and detailing on landscape drawings.
- .11 "Round-Up" or other approved herbicides may be used to eradicate natural slopes prior to planting of trees and shrubs. Herbicide to be applied by a licensed applicator.

8.5.0 SITE PREPARATION

8.5.1. Materials

- .1 Fill Material - Fill materials, where required shall be free of stones, clods, sticks, roots, concrete, any toxic materials (eg. salt, oil, etc.) and other objectionable extraneous matter and debris. These materials shall be removed from the site and disposed of.
- .2 Topsoil - Topsoil shall be natural fertile agricultural soil, capable of sustaining vigorous plant growth. It shall be best quality, weed free and shall be approved by the Municipal Engineer.

8.5.2 Subgrade Preparation

- .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 subgrade shall be 150 mm below the adjacent top of curb and/or sidewalk.

- .4 The final surface shall be sloped so that there is no runoff onto adjacent property, or any ponding.

8.5.3 Existing Utility Appurtenances and Features

- .1 All existing utility appurtenances shall be adjusted to final finished grade elevations.
- .2 All existing features e.g. trees, shrubs, monuments, curbs, sidewalks etc., shall be protected against any damage.

8.6.0 PLACING OF TOPSOIL

- .1 General - The topsoil shall be compacted to a firmness sufficient to show a heel imprint of not more than 3 mm deep, but the upper 50 mm shall be of fine texture and free of stones or lumps 6 mm or larger. Sufficient allowance shall be made for any settlement. Minimum depth of topsoil is 150 mm.
- .2 Boulevards - The finished topsoil level shall conform to the adjacent curb and sidewalk elevations and must provide for adequate drainage of sidewalk areas after turf establishment.
- .3 Buffer Strips - The finished topsoil level shall slope uniformly from the property line towards the back of the sidewalk at not less than 2%.
- .4 Utility lots and Walkways - Where sidewalks are present, a swale shall be provided at a distance of at least one metre, from either side of the sidewalk. The grade must be sloped away from the sidewalk at a minimum grade of 1%.
- .5 Median strips and Traffic Islands - The finished topsoil level shall be even from top of curb to top of curb.
- .6 Parks and Environmental Reserves - Rough grade to required levels, profiles and contours and make ready to receive surface treatment. Blend slopes into level area. Produce a uniform contoured grade, with the use of rototiller, harrow, float or roller as required.
- .7 The prepared seed bed must be inspected and approved by the Municipal Engineer before seeding commences.

8.7.0 SEEDING**8.7.1 Seeding - Materials**

- .1 Fertilizer - Fertilizer shall be 27-14-0 and shall be applied at a rate of 3 kg/100 m².
- .2 Grass Seed - Grass seed shall be certified seed comprised of the following varieties mixed in the proportion by weight shown and testing Canada #1 or better for purity and germination:
 - a) Kentucky Blue Grass 35%
Creeping Red Fescue 65%
 - b) Crested Wheat Grass (only to be used if prior approval is obtained from the Municipal Engineer)Grass seed to be applied at a rate of 3 kg/100 m².

8.7.2 Seeding - Execution

- .1 Fine grade area to a smooth, uniform grade with a loose textured surface free of stones, branches, roots, etc., 20 mm in diameter and larger. All areas must drain and positive drainage away from buildings must be assured.
- .2 Apply fertilizer at a rate of 3 kg per 100 square metres of area.
- .3 Seeding may be done immediately thereafter, provided the bed has remained in good, friable condition and has not become muddy or hard. If it has become hard, it shall be tilled to friable condition.
- .4 Seeding shall be applied at 3 kg per 100 square metres.
- .5 The seed may be sown by:
 - a) Hand application, by using a cyclone type seeder with the seed applied in two directions in equal amounts.
 - b) Mechanical application, by use of a calibrated specialized grass seeder that has a seed compaction roller. (This is the preferred method on parks and other large level areas.)
 - c) Hydro seeding by applying an approved turf fibre at the rate of 1350 kilograms (dry matter) per hectare when applying the seed.

8.8.0 SODDING

8.8.1 Sodding - Materials

- .1 Fertilizer - Fertilizer shall be 27-14-0 and shall be applied at a rate of 3 kg/100 m².
- .2 Sod - All sod shall be certified and composed of the following varieties of grass:
 Kentucky Blue Grass 35%
 Creeping Red Fescue 65%
- .3 Sod shall be well rooted, vigorous and healthy, free from disease, insect pests, weeds or other grasses, stones or other extraneous material.
- .4 Sod shall be machine stripped at a uniform thickness of 25 mm (±5 mm). The thickness shall be determined at the time of stripping and shall exclude top growth and thatch.
- .5 Wooden pegs required to hold sod in place on slopes shall have dimensions of approximately 25 mm x 50 mm x 300 mm. Metal pegs will not be accepted.

8.8.2 Sodding - Execution

- .1 Fine grade area to a smooth, uniform grade with a loose textured surface free of stones, branches, roots, etc., 20 mm in diameter and larger. All areas must drain and positive drainage away from buildings must be assured.
- .2 The fertilizer shall be applied on the finished surface by mechanical distributor, thoroughly and evenly incorporated with the soil to a depth not exceeding 75 mm.
- .3 The fertilizer rate of application shall be 3 kg per 100 square metres of area.
- .4 Sodding may be done immediately thereafter, provided the bed has remained in good, friable condition and has not become muddy or hard. If it has become hard it shall be tilled to friable condition.
- .5 Sod shall be laid such that their long dimension is parallel to the direction of the slope and in a manner that permits alternating of joints.
- .6 Sod shall be fitted tightly together with no visible joint. The finished surface of the turn shall be true to line and grade, firm and free of irregularities and voids.
- .7 Sod laid on slopes of two (2) horizontal to one (1) vertical or steeper shall be held in place by wooden pegs. Pegs shall be driven flush with sod.

8.8.3 Maintenance

- .1 General - Maintenance shall include all measures necessary to establish and maintain all seeded and sodded areas in a healthy, vigorous growing condition, including but not limited to:
- .2 Mowing - first cutting should occur when the grass is a minimum of 75 mm high and covers 100% of the seeded or sodded areas. Cut as required to maintain grass at a minimum height of 65 mm.
- .3 Watering - when required, and with sufficient amounts to ensure germination and prevent grass and underlying soil from drying out.
- .4 Fertilizing - including all required supplementary fertilizer applications as necessary to establish a vigorous growing stand of grass.
- .5 Weed Control - shall be carried out when required to keep seeded areas reasonably free of weeds. When herbicides are used, they shall be applied in accordance with manufacturer's recommendations. Any damage resulting from the Contractor's use of herbicides shall be remedied at his own expense.

Re-seed, or re-sod in the case of sodding, all areas which are deteriorating or which are bare, burned out, or are thin, and repair all damages resulting from erosion and wash-outs at the Contractor's expense.

At time of final inspection, all seeded or sodded areas shall have a healthy, even, vigorously growing stand of grass, free of diseases, weeds, bare, thin, or burned-out areas.

- .6 Maintenance shall include the erection and removal of all temporary protection fences, barriers and signs, where deemed necessary, and all other work incidental to proper maintenance.
- .7 All damaged grass as a result of negligence on the part of the Contractor shall be replaced at the Contractor's expense. Only upon issuance of Final Acceptance Certificate by the Municipal Engineer shall the Contractor cease maintenance work of the seeded or sodded area.
- .8 The maintenance period of seeded or sodded areas shall be two (2) years from the date of issuance of a Completion Certificate.
- .9 The Municipal Engineer reserves the right to reject the seeded or sodded areas if he is not satisfied with its appearance and the Contractor must reestablish the area, by removing any or all parts of the rejected work and by supplying any or all new topsoil, seed, sod (in the case of sodding), peat moss, fertilizer and labour necessary for such an operation and must do so at his own expense.
- .10 The Municipal Engineer shall inspect the landscaped areas upon written request by the Contractor. The request shall be received at least ten (10) days before the

anticipated date of inspection.

8.9.0 PLANTING (TREES AND SHRUBS)

8.9.1 Materials

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

Minimum planting requirements are specified in Section 8.4.0.

- .2 The Municipality may request higher levels of plantings depending upon the location and type of development proposed.
- .3 All plants shall be typical of their species or variety and shall have a 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 insect pests, eggs or larvae. They shall have healthy, well- developed root systems.

All plants shall be nursery grown unless specifically authorized to be collected from native stands or established wood lots.

- .4 Substitutions will not be permitted, unless written proof is submitted that specific plants or sizes are unobtainable and such substitutions are acceptable to the Municipal Engineer.
- .5 Bare root (B/R) shrubs shall be dug with adequate fibrous roots retained. The roots of these plants shall be covered with a uniformly thick coating of mud being puddled immediately after they are dug, or packed in moist straw, shingle tow or moss.
- .6 Balled and burlapped (B/B) plants shall be dug with firm natural balls of earth of sufficient diameter and depth to include most of the fibrous roots.
- .7 Container growth stock shall have been grown in a container long enough for the root system to have developed sufficient to hold its soil together firm and whole. No plants shall be loose in the container.
- .8 Undersized root systems will be rejected. All plant matter is subject to the approval of the Municipal Engineer.

Plant material shall be delivered to the job site and stored, handled and planted with the producer's label intact. All plant material must be handled in a professional manner. Damaged, sick or diseased plants must be removed from the site immediately and be replaced.

- .9 Tree stakes shall be 2.1 m in length and of the steel U-bar or T-bar type. Tree ties shall be a number ten (10) gauge galvanized wire and shall be inserted into

a 200 mm length or 10 mm diameter polythene plastic tubing. Wire for tree guying shall be a double strand of number nine (9) gauge galvanized wire.

- .10 Mulch shall be wood chips, ground bark, bark peelings, peat, hay or straw.
- .11 Arrangements for suitable water shall be undertaken by the Contractor.

8.9.2 Site Preparation

- .1 At least 24 hours notice shall be given to the Municipal Engineer prior to commencement of planting. The Contractor shall stake the location of all plantings for approval by the Municipal Engineer or his representative.
- .2 Boulevards shall be excavated to its required depth, and made ready to receive topsoil and tree planting.
- .3 No filling of boulevards or medians with topsoil is to commence until tree locations have been approved by the Municipal Engineer or his representative.
- .4 The Contractor shall be responsible for planting at correct grade and alignment.
- .5 The planting and boulevard construction work may be carried out in phases.

8.9.3 Planting Operations

- .1 Tree pits shall be excavated with vertical sides 300 mm greater in diameter than the ball of earth or spread of roots of the tree and sufficiently deep to allow for a 150 mm layer of the planting mixture beneath the ball or roots.
- .2 Shrubs shall be planted in pits 300 mm greater than the spread of the roots and 450 mm deep below the finished grade, and as necessary to properly set the plant at finished grade.
- .3 The depth of planting beds and pits shall be adjusted to permit a minimum of 225 mm of the planting mixture under balls or roots of all plants.
- .4 If pits are prepared and backfilled with the planting mixture to grade, prior to planting, their location (except in boulevards) shall be marked by 25 mm x 50 mm stakes sticking above grade by 100 mm so that when planting proceeds they can easily be found.

Plants shall be set in the centre of pits, plumb and straight, and at such a level that after settlement the crown of the plant will be 25 mm lower than the surrounding finished grade. No planting, except ground covers, vines and herbaceous plant material, shall be placed closer than 600 mm to the edge of shrub beds, hard surfaces, or building foundations.

- .5 When approximately two-thirds of the plant pit has been backfilled with soil mix, 8-24-24 fertilizer shall be applied at the following rates:

Shade Trees	0.5 kg per 25 mm of calliper
Small Trees	0.25 kg per 25 mm of calliper
Shrubs	0.06 kg per 300 mm of height
Evergreens	0.03 kg per 300 mm of height or spread
Vines, Groundcover, Herbaceous Plants	0.03 kg per plant

The fertilizer shall be distributed evenly over the pit area. The pit shall be filled with water and the soil allowed to settle around the roots.

- .6 When balled and burlapped trees are set, the soil mixture shall be compacted around the base of balls to fill all voids. All burlap, ropes and wires shall then be removed from the tops of the balls.

Roots of bare roots shall be properly spread out and the topsoil mixture carefully worked in among them. Any broken or frayed roots shall be cut off cleanly.

- .7 After the water has been absorbed the plant pit shall be filled with soil mix.

Immediately after the plant mix is backfilled, a shallow basin (approximately 100 mm deep), slightly larger than the pit, shall be formed with a ridge of soil to facilitate watering and water retention.

After the surface is sufficiently dried, the top of the pit shall be spaded to a depth of approximately 25 mm to avoid evaporation.

8.9.4 Staking and Guying

- .1 For Deciduous trees (less than 1.0 m in height) the following procedure will be observed:

Each tree shall be supported with a tree stake. This tree stake will be driven into the ground 450 mm to 600 mm below grade in a vertical position with the open side facing the street and located so that it is between the tree and the curb. Where trees are not adjacent to a street, all stakes are to be placed 150 mm northwest of the tree.

The tree shall be supported with one (1) tree tie. This tie shall be placed around the tree and the stake, as close as possible to the top of the stake, with the tie being below rather than just above a branch.

The tree stake and tie are to be attached as per Standard Drawing No. 30.

- .2 For Evergreens less than 2.45 m in height and Deciduous trees greater than 1 m in height with a calliper less than 75 mm, the following procedure will be observed:
 - (a) Each tree shall be supported by two (2) steel U or T-bars driven securely into the ground without injury to the root ball.
 - (b) Each tree shall be fastened at the top of the stakes with two (2) ties.
 - (c) The tree stakes and ties are to be attached as per Standard Drawing No. 51.

- .3 For guying of deciduous and evergreen trees the following procedure will be observed:

All deciduous trees over 75 mm calliper and all evergreens exceeding 2.45 m height shall be done with three (3) guys, spaced equally about each tree.

Each guy shall be attached to the tree trunk at an angle of 60° at about 3/5 of the height of the tree and anchored at the ground by means of a wooden stake, 50 mm x 50 mm x 450 mm, driven securely into the ground. Trees 4.3 metres in height or greater, or 100 mm calliper or larger, shall be staked with a wooden stake 50 mm x 100 mm x 750 mm in length or 15 mm diameter reinforcing steel bars 760 mm long.

Guys, stakes and ties to be placed as per Standard Drawing No. 32.

8.9.5 Pruning

- .1 All plants shall be pruned after planting. The amount of pruning shall be limited to the minimum necessary to remove dead or injured branches and to compensate for the loss of roots as a result of the transplanting operations. Pruning shall be done in such a manner as to preserve the natural character of the plants. Leaders shall not be removed. Only clean sharp tools shall be used. All cuts shall be clean and flush, leaving no stubs.

Cuts, bruises or scars on the bark shall be traced back to living tissue and removed. The affected areas shall be shaped so as not to retain water, and all treated areas shall be painted with an approved tree paint.

8.9.6 Digging of Plants

- .1 All plants shall be dug and delivered to the site as specified on the Plant list and approved landscape plan.
- .2 Plants specified "B/R" shall be moved with bare roots. They shall be dug and moved while dormant, with the major portion of the fibrous rootsystem provided.

Immediately after digging, the root system shall be wrapped or puddled and shall be kept moist to prevent drying out until planted on the site.

- .3 All plants specified "B/B" shall be moved with solid balls wrapped in burlap
- .4 No plants shall be used when the ball of earth surrounding the roots has been cracked or broken preparatory to or during the process of planting, or when the burlap, staves and ropes, required in connection with their transplanting, have been removed.
- .5 The sizes of roots balls for trees shall be as specified below. Ball sizes are minimum and shall be adjusted according to growth habits or plants. At any rate ball sizes shall be sufficiently large to contain at least 75% of the fibrous root system.

Deciduous Trees		
Root mm	Root Ball Diameter mm	Machine Ball Diameter mm
24 - 45	610	
50	760	1110
75	915	1420
100	1065	1675
125	1370	1675
150	1470	2336
200	1825	2236
250	2285	2336

Note: Deciduous Trees larger than 75 mm calliper shall be moved by machine (spade).

Coniferous Trees		
Height mm	Root Ball Diameter mm	Machine Ball Diameter 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 over 2.75 m in height, root ball diameter shall be increased 150 mm for every additional 25 mm in calliper, or every 300 mm in height.

Note: Coniferous trees larger than 2.75 m in height shall be machine moved with a 2300 mm diameter or larger spade.

- .6 All plant materials shall conform to the measurement specified in the Plant List and landscape plan. Plants larger than specified may be used if approved by the Municipal Engineer. If larger plants are used, the ball of earth shall be increased in proportion to the size of the plant.
- .7 All plants shall be measured when the branches are in their normal position. Height and spread dimensions specified refer to the main body of the plant and not from branch tip to root base or from branch tip to branch tip. Where trees are measured by calliper reference is made to the diameter of the trunk measured 300 mm above ground as the tree stands in the nursery.

8.9.7 Maintenance

- .1 Maintenance of trees shall include protective or preventative spraying when required.
- .2 Maintenance shall include resetting to proper grade position of settled plants, and planting saucer repair. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permits. Upon completion of planting, and prior to construction completion, excess soil and debris shall be removed from the site and any damage to structures, etc., resulting from planting operations shall be repaired.

8.9.8 Guarantee Period

- .1 The maintenance period for all planted material shall be two (2) years from the date of issuance of a 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 Municipal Engineer shall be removed from the site. In case of any question regarding the condition and satisfactory establishment of a rejected plant, the Contractor may elect to allow such a plant to remain through another complete growing season at which time the rejected plant, if found to be dead, or in an unhealthy or badly impaired condition, shall be replaced by the Contractor.

8.10.0 UNIFORM FENCING

- .1 Uniform wood fencing shall be constructed in accordance with Std. Dwg. No. L6 or as approved by the Municipal Engineer. Colour of stain shall be approved by the Municipal Engineer.
- .2 Chainlink fencing and gates shall be constructed in accordance with Standard Drawing No. L5.
- .3 Uniform fencing shall be constructed adjacent to and at the following locations:
 - a) Arterial Roadways
 - b) Parks and Playfields
 - c) Public Walkways and Utility Lots
 - d) School Sites
 - e) Municipality owned lands - e.g. Firehall sites etc.
 - f) Multiple Family Sites
 - g) Neighbourhood Commercial Sites
 - h) Institutional Sites and
 - i) Other areas as required by the Municipality.

Wooden fencing shall be installed where residential property adjoins the above mentioned facilities. The Municipality may approve chainlink fencing where facilities such as playgrounds, parks or school sites are adjacent to arterial roadways.

- .4 Gates shall be installed on all residential lots which back onto a public park. Gates shall be located approximately at the mid-point of each lot and shall be constructed to open inwards onto the private property.
- .5 Wood rail fencing in accordance with Standard Drawing Number L7 may be approved by the Municipal Engineer for selected park or walkway areas.

8.10.1. Maintenance Period

- .1 The applicant shall be responsible for, and at his own expense to remedy, any defect, fault or deficiency in the completed works during a twenty four (24) month maintenance period.

END OF SECTION 8

SECTION 9

FRANCHISE UTILITIES

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9.1.0 GAS SERVICE**9.1.1 General**

- .1 Natural Gas service is provided under Franchise Agreement by Atco Utilities Ltd.

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 the gas company. Refer to St.Dwg. No's T2 through T11 for preferred locations.
- .2 All easements shall be registered in the name of the Municipality.

9.1.3 Installation

- .1 The Developer and gas company shall obtain Municipality approval for the method installation including excavation and backfilling requirements.
- .2 The Developer shall coordinate the location of gas services to ensure that they do not interfere with other utilities.
- .3 Where gas distribution is installed at the front of lots, gas service to individual lots shall be installed such that the gas meter can be placed at the side or the rear of the dwelling. Where gas meters are placed at the side of the dwelling unit, the gas meter shall be placed on the side of the dwelling opposite the driveway. Gas meters shall not be permitted at the front of the dwelling unit.
- .4 An Excavation Permit must be obtained from the Municipality for any excavation on Municipality property.

9.1.3 Costs

- .1 Any capital contribution that the utility company may charge for installation of gas services shall be paid by the Developer.

9.2.0 TELEPHONE SERVICE**9.2.1 General**

- .1 Telephone services to be installed by the telephone company shall be underground.
- .2 Where possible, telephone cable to be located in the same trench as power.

9.2.2 Rights-of-Way

- .1 Where required, the Developer shall provide rights-of-way and easements of sufficient size and location to satisfy the telephone company.
- .2 All easements shall be registered in the name of the Municipality.

9.2.3 Installation

- .1 The Developer and the telephone company shall determine the method and by whom the trenches for telephone cables shall be dug and compacted.
- .2 The Developer shall coordinate the location of telephone service boxes to ensure that they do not conflict with driveways or interfere with other utilities. Alignments to be approved by the Municipal Engineer.
- .3 An Excavation Permit must be obtained from the Municipality for any excavation on public property.
- .4 Service pedestals to be located on the intersection of lot lines where possible.

9.2.4 Costs

- .1 Any capital contribution that the utility company may charge for installation of telephone services, shall be paid by the Developer.

9.3.0 ELECTRIC POWER SERVICE**9.3.1 General**

- .1 Electrical power services is provided under Franchise Agreement by Utilicorp.
- .2 Power services to be installed by Utilicorp and shall be underground. Where possible, telephone and cable T.V. shall run in a common trench.

9.3.2 Rights-of-Way

- .1 Where required, the Developer shall provide rights-of-way and easements of sufficient size and location to satisfy Utilicorp.
- .2 All easements shall be registered in the name of the Municipality.
- .3 See Std. Dwg. No's T2 through T11 for preferred alignments in road right-of-ways.

9.3.3 Installation

- .1 The Developer and Utilicorp shall obtain Municipality approval for the method of installation including excavation and backfilling requirements.
- .2 The Developer shall coordinate the location of power service boxes and transformers to ensure that they do not conflict with driveways or interfere with other utilities. Alignments to be approved by the Municipal Engineer.
- .3 An Excavation Permit must be obtained from the Municipality for an excavation on public property.

9.3.4 Costs

- .1 Any capital contribution that the utility company may charge for installation of electrical services, shall be paid by the Developer.

9.4.0 TELEVISION CABLE**9.4.1 General**

- .1 Television cable services are supplied by the television cable company.
- .2 Where possible power, telephone and Cable T.V. shall run in a common trench
- .3 All easements shall be registered in the name of the Municipality.

9.4.2 Rights-of-Way

- .1 Where required, the Developer shall provide rights-of-way and easements of sufficient size and location to satisfy the television cable company.
- .2 See Std. Dwg. No's T2 through T11 for preferred alignments in road rights-of-ways.

9.4.3 Installation

- .1 The Developer and the television cable company shall obtain Municipality approval for the method of installation including excavation and backfill requirements.
- .2 The Developer shall coordinate the location of television cable services to ensure that they do not interfere with the other utilities. Alignments are to be approved by the Municipal Engineer.

9.4.4 Costs

- .1 Any capital contribution that the utility company may charge for installation of television cable services shall be paid by the Developer.

END OF SECTION 9

SECTION 10

MANUFACTURED HOMES

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10.1 GENERAL

It is the intent of this section to outline the requirements unique to the design of a Manufactured Homes Subdivision. In general manufactured home subdivisions are expected to meet the submission requirements as outlined in Section 2. Utilities, roadway design and lot grading shall meet the requirements of foregoing relevant sections unless specifically detailed otherwise in this Section.

10.2 DEVELOPMENT SIZE

The most economic size for manufactured homes subdivision has been found to be in the 8 to 16 hectare range. This is the preferred development size but smaller or larger sized developments may be approved at the Municipality's discretion.

10.3 DENSITY

Maximum density should not exceed 20 trailers per gross hectares (8 per acre).

10.4 OPEN SPACE

10% of the gross site area shall be used for open space purposes to be provided by the following alternatives:

- a) small sites of not less than 500 m² located at strategic points within the layout
- b) as one large area located within the site, with convenient access from all trailers
- c) as a combination of (a) and (b) above.

10.5 LANDSCAPING

A detailed landscaping proposal must be submitted with the final layout plan, and must include proposals for a tree or shrub buffer strip of a minimum width of 3 metres around the periphery of the site, and shall not be considered as part of the open space provision required above. Should it prove desirable, the defined trailer lots may extend into this area.

10.6 ROADS AND STREETS

All streets and footpaths within the site shall be paved to a standard required by the Municipal Engineer for residential subdivision development.

The minimum width of a right-of-way within the site shall be 12 m, with a carriageway of no less than 8 metres. The remainder of the right-of-way shall be landscaped. There shall be no on-street parking.

Curb and gutter is strongly recommended for appearance, drainage and maintenance purposes. Minimum longitudinal grade to be 0.5%. Alternatively an inverted swale roadway section may be approved by the Municipal Engineer. Minimum longitudinal grade for swaled roadways to be 1%. Minimum cross fall for either section to be 2.5%. Rural ditches or drainage swales running adjacent to the roadway section will not be approved.

10.7 UTILITIES AND SERVICES

All utilities and services shall be underground and provision shall be made for the installation of natural gas supply. The sanitary sewer shall run within the road right-of-way or in a registered utility lot if the development is to be municipality operated. The sanitary sewer may run directly under homes if the development is a private park (e. utility and roadway maintenance to be responsibility of the owner of the development.) In either case the minimum sewer size shall be 200 mm with a minimum slope of 0.4%. Maximum manhole spacing to be 120 m and at changes in direction.

All water distribution mains feeding a fire hydrant shall be a minimum of 150 mm diameter. 50 mm lines may be approved for dead-end streets less than 100 metres in length.

10.8 PARKING

In addition to the individual trailer lot space, a common parking area shall be provided at the rate of 1 space for every 10 trailer lots for the parking of trucks, etc. No on-street parking will be allowed.

10.9 STORAGE

A screened compound for the storage of tent trailers, boats, etc. shall be provided. Provision shall be made at the rate of 70 square metres for every 10 trailer lots.

10.10 SERVICE BUILDINGS

Where necessary, shall not be nearer than 6 metres to any trailer.

10.11 DISPLAY

Provision may be made within the site for the display of not more than two manufacturers show homes. However, no retail sales of trailers shall be permitted from the site without the approval of the Municipality.

10.12 FIRE HYDRANTS

A fire hydrant shall be provided so that no trailer is more than 75 metres from a hydrant, i.e. hydrants to be at 150 metres intervals. Layout to be approved by Municipality.

10.13 STREET LIGHTING

An outdoor street and/or footpath lighting system shall be provided.

10.14 SIGNS

Not more than one free standing identification sign shall be permitted, the design to be approved by the Municipality.

10.15 LOT SIZE

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

10.16 SPACE AROUND TRAILER AND ATTACHMENTS

No trailer, or any attachment buildings associated with a trailer, shall be nearer than 5 metres to an adjacent trailer, or any attachment building. No trailer shall be located within 3 metres of the front property line of a lot adjoining an internal street or within 8 metres of the front property line of a lot which adjoins a public road or right-of-way.

10.17 SKIRTING AND ATTACHMENTS

Total floor space of attachments shall not exceed ½ of the total floor space of the trailer and shall be painted to present the same appearance as the trailer. As part of the above space allowance a prefabricated storage shed, not exceeding 3 metres x 3 metres, shall be permitted on each lot provided it is located in accordance with the immediately preceding paragraph. Skirting shall be provided and painted to match the trailer located on the lot.

10.18 LANDSCAPING

The developer shall be responsible for the landscaping of the total site, together with the individual lot, and its maintenance and replacement where necessary.

10.19 GARBAGE

Provision shall be made for screening individual garbage bins, or a screened compound serving a number of trailers shall be erected.

10.20 FENCING

No individual fencing or hedging shall be permitted, unless the developer accepts responsibility for its erection and maintenance. A uniform standard for fencing should be established for the entire development.

10.21 DEFINITION OF LOTS

Lots shall be defined by curb or post at the corner of each lot.

10.22 PARKING

A minimum of 2 parking spaces must be provided on each trailer lot which must be paved, or gravelled to an approved standard. No on-street parking will be allowed.

10.23 FUEL TANKS

Conversion to natural gas supply is recommended whenever possible in the case of propane units.

10.24 PLANS

Detailed plans in accordance with Sections 1 and 2 shall be required indicating site layout, lot grading, servicing and utility layout, together with details of connections to Municipality's Utility services, landscaping contours, and existing site or land features to be retained.

10.25 SITE REQUIREMENTS

Every trailer shall be permanently levelled, blocked and skirting erected within 30 days of installation on the lot, or by May 1st if installed between November 1st and April 1st.

END OF SECTION 10

SECTION 11

RECREATION VEHICLE PARK

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11.1 GENERAL

It is the intent of this section to outline the basic requirements for a R.V. Park development. As each development site is unique, the developer is encouraged to use innovative techniques to maximize the potential of the site. Disruption to existing vegetation and surface features should be kept to a minimum so that "natural nature" of the site may be retained.

11.2 SUBMITTALS

The Developer should submit the following plans for review by the Municipality. All plans shall be of a large enough scale (minimum 1:1000) to adequately define the existing conditions as well as proposed improvements.

1. Existing Site Plan shall show the following:
 - . legal land description
 - . north arrow, plan scale and project name
 - . registered property lines, rights-of-way and easements
 - . adjacent roadways and land use
 - . on-site roads, buildings, utilities and other improvements
 - . existing natural features such as trees, sloughs, natural drainage courses and steep slopes
 - . environmentally sensitive areas such as wildlife runs or nesting areas
 - . contours of existing ground. Maximum contour spacing to be 1 metre.
 - . Identify any adjacent land use which may affect human enjoyment of the proposed park. eg. landfill, lagoons, heavy industrial activity
2. Concept Plan is intended to illustrate the proposed development in a very general sense. The concept plan should show the general location of proposed user areas and site improvements. Items which should be shown are proposed roadways, pedestrian trails, parking areas, camping areas and site structures such as bathrooms, administrative buildings, sani-dumps and garbage collection areas. The concept plan is to be reviewed by the Municipal Engineer and Parks Department prior to proceeding to detailed design of the facility.
3. Detailed Design Drawings shall define the proposed improvements with sufficient detail to enable the correct location and construction of the individual elements. The detailed design drawings shall be reviewed by the Municipal Engineer prior

to construction. The detailed design drawings shall at a minimum show the following information.

- . All roads drawn to scale and in final location. Sufficient elevations are to be shown to establish drainage patterns.
- . All parking areas to be drawn to scale with grades to ensure adequate surface drainage.
- . Major activity areas to be shown with details such as campsite spaces, loop layout and pedestrian pathways.
- . Structures to be shown in their proposed location, with building outlines drawn to scale.
- . Location of visitor services such as toilets, firewood stations, garbage bins, water stations and sanitary sewer facilities to be shown in preferred locations.
- . Overland drainage patterns to be adequately defined with sufficient elevations to ensure ponding does not occur in activity areas.
- . Existing trees or vegetation that are to be removed as part of the development are to be clearly identified.
- . Park administration facilities to be shown.

11.3 RECOMMENDED DESIGN GUIDELINES

- 11.3.1 Roads** Where possible, utilize one-way roads to minimize traffic conflicts. Minimum roadway widths to be 4 metres for one-way traffic and eight metres for two way traffic.
- . Curved roadways are preferred. Avoid long straight sections which will encourage high speed traffic.
 - . Intersections should meet at as close to 90° as possible. Ensure adequate widths at intersections to accommodate turning movements of the larger R.V.'s using them.
 - . Developments with numerous campsites should have several campsite loops to decrease the amount of traffic going past each campsite.
 - . Roadway design should maintain existing drainage patterns where possible. Use ditches and culverts to control drainage and slant

or crossfall roads to ensure adequate drainage. Minimum recommended crossfall is 3%.

- . Minimum road structure to be 150 mm compacted subgrade, 150 mm of pitrun gravel topped with 50 mm of 20 mm crushed gravel.
- . All dead-end roads to have a turnaround at the end. Final campsite is not to be utilized as a turn around.

11.3.2 Campsites - General

- . Provide a variety of campsite styles. At least one campsite per loop should be handicapped accessible. Approximately 15% of site should be double sites. Typical campsite layouts are shown in the Standard Details.
- . Provide adequate spacing to provide privacy to each campsite. Minimum recommended distance between sites is 15 metres.
- . Leave a minimum of 5 metres between camping space and loop road. This distance is required to provide adequate manoeuvring room for vehicles.
- . Install barriers to restrain vehicle to roads and parking areas and to keep them off campsite activity pads.
- . Campsite spaces to have same structure as roadways.
- . Clear campsite activity pads by hand. Grub roots and remove large stones.

11.3.3 Single Campsite

- . Easy to back into. Back-in spurs to be placed at 45° to 60° angle from centreline of road.
- . Campsite spurs to be 4 m wide and 18 m long.
- . Level area approximately 6 m x 6 m for a campstove and picnic table. Larger activity pads are required for pitching tents.
- . Activity pads should be built to the right or rear of the parked vehicle. Spur angle on the left of a one-way road should be 60° to provide adequate space from the road.

11.3.4 Double Campsite

- . Provide approximately 15% double back-in campsites to accommodate campers travelling with another party.

- . Double campsite should also work as singles in that each half has its own table and campstove.
- . One double site counts as two singles when calculating the number of toilets and other visitor services required.

11.3.5 Drive-Through Campsites

- . Larger R.V.'s and trailers should be accommodated by including some pull-through or pull-over campsites in each campground loop.
- . Pull-over campsites can be utilized where space is limited. Pull-over sites must be located to the right of traffic of flow to accommodate R.V. doors which are on the passenger side.
- . Pull-over sites should be 12 to 15 m long and 4 to 5 m wide with a minimum 6 m x 6 m activity pad.
- . Avoid short-cutting curves with pull-through campsites. This may cause confusion as the pull-through may look like a road. Pull-through campsites should be located on tangent sections of the roadway.
- . Pull-through sites should be a minimum 18 m long and 4 to 5 m wide. A 6 m x 6 m activity pad should be located on the right side of spur. Spur should be at 45° to 60° to road.

11.3.6 Serviced Campsites

- . Serviced campsites may not be cost effective. Most vehicles capable of service hookups can also operate independently for the normal length of stay as long as communal water and sanitary services are available.
- . To minimize servicing costs locate all serviced sites on a common loop.
- . All service connections should be located on the left side of the site to accommodate connections to R.V.s.
- . Electrical services to be constructed in conformance with the Electrical Protection Act. Electrical service should be one 15 Amp duplex and one 30 Amp duplex outlet per site.
- . A central sewage dumping station is preferable to a campsite sewer system unless the campsite sewer system can be serviced by the Municipality's sewer collection and treatment system.
- . Sewer hook-ups, if provided, should use a 75 mm treated sewer ferrule and plug and must be separated by 2 metres or more from the water riser.

Water hook-up to be a 20 mm swivel hose connection with water pressure of between 20 to 70 psi. All water supply bibs must have backflow prevention and must incorporate a self draining curbstop so the standpipe can be drained to prevent freezing during the winter. Alternately, the water service standpipe can be insulated and heat traced.

11.3.7 Visitor Services

All R.V. parks to have toilet facilities. Minimum requirement is 2 seats per 15 campsites. Unisex toilets are acceptable. Keep water source and toilet separated by a minimum of 30 metres. Locate toilets downwind of activity areas.

Provide adequate garbage containers. All containers should have lids to prevent odour and pest problems.

A source of drinking water must be supplied. The fixture must be clearly identified as "Drinking Water". Keep drinking water source at least 30 metres from the nearest toilet.

Build camper registration needs into the design. If self-registration stations are utilized they should be located near the entrance to each campsite loop on the right side of entering vehicle. Registration procedures should be clearly stated at a sign in close proximity to the campground entrance.

Visitor services should be located in clusters to make it convenient for campers to use. Cluster should be located within easy walking distance of campsites. Locating cluster near roads will minimize trail requirements and reduce disturbances to other campers.

Adequate pullover area should be provided adjacent to visitor services facilities to accommodate service vehicles.

Services such as firewood, picnic shelters, general picnic areas and open play areas to be provided at the discretion of the park developer.

11.3.8 Typical Site Layout & Servicing Plans

See Std. Drg. No. RV1 through RV4.

END OF SECTION 11

SECTION 12

LOW PRESSURE SEWER SYSTEM

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12.0 GENERAL

Low pressure sanitary collection systems are normally installed in cases where there is inadequate grade to economically install a gravity collection system. Due to the increased operation and maintenance costs associated with the septic tank and pump required for a low pressure system, it has been found that a gravity collection system is strongly preferred where adequate grade exists for economical construction.

A low pressure sewer system consists of two major elements; the onsite pressurization facility and the pressurized sewer main. The pressurization facility may consist of a grinder pump system or a septic tank and effluent pumping system. Due to the higher operational and maintenance requirements of a grinder pump system, the septic tank system has become the most common option. Household wastes are collected utilizing standard plumbing within the house and conveyed to a two-compartment septic tank. The liquid is pumped from the second compartment by an automatically controlled sewage pump located either in the second compartment (submersible pump) or a suction line leading to a pump located in the house basement (centrifugal pump). The pressurized sewer mains normally range in size from 30 mm to 100 mm depending upon the number of homes connected.

12.1 DESIGN CRITERIA**12.2 Septic Tanks**

A two-compartment septic tank with access manholes is required. Minimum recommended total volume is 3000 litres for a single-family dwelling. The septic tank serves as a solids settling and grease removal device as well as providing adequate volume retention to ensure reasonable pump cycle times. This reduces the possibility of simultaneous operation of several pumps and, thus, the peak flow entering the transmission main. Storage is also available for extended power outages or system failure. The first compartment of the tank should be pumped out once every two years to prevent solids build-up and the associated reduction in grease and solids removal efficiency. For detail see std. Drg. No. LP1

12.3 Sewage Pumps

Depending upon the homeowners preference the pump may be either a submersible pump installed in the second (liquids) chamber of the septic tank or a centrifugal pump installed in the basement with controls and a suction line installed in a conduit to the liquid compartment. A grinder pump may also be used, allowing the elimination of the septic tank, but they are high maintenance pumps and with elimination of the septic tank there is no storage available in case of power or system failure.

Experience has shown the maximum head for economical operation of a low pressure system is 24 metres (35 psi). Pumps with higher discharge pressure should not be utilized in a low pressure system unless a detailed engineering design has

recommended a higher pressure and all pumps and collection mains within the system have been selected to accommodate this higher pressure. Typical motor size is in the one third to half horsepower range.

Typically in small collection systems (40 homes or less) all the discharge pumps should have the same maximum discharge head. This ensures that if two or more pumps are running simultaneously, the pump with the least operational head (normally the house closest to the collection system discharge) will be able to pump the liquid chamber dry and shut-off. Upon shut-off the next pump will then be able to pump into the system. Mixing pumps with different maximum discharge heads may result in several pumps running simultaneously without being able to pump liquid into the system pressure (e pumps operate at "shut-off" head). This may result in overheating of the pump and, ultimately, pump failure.

Low pressure systems with large elevation differences may require pumps with different pump discharge pressure for economical operation. Normally the resident the farthest away from the receiving sewer or at the lowest elevation may require a higher discharge pressure. This requirement can only be determined upon detailed design of the system and requires careful pump selection to ensure the complete collection system operates correctly.

12.4 Fittings

As shown in Figure LP-1 all pump connections should incorporate double check valves and a gate valve downstream of the pump discharge. The incorporation of a check valve is an absolute necessity to ensure sewage does not flow backwards into the septic tank when the collection system is pressurized by other pumps. Two check valves are recommended as check valves are subject to failure due to debris. The consequence of failure is normally backflowing of sewage into the septic tank and, ultimately, the house basement if the problem is not corrected. The gate valve is required to isolate the pump and check valves for maintenance. All fittings should be either plastic, brass or stainless steel. Other materials will corrode and ultimately fail.

12.5 Service Line

The service line (line between septic tank and collector sewer in the street) should be 30 mm (1.25 inch) diameter minimum DR21 (Series 60) polyethylene pipe. Higher pressure rated pipe may be required (DR17, Series 80 or greater) in systems with long runs or large elevation differences.

A curb stop (shut off valve) and service box should be installed on property line to allow isolation of the service for maintenance.

Service connections to the mainline collector to be made utilizing either in line tees or saddles. All fittings to be either plastic, brass or stainless steel.

12.6 Collector Sewer

The collector sewer should be minimum DR21 (Series 60) polyethylene pipe. Higher pressure rated pipe may be required in systems with long runs or large elevation differences. The diameter of the collector sewer will vary depending on the number of residences. The following table can be used as a general guideline.

Maximum Number of Service Connections	Minimum Pipe Diameter
40 or less	50 mm (2 inch)
70	75 mm (3 inch)
120	100 mm (4 inch)

It should be noted that the collector sewer should not be oversized solely to reduce head loss due to friction. This will result in low flow velocities and may lead to plugging of the line due to settling out of solids. Minimum recommended size is 50 mm (2 inch) diameter.

All mains should be installed with a minimum of 2.7 metres of cover to top of pipe to ensure adequate frost protection. If line is installed under a roadway that receives regular snow removal, the depth of cover should be increased to 3.0 metres.

END OF SECTION 12

SECTION 13

GUIDELINES FOR DESIGN OF SAFE ACCESSIBLE PEDESTRIAN ENVIRONMENTS

SECTION 13:GUIDELINES FOR DESIGN OF SAFE ACCESSIBLE PEDESTRIAN ENVIRONMENTS13-1 TO 13-14

Prepared and recommended by Alberta Transportation & Utilities (December 1995)

Guidelines for Design of Safe Accessible Pedestrian Environments

Introduction

Pedestrian environments which are designed to be used by the general public, including those with disabilities, should be accessible to all persons, as well as being safe, functional and attractive. The purpose of these guidelines is to bring together the principles of good design as well as to highlight some of the commonly experienced barriers in the pedestrian environment and to illustrate some design solutions.

Principles of Good Design

Pedestrian environments in public places, either publicly or privately owned, should be designed to allow safe and convenient access by all pedestrian traffic. Although the majority of pedestrian traffic is ambulatory, a significant and growing number of pedestrians have somewhat restricted mobility due to disability or age. This group includes persons using walkers, scooters, wheelchairs (both manual and electric), people with impaired vision or hearing and some seniors. An additional group may have limited mobility temporarily due to the need to bring along a baby carriage or other wheeled device on their trips.

To ensure that the design of pedestrian environments accommodates the greatest possible number of people, it is desirable to adhere to the following:

1. Allow a clear path of travel, free of obstructions to a minimum height of 1980mm. Examples of obstructions are directional signs, tree branches, guy wires and street furniture. Handrails projecting up to 100mm into the clear path of travel are permitted. See drawing TEMP-4.2M97.
2. Provide a firm, even, non-slip, glare-free surface (for example: broom concrete finish). An elevation change of 13mm or more is considered to be a trip hazard and therefore should not be permitted in the clear path of travel.
3. Ensure that gradients along the path of travel are very gradual to allow access by all and that landings are added according to the desirable spacing shown in Table 1, where feasible.

Table 1 Sidewalk Gradients

Max. Slope	Max. Length	Max. Height	Landings
less than 2%	None	None	Not required
2% < grade < 5%	None	None	landings at 750mm elevation differences are desirable
5%	None	None	Every 9m *
6.25%	12m	750mm	Every 9m *
8.3%	9m	750mm	Every 9m *
10%	1.5m	150mm	- *
12.5%	.6m	75mm	- *

* Note: Sidewalks with gradients of 5% or steeper are generally considered to be ramps and therefore a minimum spacing of 9m between landings is suggested. It is recognized that the gradient and building layout on some streets may make the provision of landings impractical.

4. Provide a sufficiently wide path to suit the intended traffic. Generally an unobstructed clear width of 1.5m should be considered a minimum however intermittent narrower paths of 1.2m width are allowed for short segments or adjacent to obstacles.
5. Provide standardized ramps where necessary to cross curbs, etc.
6. The standardized maximum gradient (0.08m/m) used on ramps should also be applied where driveways or alleyways cross sidewalks. This maximum applies to the sides of the ramp as well as to the ramp proper.
7. Provide tactile cues for people with impaired vision and audible cross walk signals where warranted at intersections. For example, the use of a 10mm high lip is suggested to delineate the edge of roadway (beginning of ramp) or other significant boundaries, see drawing CB6-4.2M86 attached. Tactile cues are also recommended to delineate the edge of hazard in pedestrian areas, for example edge of platform at rail station or top of stairs, etc.

For additional information on Audible Traffic Signals, designers are referred to the Uniform Traffic Control Devices for Canada manual, published by the Transportation Association of Canada.

8. Ensure that drainage grates on the covers of catch basins or manholes are located off the clear path of travel where possible, i.e. not on curb ramps for example. Where it is not feasible to relocate a catch basin inlet off a ramp, for example due to excessive cost on a retrofit project, the second choice is to offset the ramp provided that the ramp will still give direct access to the crosswalk. The third choice is to have the grate installed in the ramp however in this case the cover should be installed as shown on drawing TEMP 4.2M96 i.e. so that the long dimension of the elongated opening is perpendicular to the pedestrian path of travel on the ramp.
9. Grates for non-drainage structures for example electrical vaults or access hatches, etc., should be located off the clear path of travel where possible. Where grates are necessary, they should have no opening that will permit the passage of a sphere more than 13mm diameter. Drawing TEMP-4.2M97 shows the maximum recommended opening size and orientation for non-drainage grates located in pedestrian areas. If the gratings have elongated openings, they should be placed so that the long dimension is perpendicular to the direction of travel.

Some barriers to travel

Although most pedestrian environments in Alberta that have been designed and built in recent years are generally barrier-free, there are some construction and operational practices that present a barrier to the public at large and can have a much more restrictive impact on people with transportation disabilities.

One set of obstacles can generally be referred to as street furniture. This includes light poles, fire hydrants, traffic signals, signs, bus benches, mail boxes, newspaper vending machines, sandwich boards, tables, bike racks, waste receptacles, telephone booths, bollards, trees, etc. These items are frequently needed or desired on streets, however their placement should be carefully planned to ensure that they do not become a hazard for people with impaired vision or an obstacle for wheelchair users or other pedestrians.

A second area of concern, especially for older pedestrians and wheelchair users is the use of paving stones or bricks in pedestrian areas. The main difficulty with paving stones is the uneven surface that can result due to differential settlement that generally occurs within a few years of construction. Some paving stones have rounded edges on the surface which creates a wider and deeper joint. The uneven surfaces and joints can cause pedestrians to trip, will give wheelchair users a rough ride and could contribute to persons falling from their wheelchairs. Where paving stones are used in an indoor setting, although frost heaving and differential settlement may be eliminated, the stone surface still provides a less than ideal riding surface for people using wheelchairs.

Based on the above, it is preferred that an even concrete surface be provided for the main path of travel through pedestrian areas. Ideally, paving stones should be used as borders only. Where a designer chooses to use a paving stone edger on a sidewalk, the outside edge (adjacent to curb) is generally preferred. This provides a good tactile cue for people with impaired vision while also ensuring that the main path of pedestrian travel is separated from vehicular traffic. In general, a safer and more functional pedestrian environment would result if the clear path of travel was given top priority in all layouts i.e. with decorative finishes, paving stone tree surrounds and other street furniture not being permitted to encroach on the path of travel.

Design Solutions

1. **Ensure street furniture does not encroach on the clear path of travel in pedestrian areas.**

In the case of lower volume residential or light industrial sidewalks where a monolithic curb, gutter and sidewalk cross-section has been selected, it is preferred that all street furniture be placed on the private property side of the sidewalk i.e. away from the roadway, so as not to encroach on the clear path of travel.

Where additional right-of-way is available, a boulevard between roadway and sidewalk is very desirable aesthetically, provides greater safety for pedestrians and allows street furniture to be placed off the pedestrian walking surface.

Where wider sidewalks are required, for example in commercial or business areas or in the vicinity of educational or health care facilities, the sidewalk cross-section should generally be designed to accommodate street furniture without encroaching on the clear path of travel and while still providing a minimum 800mm offset from the curb to allow for vehicle door-openings. Where buildings are constructed adjacent to sidewalks, it is best to place street furniture on the curb side of the walkway thus providing a greater offset between the pedestrian clear path of travel and the vehicular traffic. The absence of obstructions along the face of buildings is desirable.

On major arterial roads, where higher speeds and higher traffic volumes are expected, a 3m offset between curb and sidewalk is desirable. A grass surface may be used to provide a contrasting colour and texture for the boulevard.

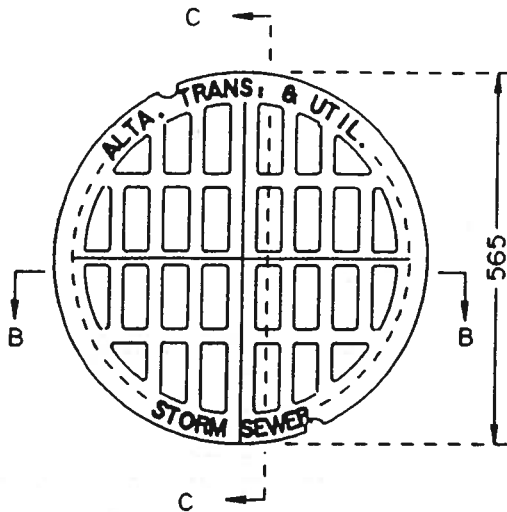
Drawing TEMP 4.2M95 (attached) shows the typical cross-sections for the sidewalks described here.

2. **If paving stones are required on a project, they should not be placed across the main path of travel where they would be a barrier or possible hazard to some pedestrians.**

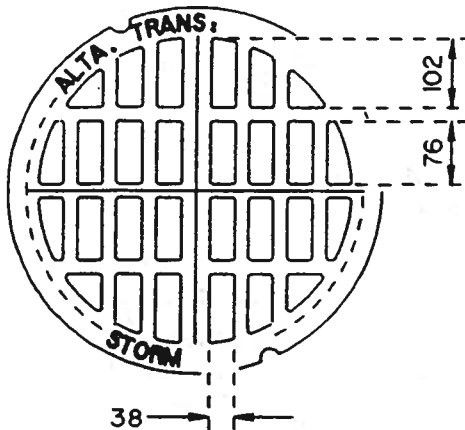
In addition to the above, measures should be taken to ensure that the effects of frost heave and/or differential settlement of paving stones are minimized. Experience has shown that the best way to ensure the integrity of a surface is to build a strong base. The major cities in Alberta have used either lean concrete or soil cement for this purpose. A leveling course of sand is generally used on top of the base and the paving stones are placed on the sand. If the back of the walkway is within 3.0m of a building, a 50mm layer of rigid insulation is typically placed under the base to reduce frost penetration into the subgrade. A 50mm layer of crushed gravel may also be used below the insulation. The attached drawing, TEMP 4.2M93, shows a typical structure which should provide a safe, smooth partially paved sidewalk.

TEMP 4.2M94 is a plan view of a typical urban intersection where paving stones have been used to delineate the edge of sidewalk and crosswalk while not obstructing the clear path of travel. Drawings CB6-4.2M85, 86, 87 and 91 are also included to show the typical layout and construction details for ramps where urban sidewalks meet crosswalks. Drawing CB6-2.10M34 shows the details of a special catch basin/manhole frame and cover that is suitable for use on a curb ramp.

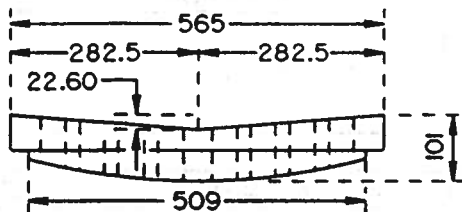
COVER-PLAN VIEW



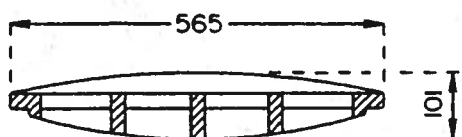
OPENING SIZES



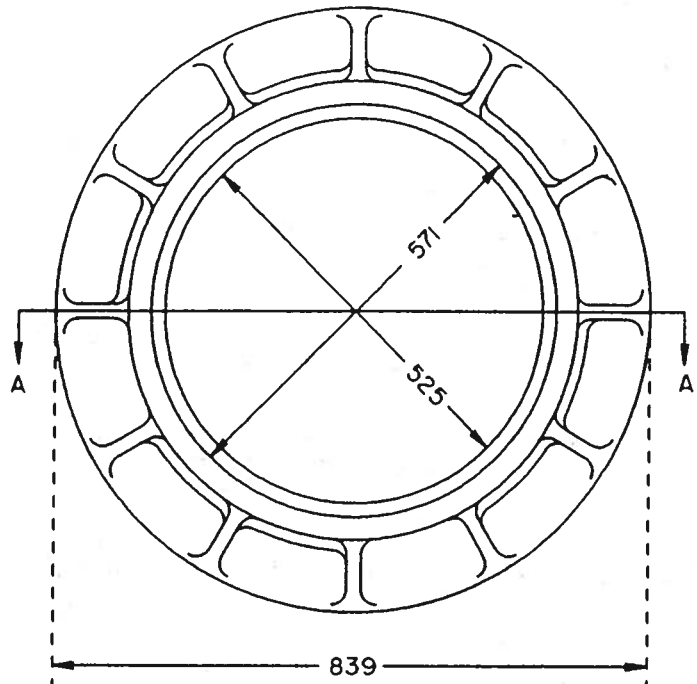
SECTION B-B



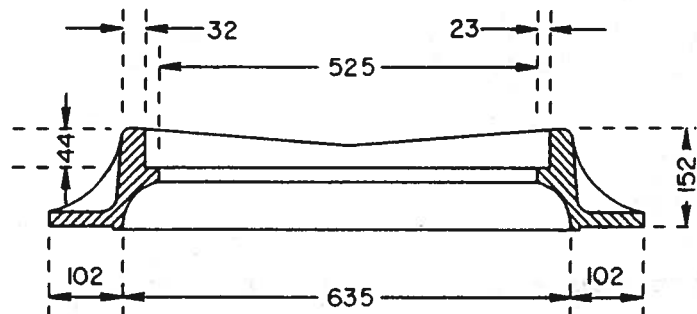
SECTION C-C



FRAME-PLAN VIEW



SECTION A-A



NOTES:

1. DIAGRAMS ARE BASED ON TYPE F-38 FOUNDRY CASTINGS.
2. NOMINAL DIMENSIONS IN mm.
3. THE LETTERING IS TO BE 'STANDARD RAISED CAST LETTERING' WITH 50mm SIZE LETTERS.

No.	REVISIONS	BY	DATE

Approved:

Allan Dwan
Executive Director,
Roadway Engineering Branch

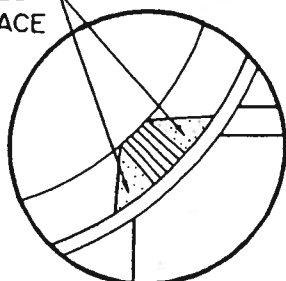
Date: DECEMBER 4, 1995

Alberta
TRANSPORTATION
AND UTILITIES
Engineering Division

**WHEELCHAIR RAMP
CATCH BASIN
MANHOLE COVER**

Prepared By: R.M.	Checked By: <i>B.K.</i>	Scale: N.T.S.	Dwg No.: CB6-2.10M34
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SLOPED
SURFACE



DETAIL 2

1.8 SIDEWALK

1.8 SIDEWALK

- Type 1 ramp locations.
- * Type 2 ramp locations.

SEE DETAIL 2

R=12

R=12

SEE
DETAIL 1

R=1.5

R=3.0

R=1.5

R=60

R=60

R=1.5

R=1.5

SLOPED
SURFACE
MAXIMUM 8.0%

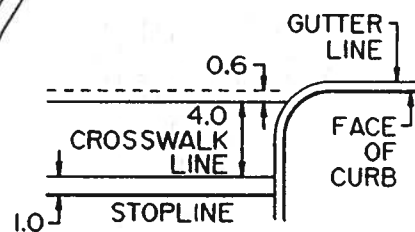
TOP OF
CURB

BACK OF
SIDEWALK

1500mm
MINIMUM
RAMP

1500mm
MINIMUM
RAMP

SECTION A-A



DETAIL SHOWING
CROSSWALK DIMENSIONS

Notes:

1. All dimensions are in metres unless otherwise specified.
2. Sidewalk ramps must provide access directly to crosswalks.
3. The selection of curb ramp type is dependent on the location of the crosswalk relative to the curb face. Where the curb return radius is greater than or equal to 4.0m, one Type 2 ramp can be used. Where the curb return radius is less than 4.0m, two Type 1 ramps are required.
4. Where crosswalks are controlled by signals with a push-button system, the sidewalks and ramps must allow access by wheelchair to the push-button.
5. Refer to Drawing Nos. CB6-4.2M86 & CB6-4.2M87 for details of Type 1 and Type 2 ramps.
6. On a sharp corner where two Type 1 ramps are being used, the slope on the flared areas between the two ramps can be less than the 0.08m/m maximum shown. This will provide a smoother sidewalk for general use especially for pedestrians who are not using the crosswalk.

A			
A	Type 1 ramp layout modified.	BK.	Aug.94
No.	REVISIONS	BY	DATE

Approved:

Executive Director

Executive Director,
Roadway Engineering Branch

Alberta

TRANSPORTATION
AND UTILITIES
Engineering Division

Date: JULY 2, 1991

TYPICAL LAYOUT OF CROSSWALKS AND LOCATION AND TYPE OF SIDEWALK RAMPS AT URBAN INTERSECTIONS

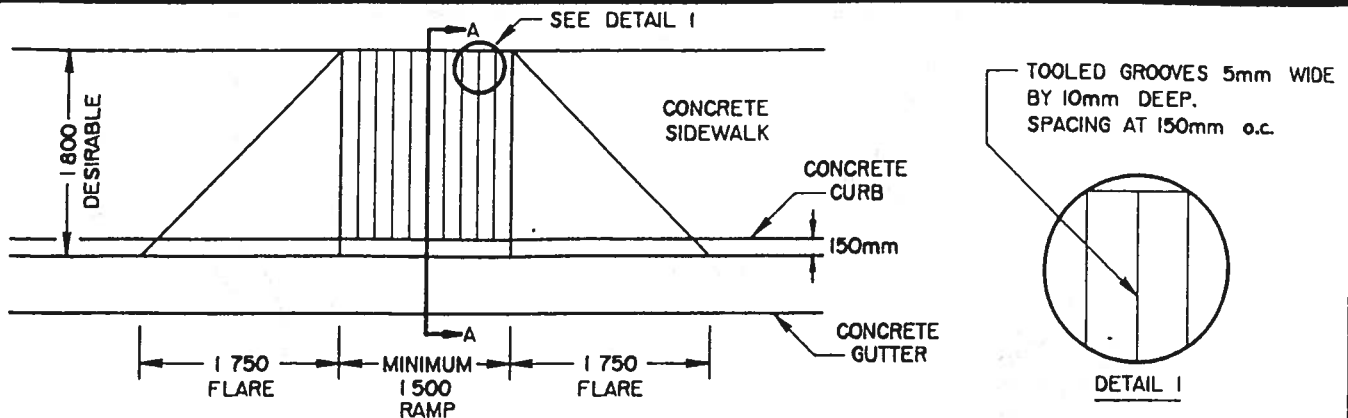
Prepared
By: R.T.

Checked
By: BK.

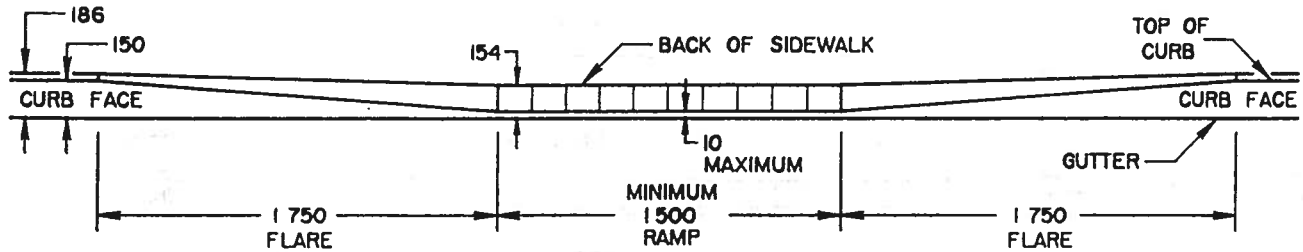
Scale:
N.T.S.

Dwg No.:

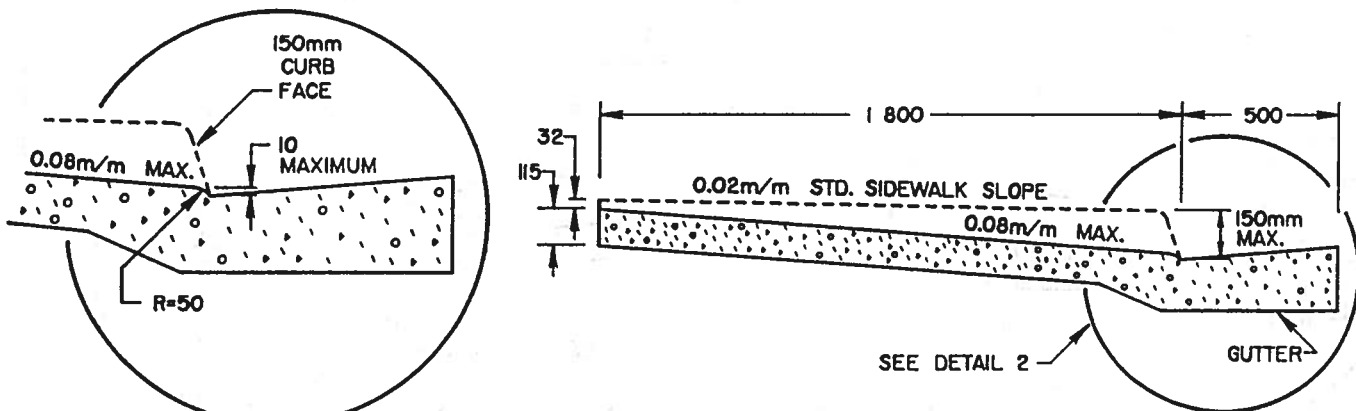
CB6-4.2M85



TYPICAL PLAN VIEW



TYPICAL ELEVATION

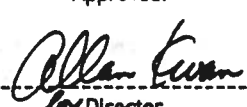
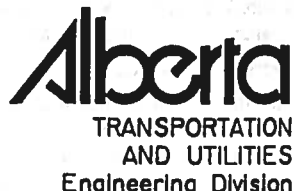


TYPICAL CROSS SECTION (A-A)

Notes:

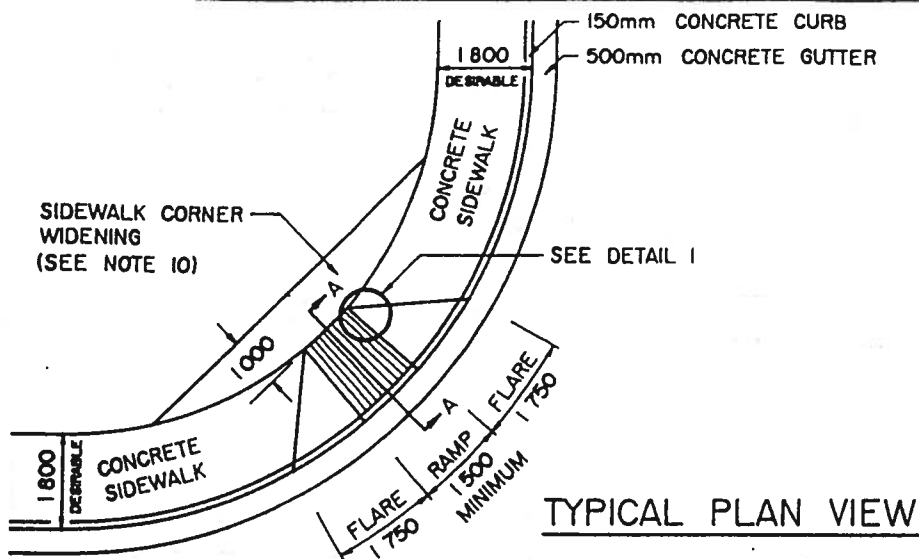
1. All dimensions are in millimetres unless otherwise specified.
2. Ramps for users of wheelchairs/bicycles should be located at all junctions of crosswalks and sidewalks.
3. Grooves on sidewalk ramps are to alert persons who are visually impaired of the curb-cut and a street crossing.
4. Where crosswalks are controlled by signals with a push-button system, the sidewalks and ramps must allow access by wheelchair to the push-button.
5. Concrete sidewalks, curbs and ramps to be poured monolithically.
6. Minimum width of ramp is 1500mm. It may be necessary to build wider ramps in busy urban areas where the volume of pedestrian traffic is high.
7. Maximum ramp slope is 0.08m/m.
8. Where the sidewalk is less than 1800mm wide, the 0.08m/m maximum slope should not be exceeded and therefore the back of the sidewalk must be lowered accordingly.
9. Refer to Drawing No. CB6-4.2.M85 for typical layout of crosswalks and location and the type of ramp to be used.
10. For details of typical ramps for 90 degree corners, refer to Drawing No. CB6-4.2.M87.

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No.	REVISIONS	BY	DATE

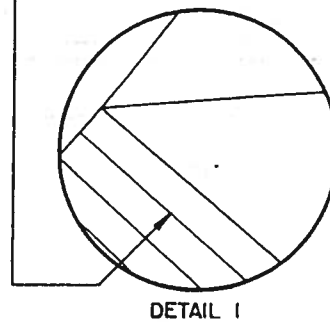
Approved:	 Director, Design Engineering Branch		
Date:	JULY 2, 1991		

CONCRETE SIDEWALK RAMP FOR
WHEELCHAIR OR BICYCLE
ON TANGENT (TYPE I)

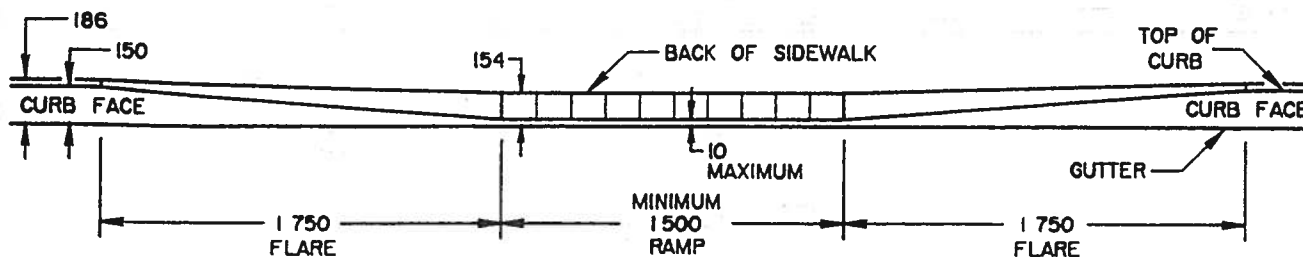
Prepared By: R.T.	Checked By: B.K.	Scale: N.T.S.	Dwg No.: CB6-4.2.M86
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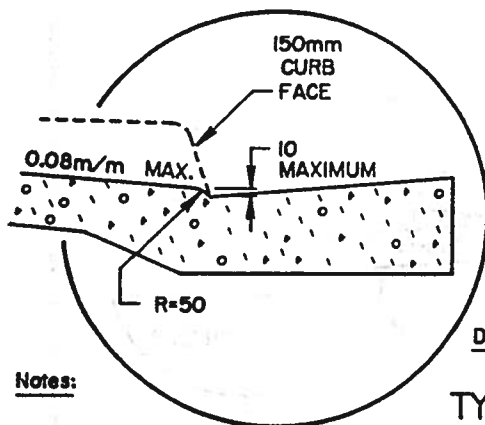
TOOLED GROOVES 5mm WIDE
BY 10mm DEEP.
SPACING AT 150mm o.c.



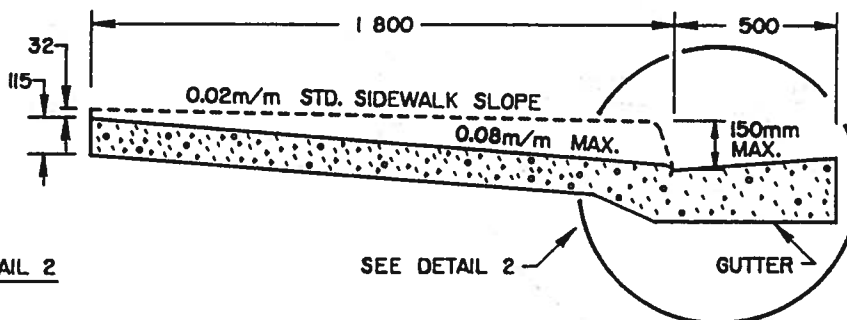
TYPICAL PLAN VIEW



TYPICAL ELEVATION



DETAIL 2



TYPICAL CROSS SECTION (A-A)

Notes:

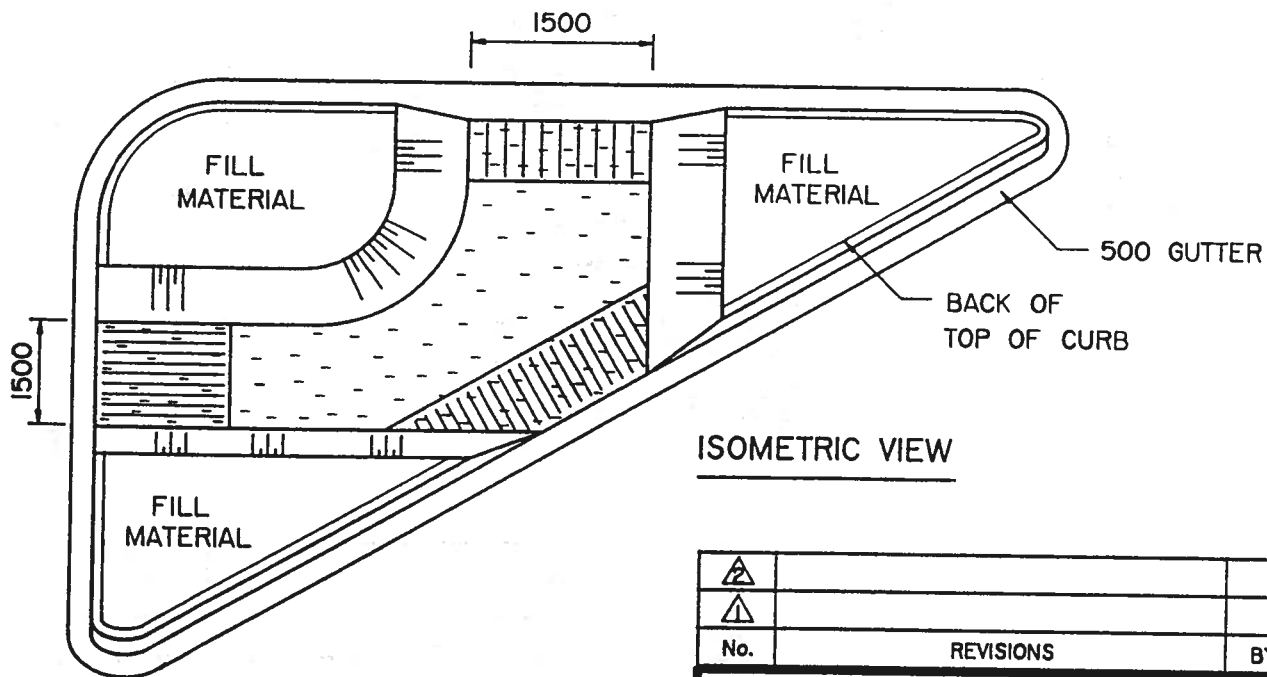
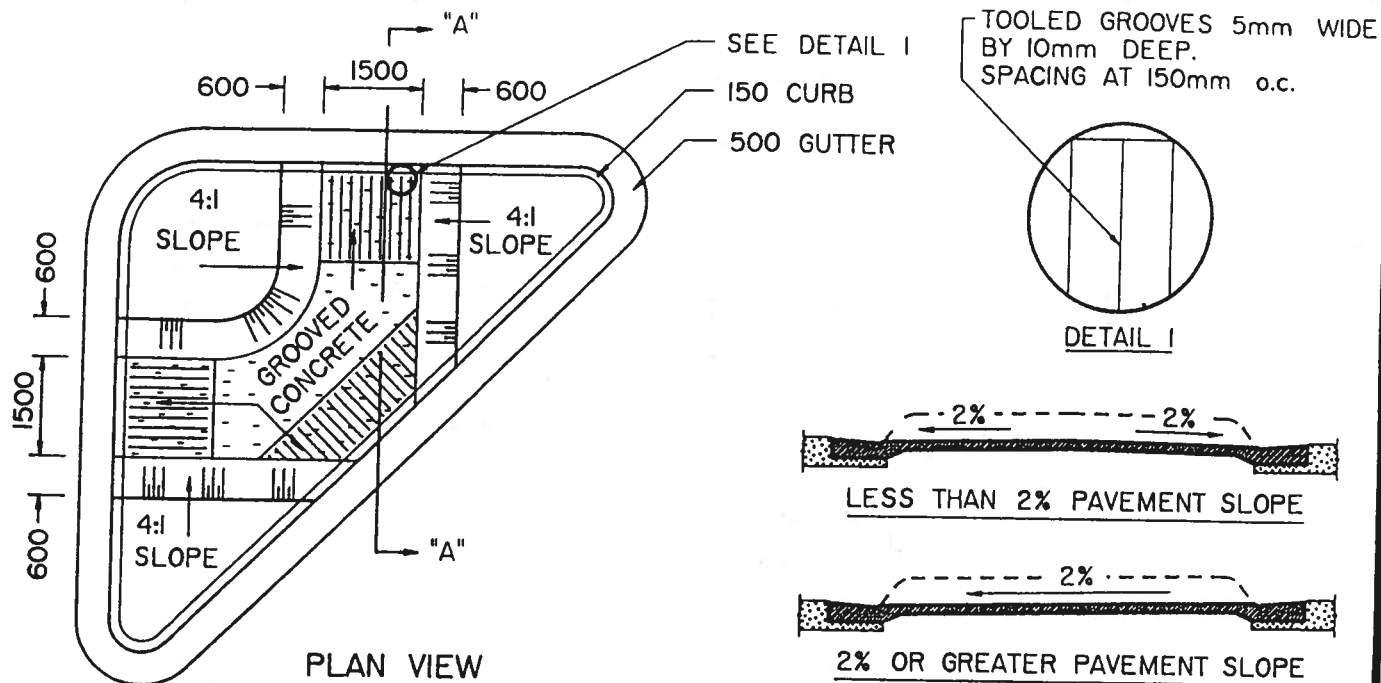
1. All dimensions are in millimetres unless otherwise specified.
2. Ramps for users of wheelchairs/bicycles should be located at all junctions of crosswalks and sidewalks. Ramp must be located within a crosswalk.
3. Grooves on sidewalk ramps are to alert persons who are visually impaired of the curb-cut and a street crossing.
4. Where crosswalks are controlled by signals with a push-button system, the sidewalks and ramps must allow access by wheelchair to the push-button.
4. Concrete sidewalks, curbs and ramps to be poured monolithically.
5. Minimum width of ramp is 1500mm. It may be necessary to build wider ramps in busy urban areas where the volume of pedestrian traffic is high.
3. Maximum ramp slope is 0.08m/m.
7. Where the sidewalk is less than 1800mm wide, the 0.08m/m maximum slope should not be exceeded and therefore the back of the sidewalk must be lowered accordingly.
3. Refer to Drawing No. CB6-4.2.M85 for typical layout of crosswalks and location and the type of ramp to be used.
7. For details of typical ramps for tangent sections, refer to Drawing No. CB6-4.2.M86.
3. Where right-of-way is available, the sidewalk is to be widened at corner locations as shown so that at least a 1.0m width of "flat" sidewalk is provided adjacent to the ramp.

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No.	REVISIONS	BY	DATE

Approved: Director, Design Engineering Branch		Alberta TRANSPORTATION AND UTILITIES Engineering Division
Date: JULY 2, 1991		

CONCRETE SIDEWALK RAMP FOR
WHEELCHAIR OR BICYCLE
ON CORNER (TYPE 2)

Prepared By: R.T.	Checked By: B.K.	Scale: N.T.S.	Dwg No.: CB6-4.2.M87
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Notes:

1. All dimensions are expressed in millimetres unless otherwise noted.
2. Where crosswalks are controlled by signals with a push-button system, the sidewalks and ramps must allow access by wheelchair to the push-button.
3. Add 10M rebar to the ends of all bullnoses, medians and traffic islands.
4. Fill material for islands shall be earth, concrete or asphalt concrete as specified.
5. Sidewalk and ramps shall be concrete.

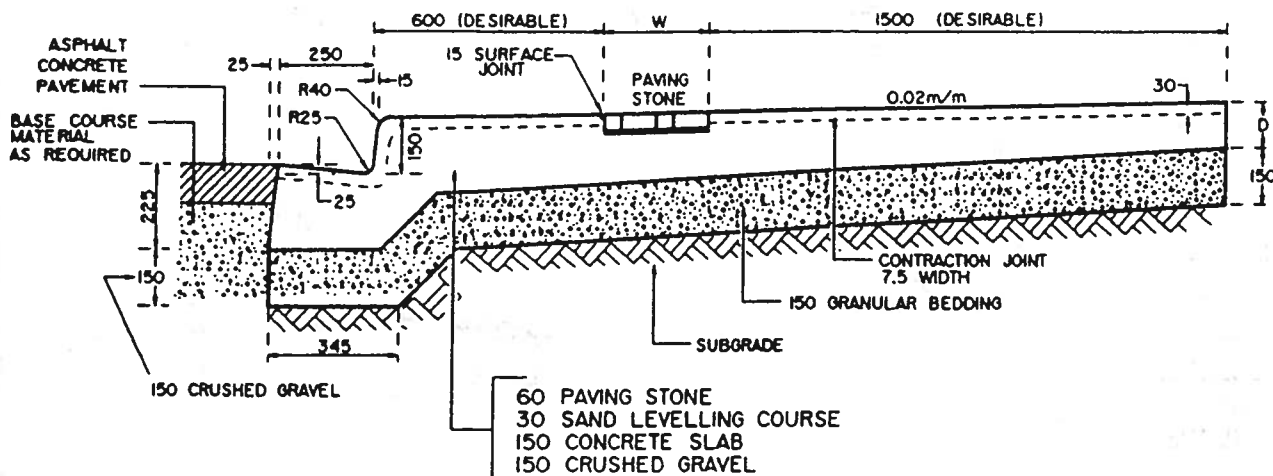
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No.	REVISIONS	BY	DATE

Approved:	
 Director, Design Engineering Branch	
Date:	JULY 2, 1991

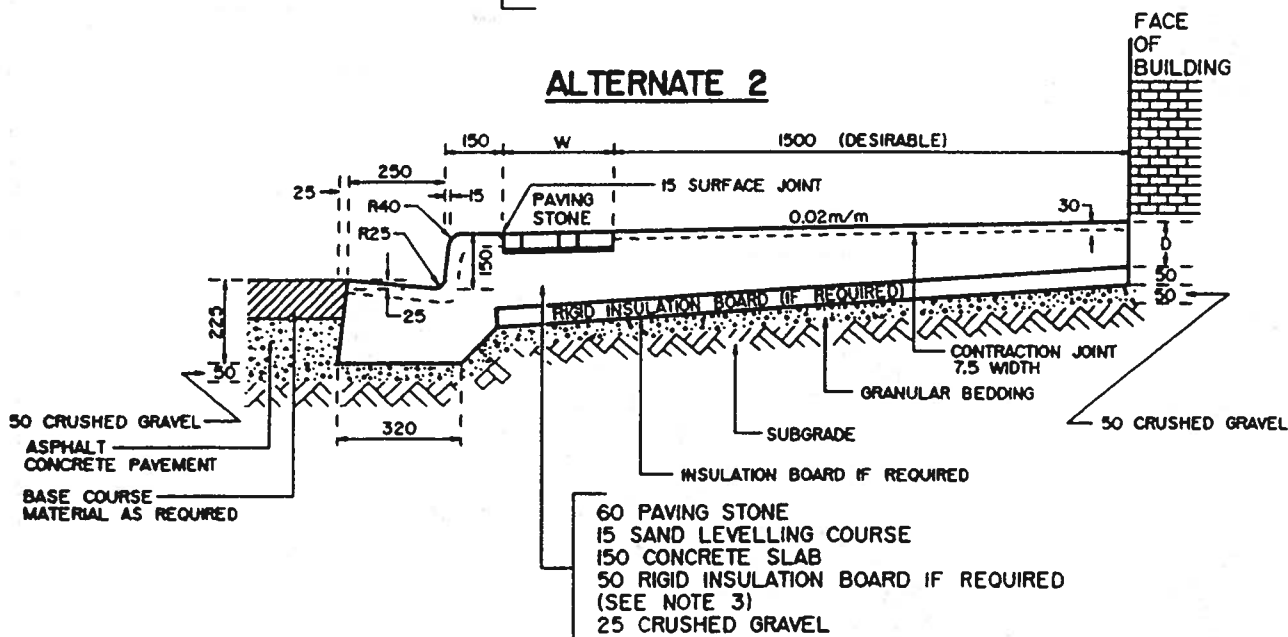
TYPICAL SIDEWALK AND CROSSWALK LAYOUT OF SMALLER ISLANDS AND MEDIANS LESS THAN 6m WIDE

Prepared By: R.T.	Checked By: 3K.	Scale: N.T.S.	Dwg No.: CB6-4.2.M91
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ALTERNATE 1



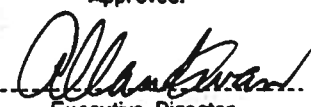



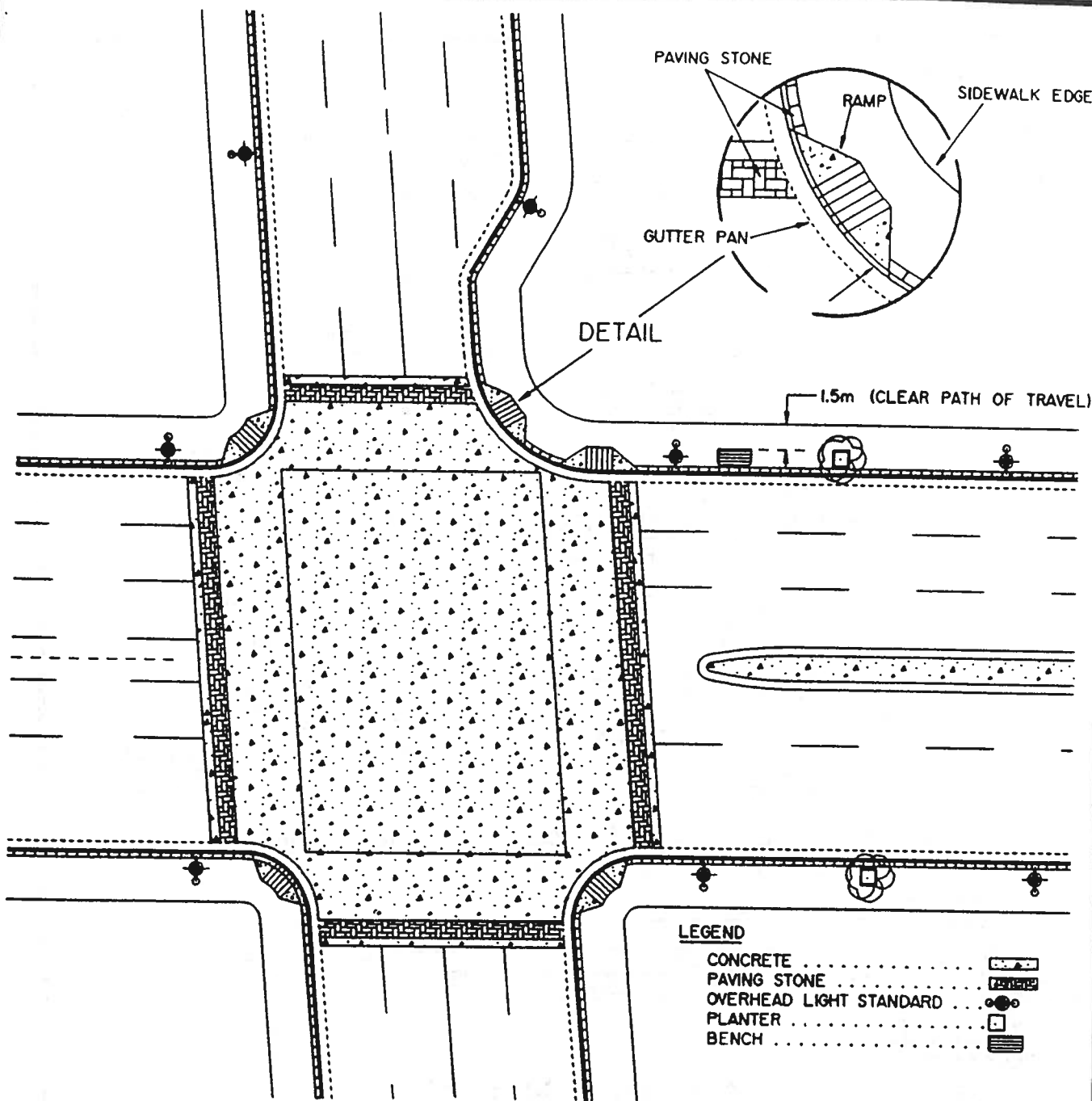
ALTERNATE 2



NOTES

1. DEPTH OF CONCRETE FOR SIDEWALK 'D' AS PER DETAILED DESIGN.
2. 'W' IS THE WIDTH OF PAVING STONE EDGING GUIDE. THIS MAY BE SELECTED BASED ON OVERALL WIDTH BUT SHOULD NOT CAUSE CONCRETE SURFACE TO BE REDUCED TO LESS THAN 1500mm.
3. ALTERNATIVE 2 IS GENERALLY USED ONLY IN DOWNTOWN AREAS WHERE THE SIDEWALKS ADJACENT TO BUILDINGS AND FREQUENT FREEZE-THAW CYCLES ARE LIKELY TO CAUSE LONGITUDINAL CRACKING.
4. THE GUTTER PAN WIDTH MAY BE ADJUSTED WHERE NECESSARY TO MEET DRAINAGE REQUIREMENTS.
5. ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED.

			
			
No.	REVISIONS	BY	DATE
Approved:  Executive Director, Roadway Engineering Branch			
Date: DECEMBER 4, 1995			
MONOLITHIC CONCRETE SIDEWALK CURB AND GUTTER (250mm GUTTER) PAVING STONE EDGING			
Prepared By: R.M.	Checked By: B.K.	Scale: N.T.S.	Dwg No.: CB6-4.2M93



NOTES

1. THIS DRAWING ILLUSTRATES A SIDEWALK/CROSSWALK/RAMP LAYOUT WHICH PROVIDES AN ACCESSIBLE CLEAR PATH OF TRAVEL.
2. USE OF PAVING STONES AS SHOWN IS HELPFUL TO THE VISUALLY IMPAIRED WHILE NOT BEING AN OBSTACLE FOR WHEELCHAIR USERS OR OTHER PEDESTRIANS. PAVING STONE EDGING AS SHOWN PROVIDES A TACTILE CUE FOR THE VISUALLY IMPAIRED BY DEFINING THE EDGES OF SIDEWALK AND OUTLINING AREAS TO BE USED FOR STREET FURNITURE. TO OUTLINE THE CROSSWALK, TEXTURED AND/OR COLOURED CONCRETE OR OTHER MATERIALS MAY BE USED INSTEAD OF PAVING STONES.
3. PAVING STONES DO NOT ENCR OACH ON THE SIDEWALK'S CLEAR PATH OF TRAVEL.

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No.	REVISIONS	BY	DATE

Approved:

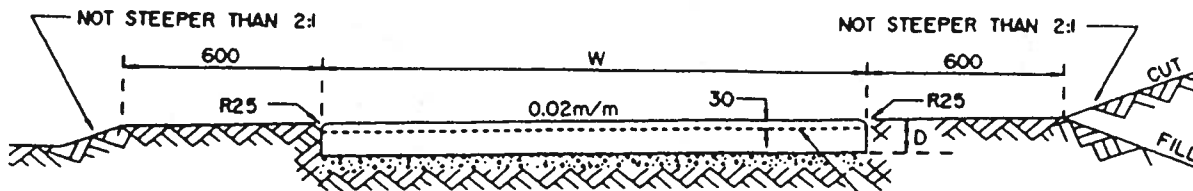
Alan K.
Executive Director,
Roadway Engineering Branch

Date: DECEMBER 4, 1995

Alberta
TRANSPORTATION
AND UTILITIES
Engineering Division

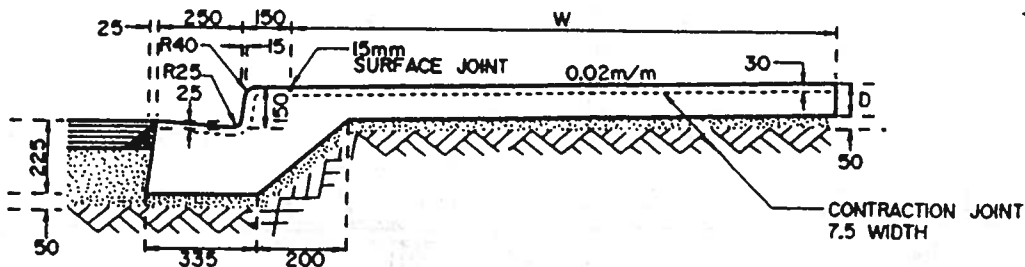
EXAMPLE OF USE OF PAVING STONES ON URBAN INTERSECTION

Prepared By: R.M.	Checked By: B.K.	Scale: N.T.S.	Dwg No.: CB6-4.2M94
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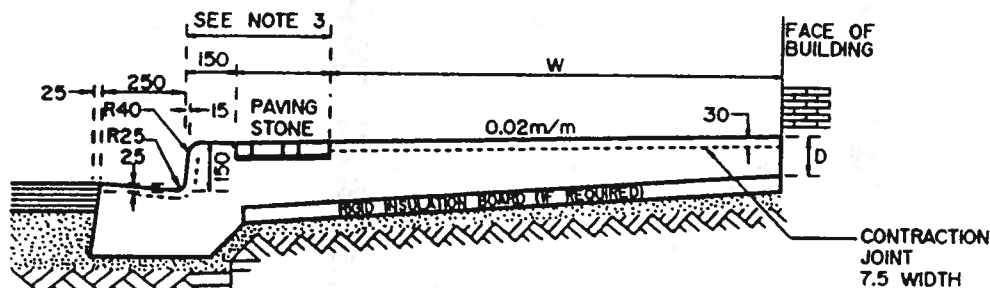
SIDEWALK

(SEE DRAWING CB6-4.2M78 FOR DETAILS)



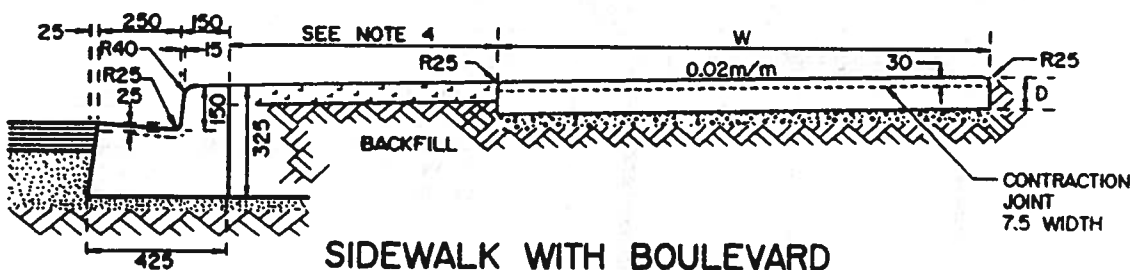
STANDARD MONOLITHIC SIDEWALK

(SEE DRAWING CB6-4.2M88 FOR DETAILS)



MONOLITHIC SIDEWALK WITH PAVING STONE EDGING


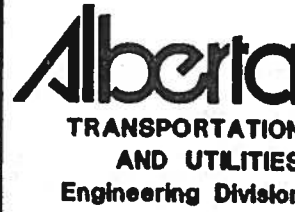
(SEE DRAWING CB6-4.2M93 FOR DETAILS)

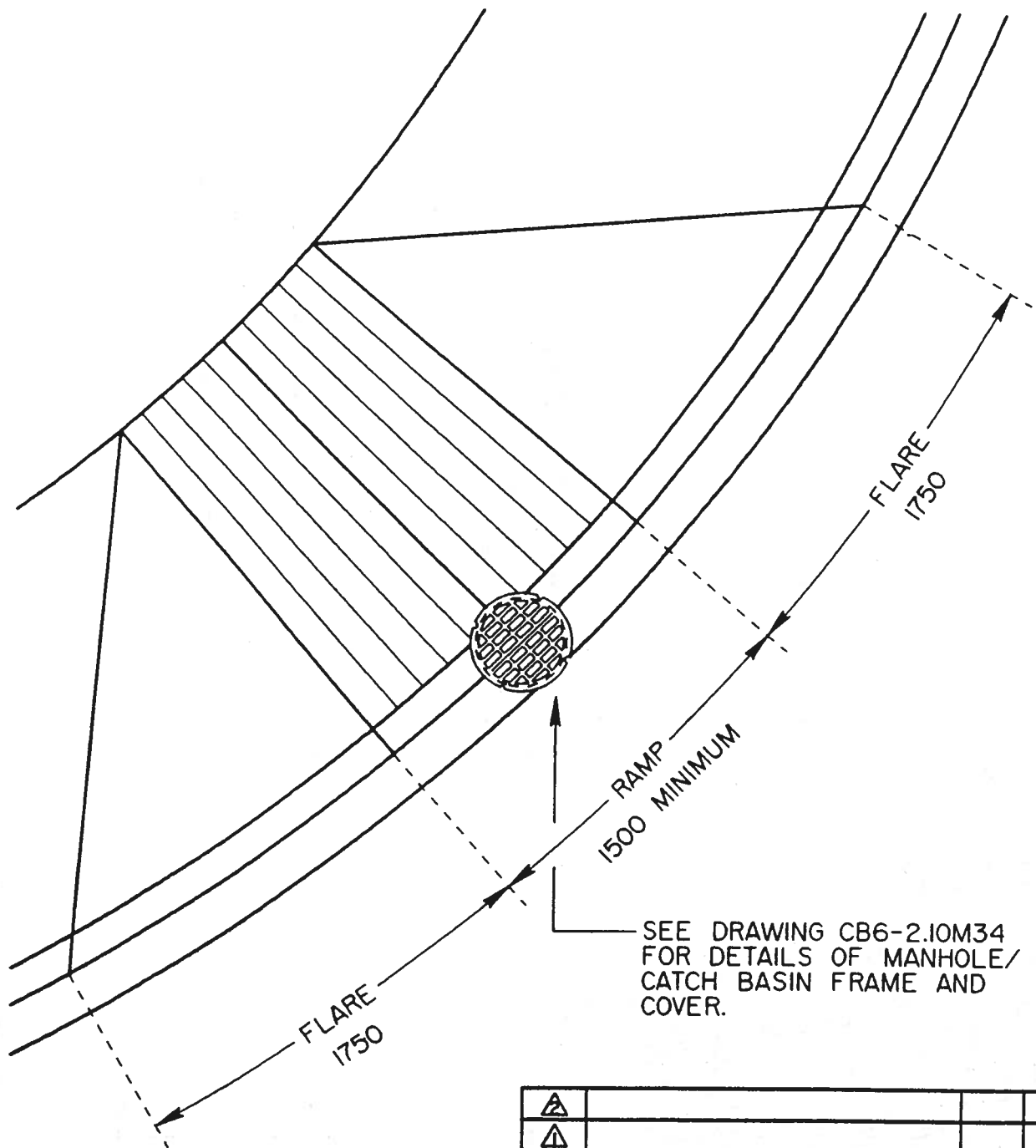


SIDEWALK WITH BOULEVARD

NOTES

1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. 'W' IS THE WIDTH OF CLEAR PATH OF TRAVEL. 1.5m IS THE SUGGESTED MINIMUM HOWEVER, INTERMITTENT NARROWER PATHS OF 1.2m WIDTH ARE ALLOWED FOR SHORT SEGMENTS OR ADJACENT TO OBSTACLES.
3. WHERE PAVING STONE EDGING IS USED, THE WIDTH OF THE BORDER SHOULD GENERALLY ALLOW AN 800mm CLEARANCE FOR VEHICLE DOOR OPENINGS AND MAY ALSO ACCOMMODATE SOME STREET FURNITURE.
4. WHERE A BOULEVARD IS USED, IT IS DESIRABLE THAT IT BE WIDE ENOUGH TO ALLOW FOR DOOR OPENINGS (800mm) AND PLACEMENT OF STREET FURNITURE. NARROW BOULEVARDS ARE NORMALLY PAVED, WIDER BOULEVARDS (APPROXIMATELY 3m) MAY BE GRASS.
5. 'D' IS THE DEPTH OF CONCRETE, AS SPECIFIED.

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No.	REVISIONS	BY	DATE
Approved:			
 Executive Director, Roadway Engineering Branch			
Date: DECEMBER 4, 1995			
<h2>SIDEWALKS</h2> <h2>TYPICAL CROSS SECTIONS</h2>			
Prepared By: R.M.	Checked By: B.K.	Scale: N.T.S.	Dwg No.: CB6-4.2M95





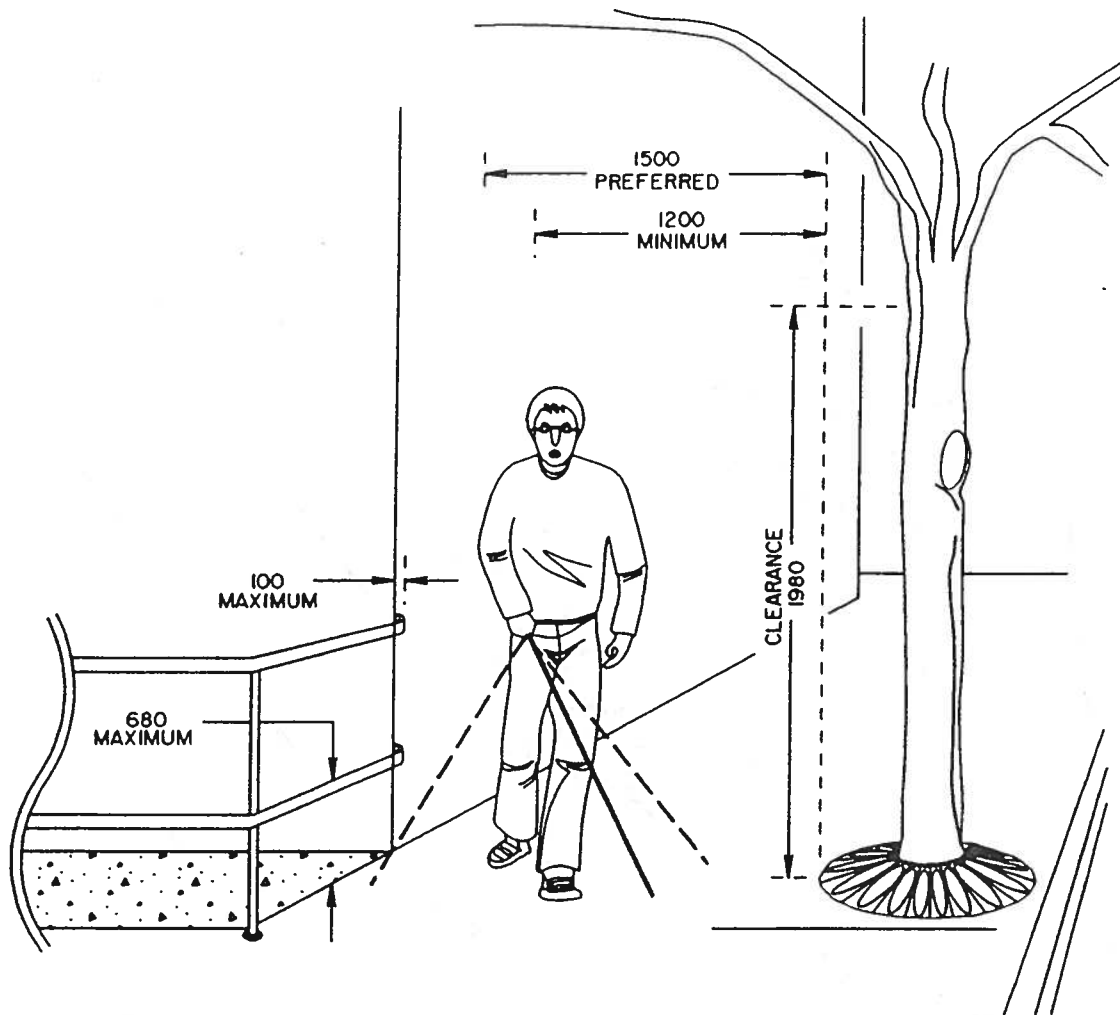
SEE DRAWING CB6-2.10M34
FOR DETAILS OF MANHOLE/
CATCH BASIN FRAME AND
COVER.

TYPICAL PLAN VIEW

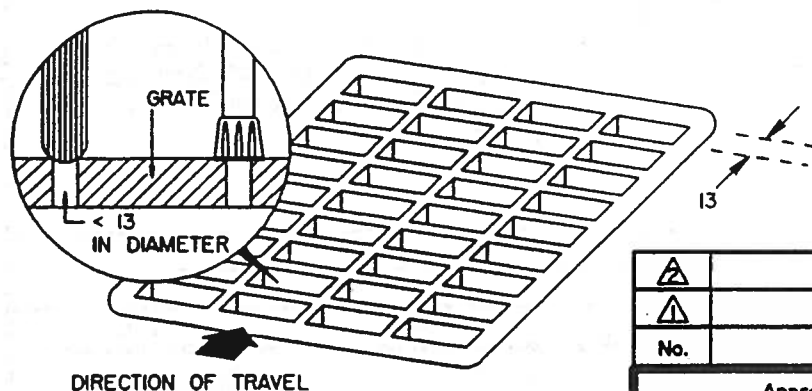
NOTE

1. IT IS PREFERRED THAT GRATES BE CONSTRUCTED OFF THE CLEAR PATH OF PEDESTRIAN TRAVEL WHERE FEASIBLE. WHERE IT IS NECESSARY TO INSTALL GRATES IN RAMPS, THE COVER SHOULD BE INSTALLED AS SHOWN HERE I.E. SO THAT THE LONG DIMENSION OF THE ELONGATED OPENING IS PERPENDICULAR TO THE PEDESTRIAN PATH OF TRAVEL ON THE RAMP.

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No.	REVISIONS	BY	DATE
Approved:  Director, Engineering Branch		 TRANSPORTATION AND UTILITIES Engineering Division	
Date: DECEMBER 4, 1995			
WHEELCHAIR RAMP SPECIAL CATCH BASIN MANHOLE COVER			
Prepared By: R.M.	Checked By: B.K.	Scale: N.T.S.	Dwg No.: CB6-4.2M96



OPENINGS LARGER THAN 13mm MAY CATCH WHEELCHAIR WHEELS OR CANES, AND MAY CAUSE A PERSON TO TRIP.



△			
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No.	REVISIONS	BY	DATE

Approved: Director, Engineering Branch		Alberta TRANSPORTATION AND UTILITIES Engineering Division
Date: DECEMBER 4, 1995		

PEDESTRIAN PATH OF TRAVEL

- DIMENSIONS OF ENVELOPE
- GRATE SIZE & ORIENTATION

Prepared By: R.M.	Checked By: B.K.	Scale: N.T.S.	Dwg No.: CB6-4.2M97
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NOTES

1. NOMINAL DIMENSIONS IN mm.
2. IT IS PREFERRED THAT GRATES BE LOCATED OFF THE CLEAR PATH OF PEDESTRIAN TRAVEL. WHERE IT IS NECESSARY TO INSTALL GRATES IN A PATH, THE COVER SHOULD BE ORIENTED AS SHOWN HERE i.e. SO THAT THE LONG DIMENSION OF THE ELONGATED OPENING IS PERPENDICULAR TO THE PEDESTRIAN PATH OF TRAVEL.
3. THIS DRAWING IS ADOPTED FROM ALBERTA LABOUR'S BARRIER FREE DESIGN GUIDE.

LIST OF STANDARD DRAWINGS

LIST OF STANDARD DRAWINGS

Transportation – Roads & Streets

M.D. OF BRAZEAU NO. 77:

Table 6 – Hamlet and Country Residential Road Classification

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Local Road 2 – Standard Cross-section	Fig. 13
Local Road 1 – Standard Cross-section	Fig. 14
Lease Road – Standard Cross-section	Fig.15
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Hamlet Local 1 (Rural) – Standard Cross-section	Fig.19
Hamlet Local 2 (Urban) – Standard Cross-section	Fig.20
Hamlet Local 1 (Urban) – Standard Cross-section	Fig. 21
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TOWN OF DRAYTON VALLEY:

Typical Lot Grading Plan	T1
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Minor Residential Collector	T3
Major Residential Collector	T4
Local Industrial (Urban)	T5
Local Industrial (Rural)	T6
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Divided Arterial	T11
Concrete Meridian	T12
Concrete Drainage Swales	T13
Straight Faced Curb and Gutter	T14
Rolled Curb & Gutter	T15
Rolled Monolithic Curb & Gutter	T16
Straight Faced Monolithic Curb & Gutter	T17
Paraplegic Ramp	T18
Concrete Driveway	T19
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Utilities – Water, Sewer, & Storm

Standard 1200 mm Manhole.....	U1
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Standard 1200 mm Perched Manhole	U3
Standard 900 mm Catchbasin.....	U4
Standard Hydrant Connection Detail.....	U5
Buried Valve Detail	U6
Typical Trenching Detail.....	U7
Thrust Block Detail	U8
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Standard Water Service Connection.....	U10
Typical Wet Pond Section	U11
Typical Dry Pond Section.....	U12

Landscaping

Asphalt Trail Detail.....	L1
Shrub Installation.....	L2
Large Tree Guying.....	L3
Small Tree Staking	L4
Chain Link Fence.....	L5
Typical Cedar Fencing.....	L6
Timber Fence for Open Space Areas	L7

Recreational Vehicle Park

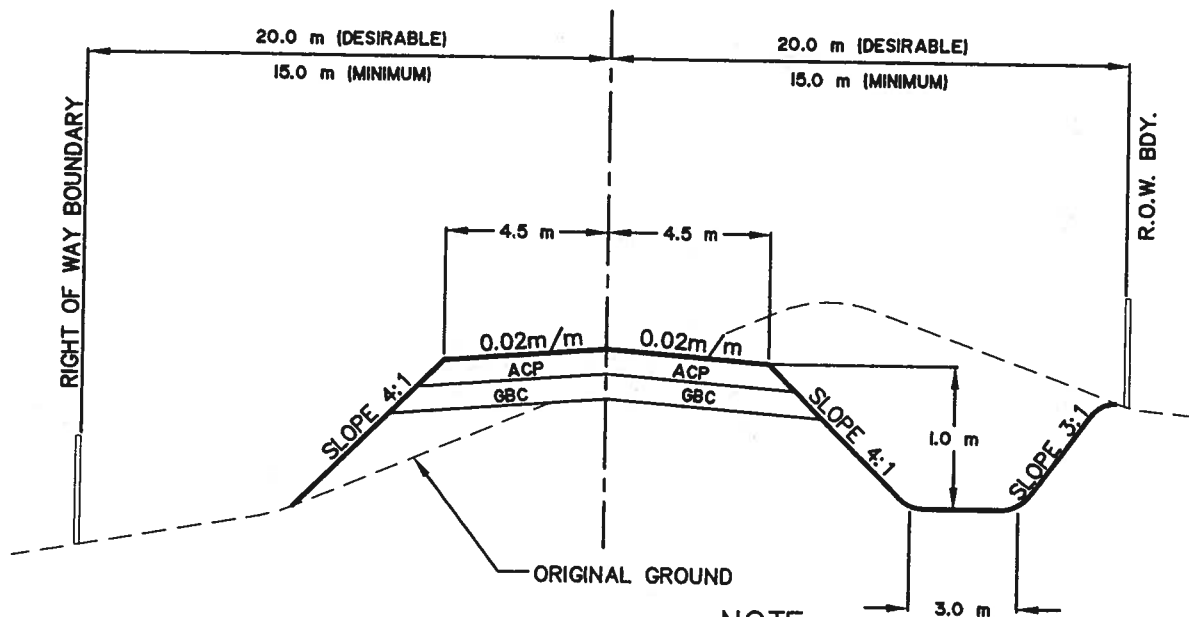
Campground Details.....	RV1
Water Riser for RV Hookup.....	RV2
RV Sani-Dump Station	RV3
Electrical Receptacle.....	RV4

Manufactured Homes

Roadway Section	MH1
Sanitary Service Connection	MH2
Water Service Connection.....	MH3
Single Vault Toilet	MH4

Low Pressure Sewer

Septic Tank Installation	LP1
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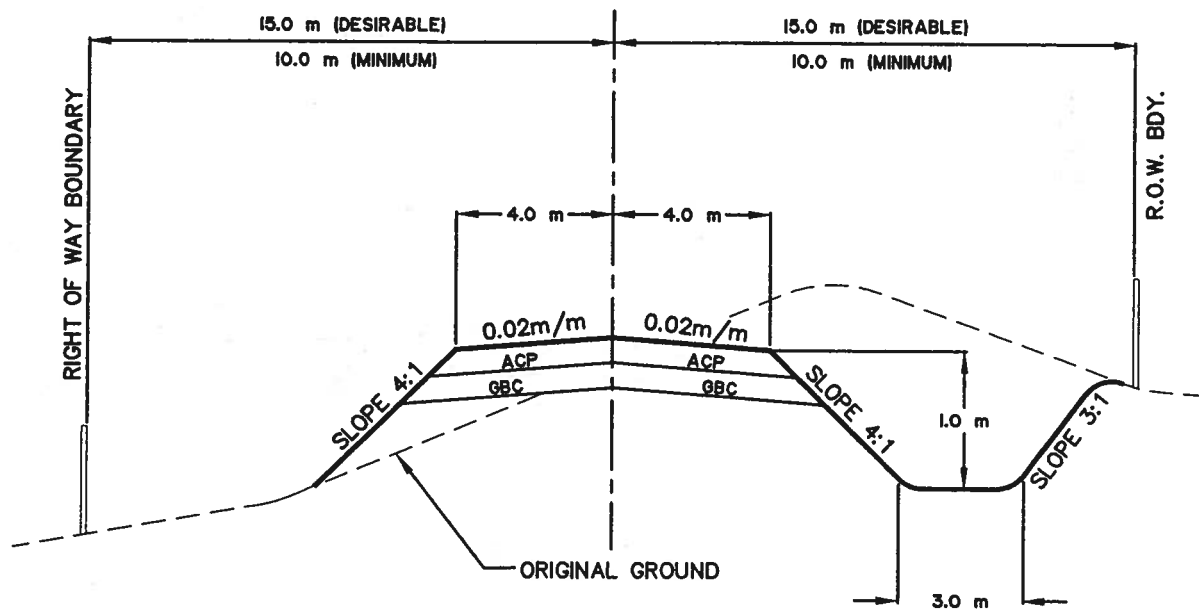
NOTE:
DITCH WIDTH AND DEPTH ARE
DESIRABLE DIMENSIONS

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



PROJECT NO.:	200100	DATE:	01/29/2001
		DRAWN:	GL
		CHECKED:	DJE
		SCALE:	N.T.S.

FIGURE 9
ARTERIAL ROAD
STANDARD CROSS-SECTION



NOTE:

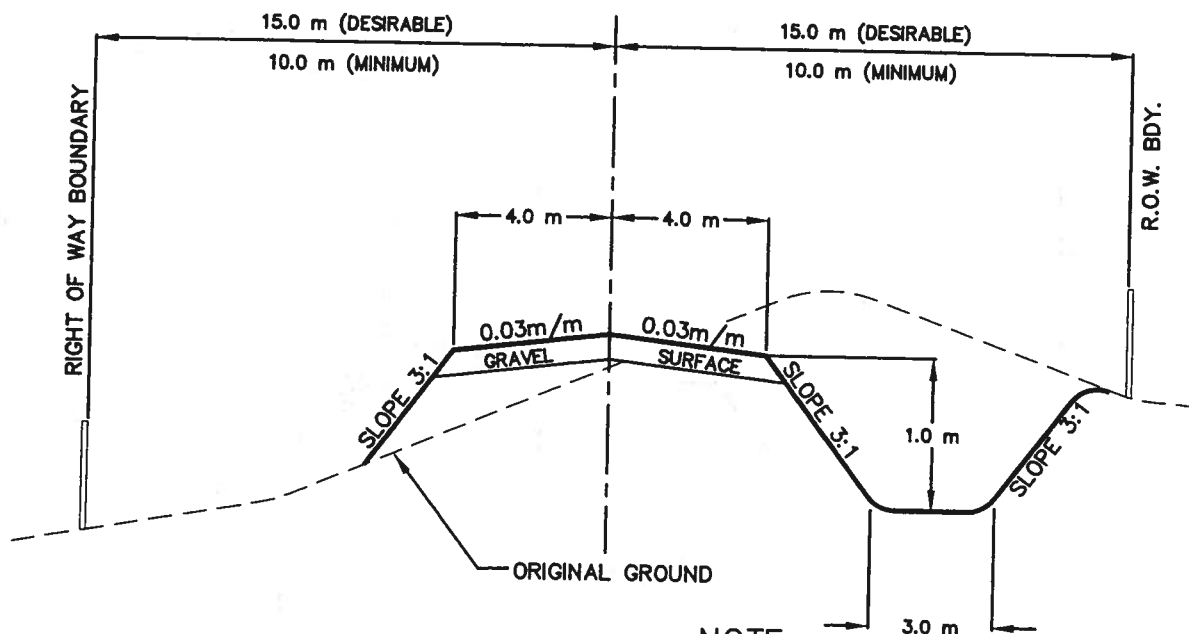
DITCH WIDTH AND DEPTH ARE DESIRABLE DIMENSIONS

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



DATE:	01/29/2001
PROJECT NO.:	200100
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CHECKED:	DJE
SCALE:	N.T.S.

**FIGURE 10
COLLECTOR ROAD
STANDARD CROSS-SECTION**



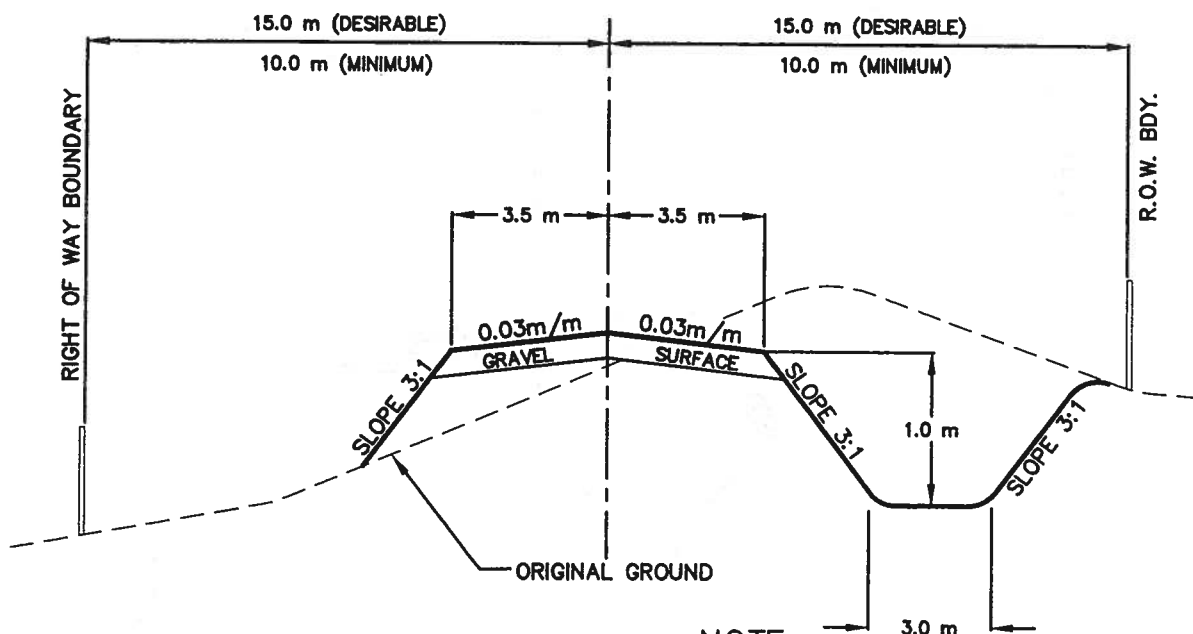
NOTE:
DITCH WIDTH AND DEPTH ARE
DESIRABLE DIMENSIONS

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	3:1	3:1	3:1	2:1	300	0.08	7.0



DATE:	01/29/2001
PROJECT NO.:	200100
DRAWN:	GL
CHECKED:	DJE
SCALE:	N.T.S.

FIGURE 13
LOCAL ROAD 2
STANDARD CROSS-SECTION



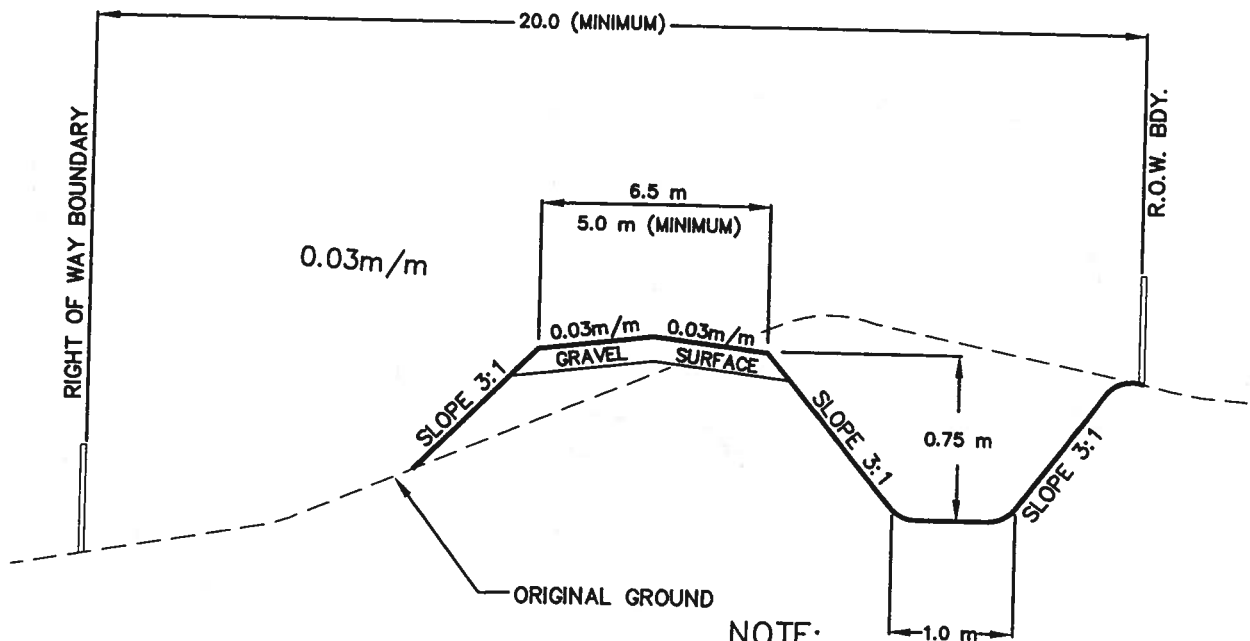
NOTE:
DITCH WIDTH AND DEPTH ARE
DESIRABLE DIMENSIONS

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 (%)
7.0	30.0	3:1	3:1	3:1	2:1	300	0.08	7.0



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EXH Engineering Services Ltd.		DRAWN:	GL
		CHECKED:	DJE
		SCALE:	N.T.S.

FIGURE 14
LOCAL ROAD 1
STANDARD CROSS-SECTION



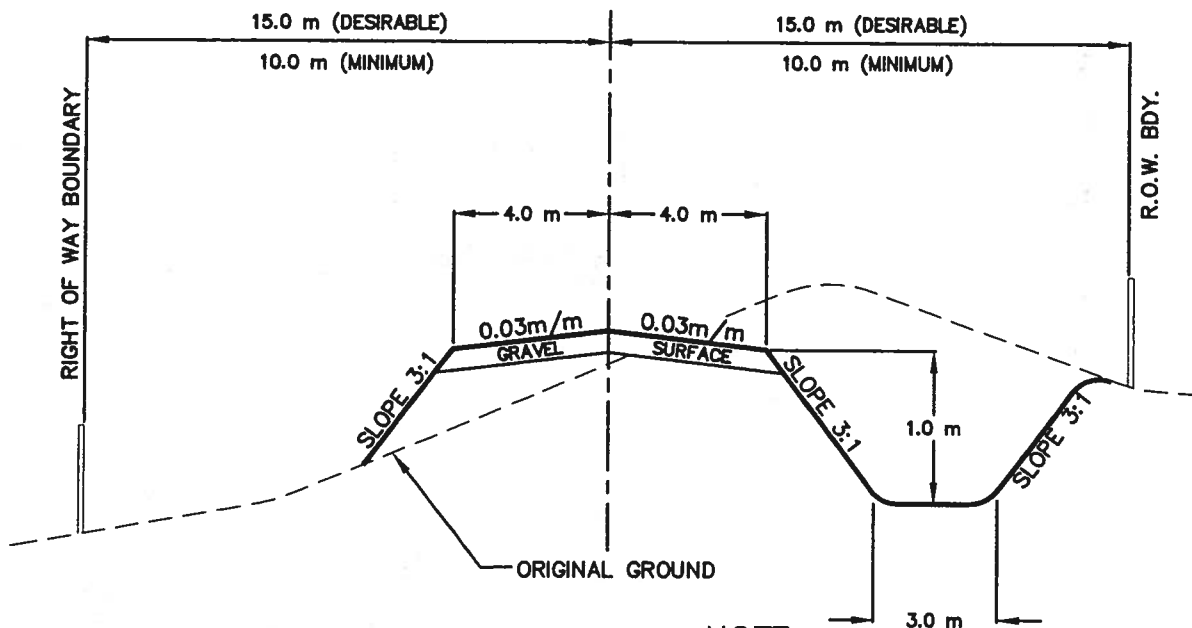
NOTE:
DITCH WIDTH AND DEPTH ARE
DESIRABLE DIMENSIONS

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 (%)
6.5	20.0	4:1	3:1	3:1	2:1	120	0.08	8.0



DATE:	01/29/2001
PROJECT NO:	200100
DRAWN:	GL
CHECKED:	DJE
SCALE:	N.T.S.

**FIGURE 15
LEASE ROAD
STANDARD CROSS-SECTION**



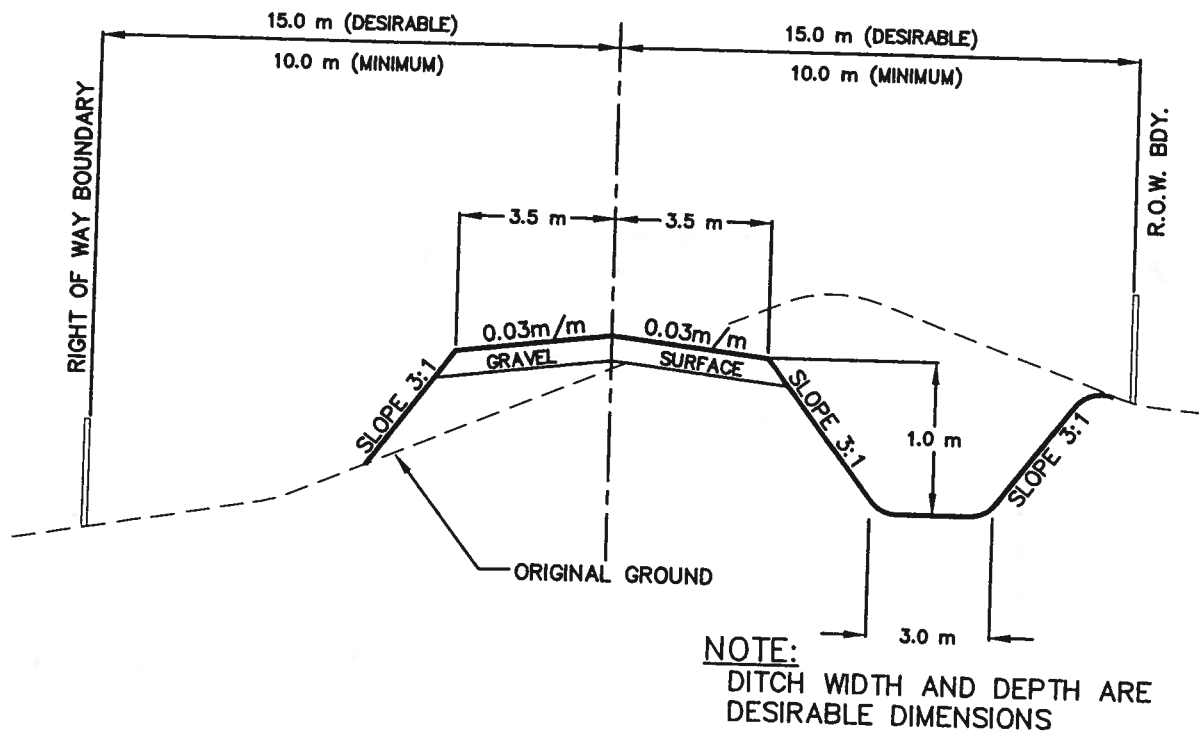
NOTE:
DITCH WIDTH AND DEPTH ARE
DESIRABLE DIMENSIONS

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	3:1	3:1	3:1	2:1	120	0.06	6.0



PROJECT NO.: 200100	DATE: 01/29/2001
EXH Engineering Services Ltd.	DRAWN: GL
	CHECKED: DJE
	SCALE: N.T.S.

FIGURE 16
COUNTRY RESIDENTIAL 2
STANDARD CROSS-SECTION

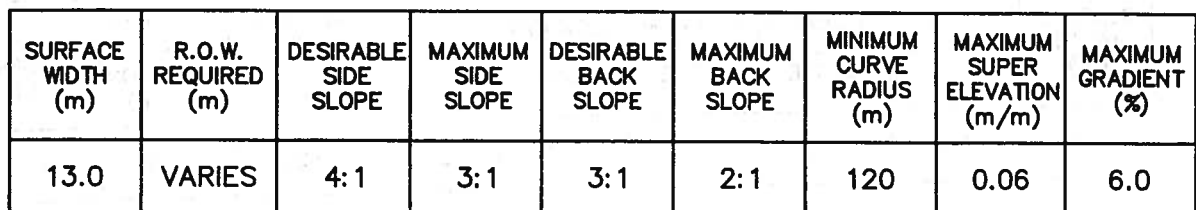


SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
7.0	30.0	3:1	3:1	3:1	2:1	120	0.06	6.0



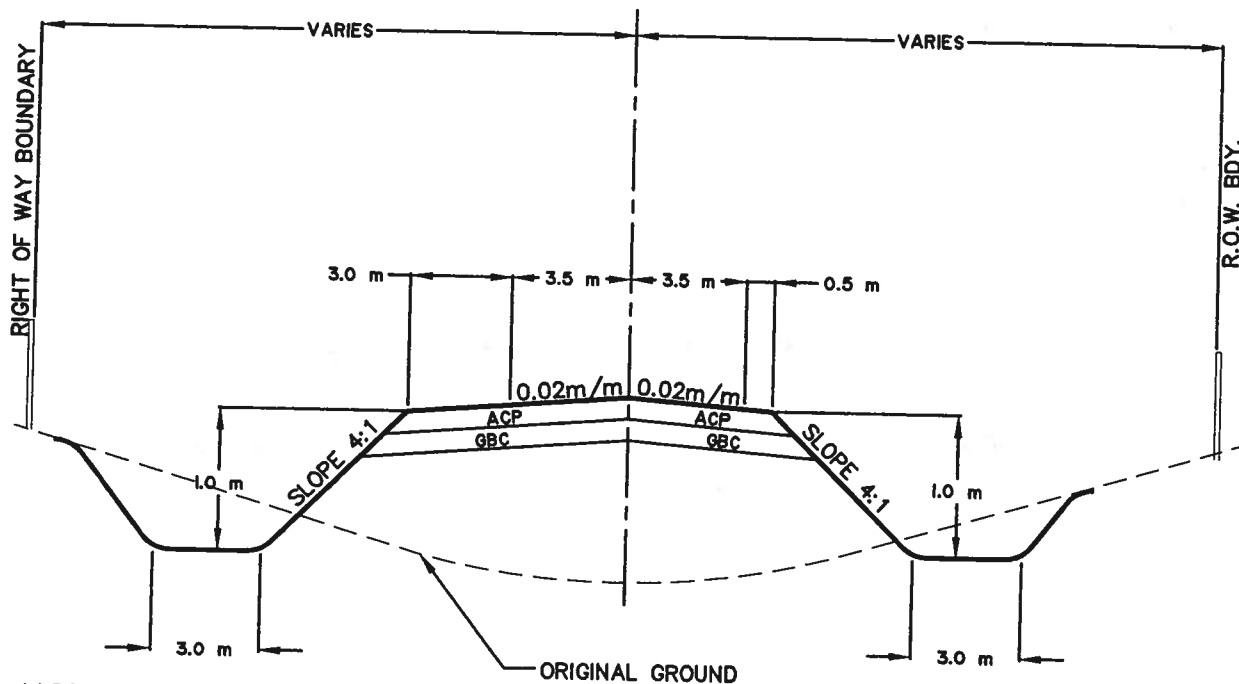
DATE:	01/29/2001
PROJECT NO.:	200100
DRAWN:	GL
CHECKED:	DJE
SCALE:	N.T.S.

FIGURE 17
COUNTRY RESIDENTIAL 1
STANDARD CROSS-SECTION



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FIGURE 18
HAMLET LOCAL 2 (RURAL)
STANDARD CROSS-SECTION



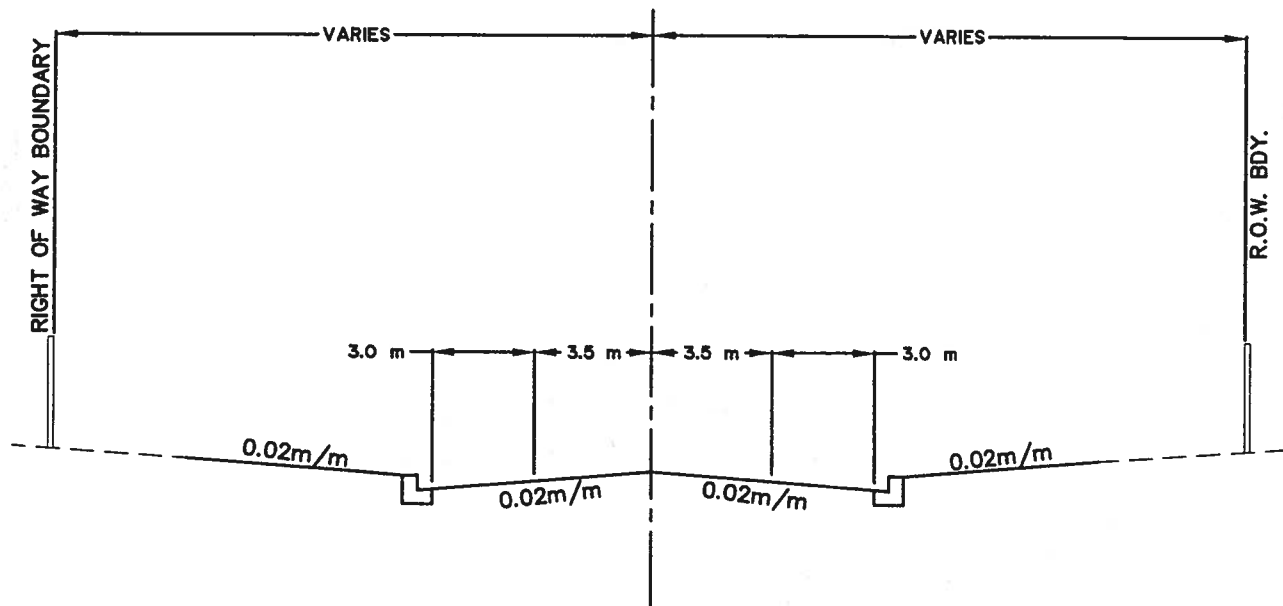
NOTE:
DITCH WIDTH AND DEPTH ARE
DESIRABLE DIMENSIONS

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 (%)
10.5	VARIES	4:1	3:1	3:1	2:1	120	0.06	6.0



DATE:	01/29/2001
PROJECT NO.:	200100
DRAWN:	GL
CHECKED:	DJE
SCALE:	N.T.S.

FIGURE 19
HAMLET LOCAL 1 (RURAL)
STANDARD CROSS-SECTION

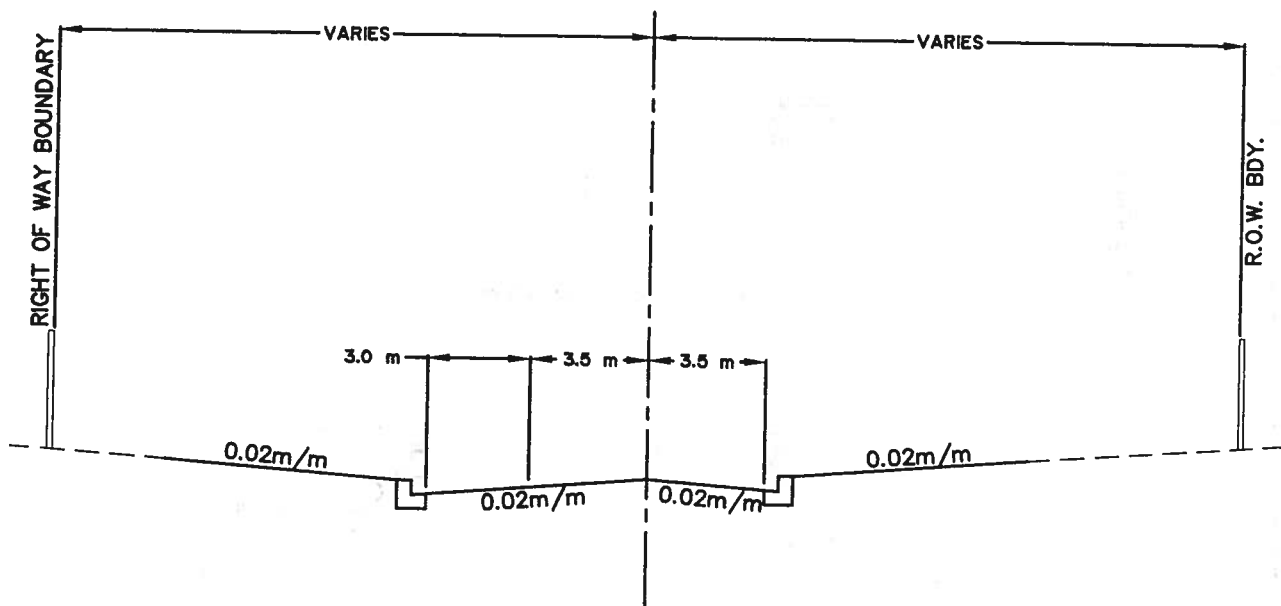


SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
13.0	VARIES	N/A	N/A	N/A	N/A	120	0.06	6.0



DATE:	01/29/2001
PROJECT NO.:	200100
DRAWN:	GL
CHECKED:	DJE
SCALE:	N.T.S.

FIGURE 20
HAMLET LOCAL 2 (URBAN)
STANDARD CROSS-SECTION

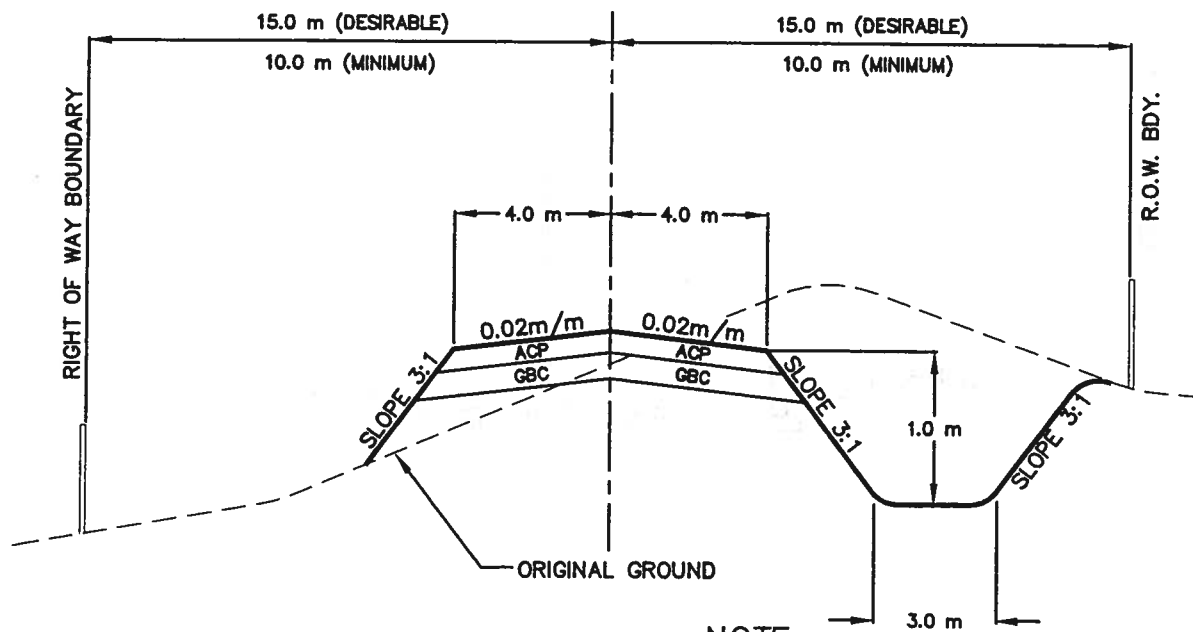


SURFACE WIDTH (m)	R.O.W. REQUIRED (m)	DESIRABLE SIDE SLOPE	MAXIMUM SIDE SLOPE	DESIRABLE BACK SLOPE	MAXIMUM BACK SLOPE	MINIMUM CURVE RADIUS (m)	MAXIMUM SUPER ELEVATION (m/m)	MAXIMUM GRADIENT (%)
10.0	VARIES	N/A	N/A	N/A	N/A	120	0.06	6.0



PROJECT NO.: 200100	DATE: 01/29/2001
EXH Engineering Services Ltd.	DRAWN: GL
	CHECKED: DJE
	SCALE: N.T.S.

FIGURE 21
HAMLET LOCAL 1 (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 (%)
8.0	30.0	3:1	3:1	3:1	2:1	120	0.06	6.0

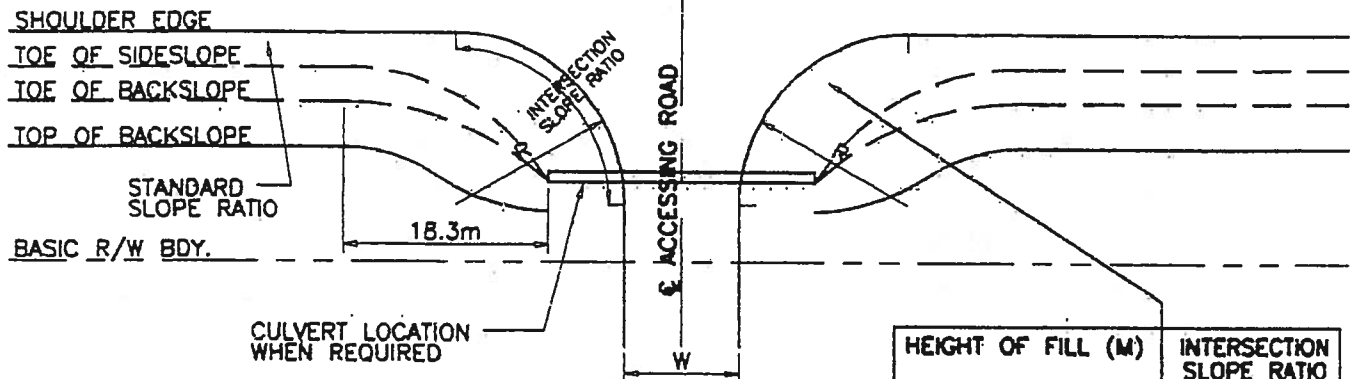


DATE:	03/07/2002
PROJECT NO.:	200100
DRAWN:	GL
CHECKED:	DJE
SCALE:	N.T.S.

EXH Engineering
Services
Ltd.

FIGURE 22
PAVED COUNTRY
RESIDENTIAL 3
STANDARD CROSS-SECTION

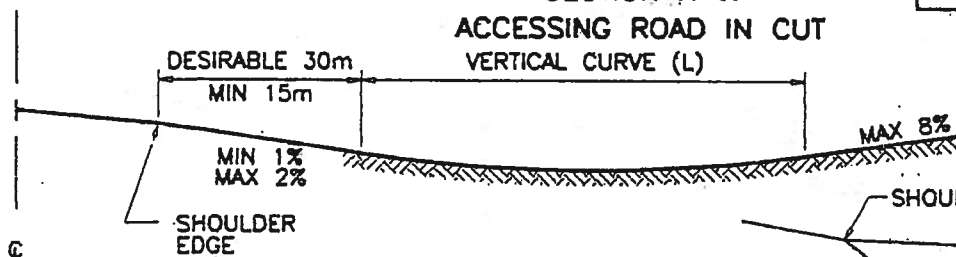
RECEIVING ROAD



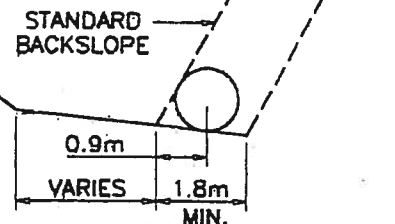
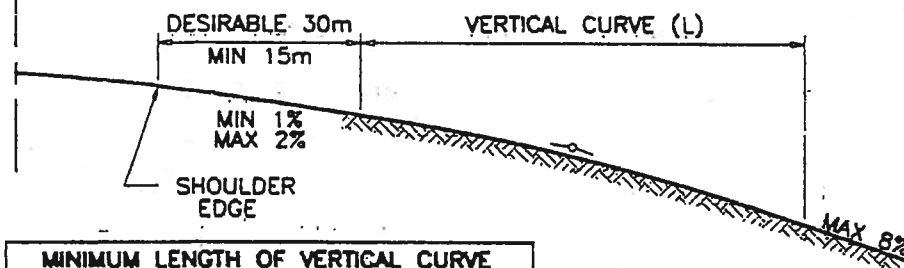
HEIGHT OF FILL (M)	INTERSECTION SLOPE RATIO
0 - 4.0	7:1
OVER 4.0	3:1

SLOPE RATIO OF 5:1 AT CULVERT AND CONTINUE USE OF 5:1 SLOPE TO R/W BOUNDARY

SECTION A-A ACCESSING ROAD IN CUT VERTICAL CURVE (L)



SECTION A-A ACCESSING ROAD IN FILL VERTICAL CURVE (L)



NOTE: WIDEN DITCHES ONLY WHERE CULVERTS ARE TO BE INSTALLED.

DETAIL OF DITCH AND CULVERT LOCATION.

MINIMUM LENGTH OF VERTICAL CURVE		
ALGEBRAIC DIFFERENCE IN GRADIENT %	LENGTH L (m)	
	CREST	SAG
1	60	60
2	60	60
3	60	60
4	75	60
5	90	80
6	105	95
7		110
8		130
8		145

NOTE:

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

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

ROAD CLASSIFICATION	ROADWAY WIDTH W (m)	RADIUS OF INTERSECTION EDGE OF SHOULDER (m)
RESIDENTIAL LOCAL	8.0	10
RESIDENTIAL COLLECTOR	9.0	10
INDUSTRIAL	10.0	15

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PUBLIC WORKS DEPARTMENT

REVISION No.

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SUPERINTENDANT OF PUBLIC WORKS

DATE:

FEB. 1997

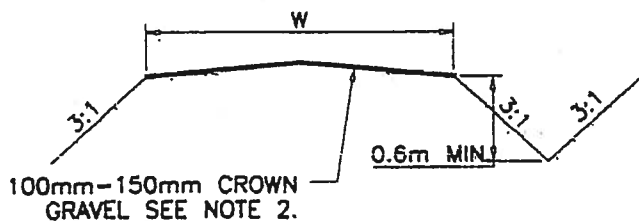
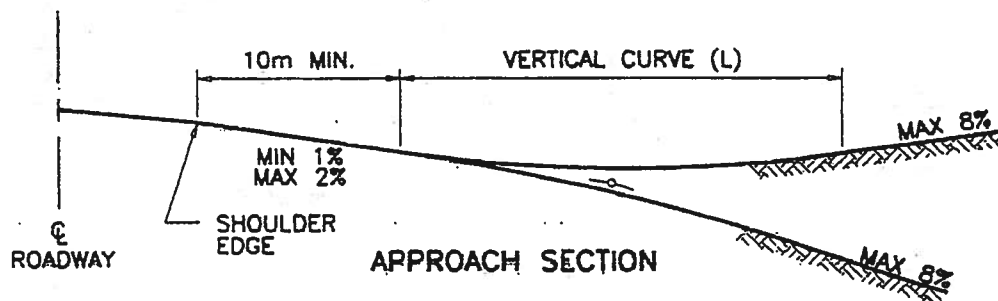
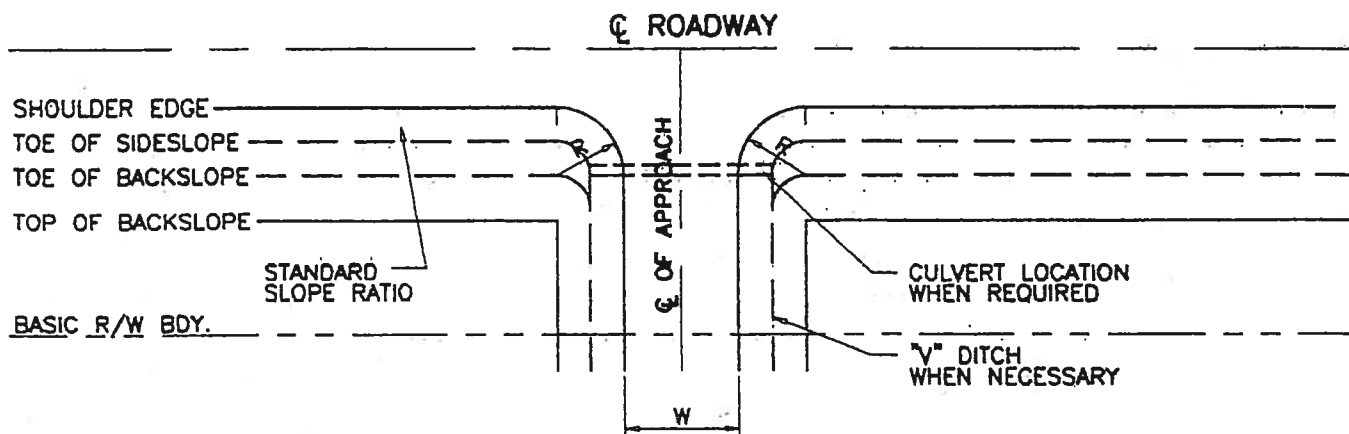
SCALE:

N.T.S.

INTERSECTION TREATMENT

DWG. No.

R-3



NOTE:

1. WHEN CULVERTS ARE REQUIRED THEY MUST BE C.S.P. CULVERTS AND BE THE FOLLOWING MINIMUM DIAMETRES
 RESIDENTIAL - 400mm
 INDUSTRIAL - 500mm
 - LENGTH WILL VARY WITH DEPTH OF FILL
 - CULVERT WILL BE PLACED AT TOE OF BACKSLOPE
2. A MINIMUM 8m³ OF MAXIMUM 50mm CRUSHED GRAVEL IS TO BE APPLIED TO THE APPROACH.
3. ALL DIMENSIONS SHOWN ARE IN METRES.
4. MINIMUM APPROACH LENGTH - FROM EDGE OF ROAD SHOULDER TO R/W BOUNDARY.

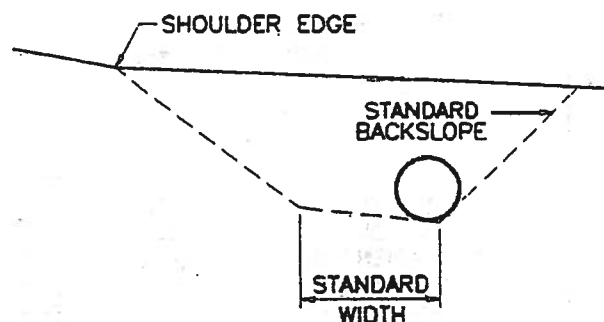


TABLE FOR DETERMINATION OF ROADWAY WIDTH		RADIUS OF INTERSECTION EDGE OF SHOULDER (R)
USE	ROADWAY WIDTH W (m)	
RESIDENTIAL	6	6
INDUSTRIAL	8	6

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MD OF BRAZEAU No.77
PUBLIC WORKS DEPARTMENT

TYPICAL PRIVATE APPROACHES

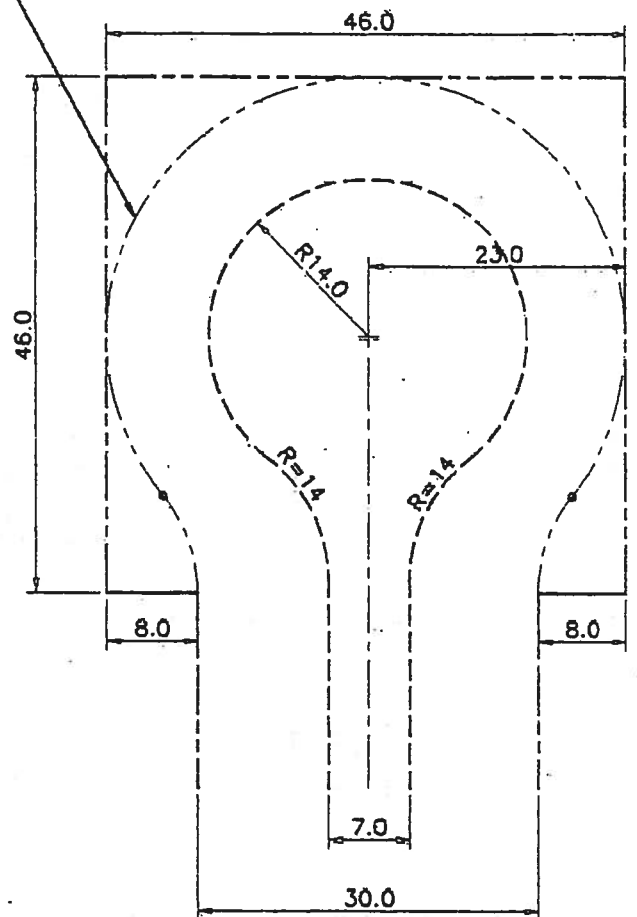
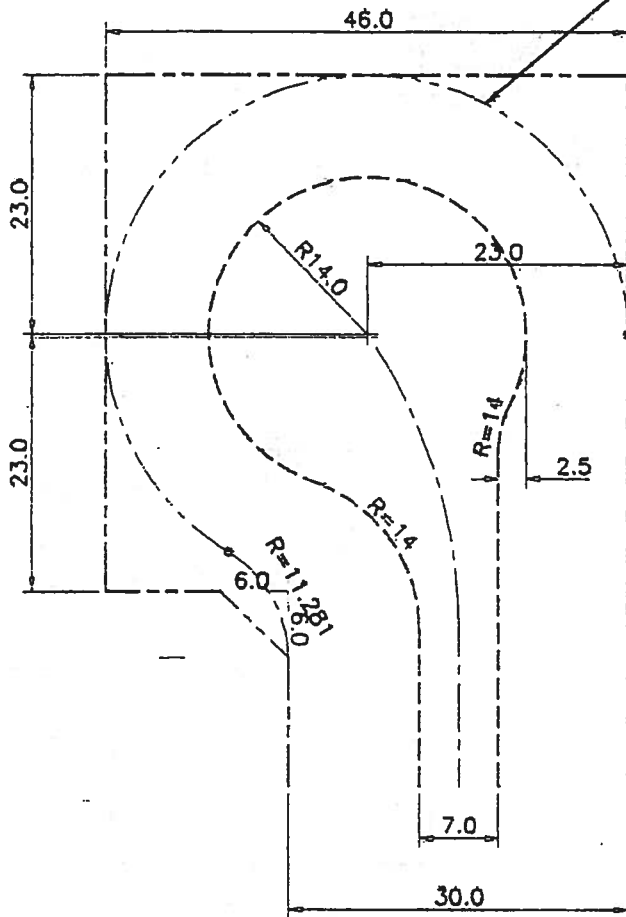
REVISION

6

DWG. No.

R-4

THE R MAY ALSO BE SYMMETRICAL TO AND A MINIMUM OF 9.0m FROM THE SHOULDER OF THE CUL-DE-SAC.



NOTE: THE MINIMUM CROWN SLOPE WITHIN THE CUL-DE-SAC SHALL BE 0.040m/m

ALL DIMENSIONS IN METRES
UNLESS OTHERWISE SPECIFIED

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STANDARD CUL-DE-SAC

DWG. No.
R-5

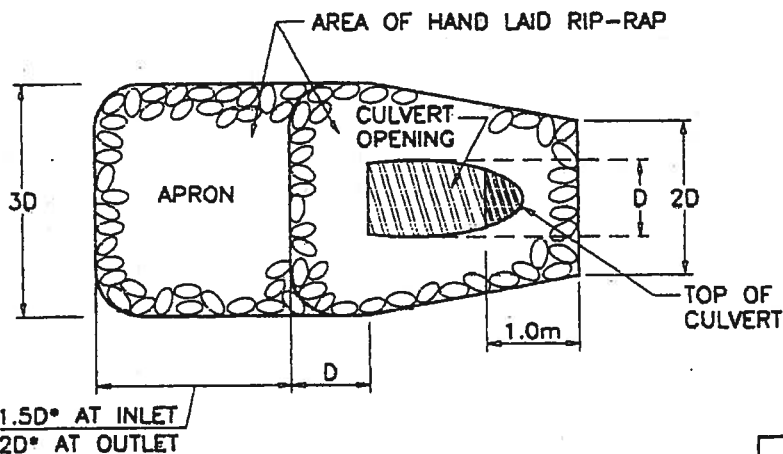
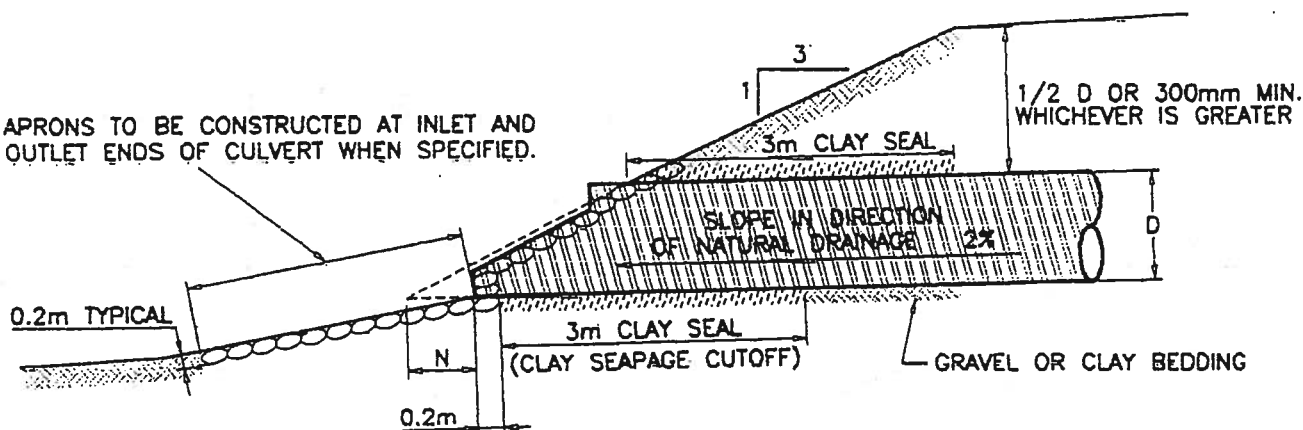
DATE:

FEB. 1997

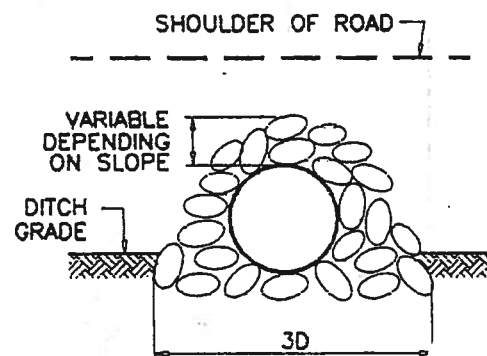
SCALE:

N.T.S.

APRONS TO BE CONSTRUCTED AT INLET AND OUTLET ENDS OF CULVERT WHEN SPECIFIED.



* THESE ARE TYPICAL MINIMUM DIMENSIONS.



NOTES:

1. ROCKS AND BOULDERS SHALL BE SELECTED AS NEARLY CUBICAL IN FORM AS PRACTICAL AND SHALL HAVE A LEAST MINIMUM DIMENSION OF 200mm . THE STONES SHALL BE PLACED WITH THEIR BEDS AT RIGHT ANGLES TO THE SLOPE, THE LARGER STONES BEING USED IN THE BOTTOM COURSES AND THE SMALLER STONES AT TOP. THEY SHALL BE LAID IN CLOSE CONTACT SO AS TO BREAK JOINTS AND IN SUCH MANNER THAT THE WEIGHT OF THE STONE IS CARRIED BY THE EARTH AND NOT BY THE ADJACENT STONES. THE FINISHED WORK SHALL PRESENT AN EVEN, TIGHT, AND REASONABLY PLANE SURFACE, VARYING NOT MORE THAN 75mm FROM THE REQUIRED CONTOUR.
2. WHERE NO SPECIAL TREATMENT IS REQUIRED, CULVERT INVERT ELEVATIONS ARE TYPICALLY SET ABOUT $0.15 \times$ DIAMETER BELOW THE DRAINAGE COURSE ELEVATION.

C.S.P. # D (mm)	SLOPE RATIO	N (mm)
300-450	3:1	300
600	3:1	300
750	3:1	450
900	3:1	450

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 WIDTH OF THE EXCAVATION.
4. WHERE APRONS ARE REQUIRED DUE TO HIGH VELOCITY FLOW OR EROSION PRONE SOIL, TYPICALLY THE MINIMUM INLET APRON IS $1.5 \times$ DIAMETER LONG WHILE THE MINIMUM OUTLET APRON (WHERE WATER VELOCITY IS HIGHER) IS TWO DIAMETERS LONG.

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DATE: FEB. 1997

SCALE: N.T.S.

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PUBLIC WORKS DEPARTMENT

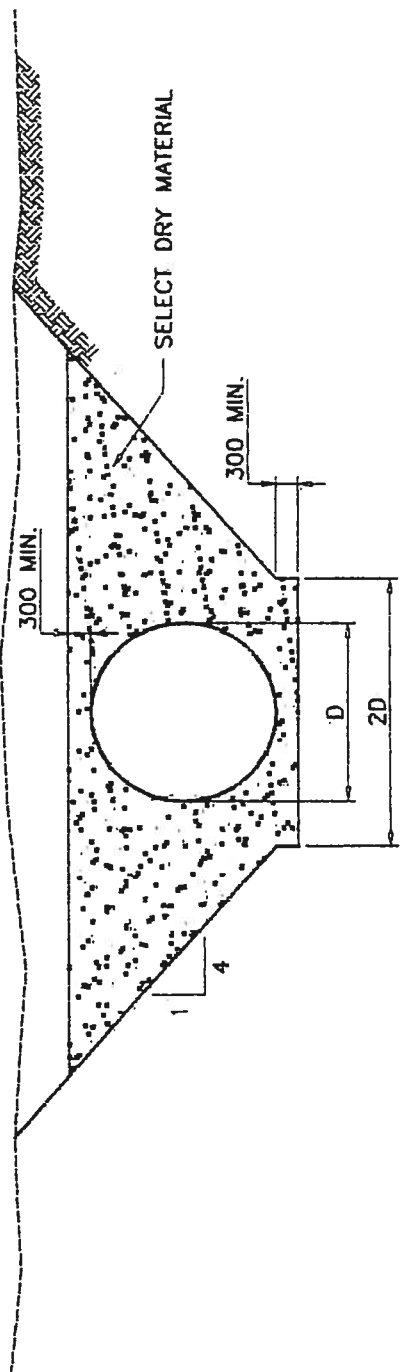
TYPICAL ROADWAY CULVERT

REVISION

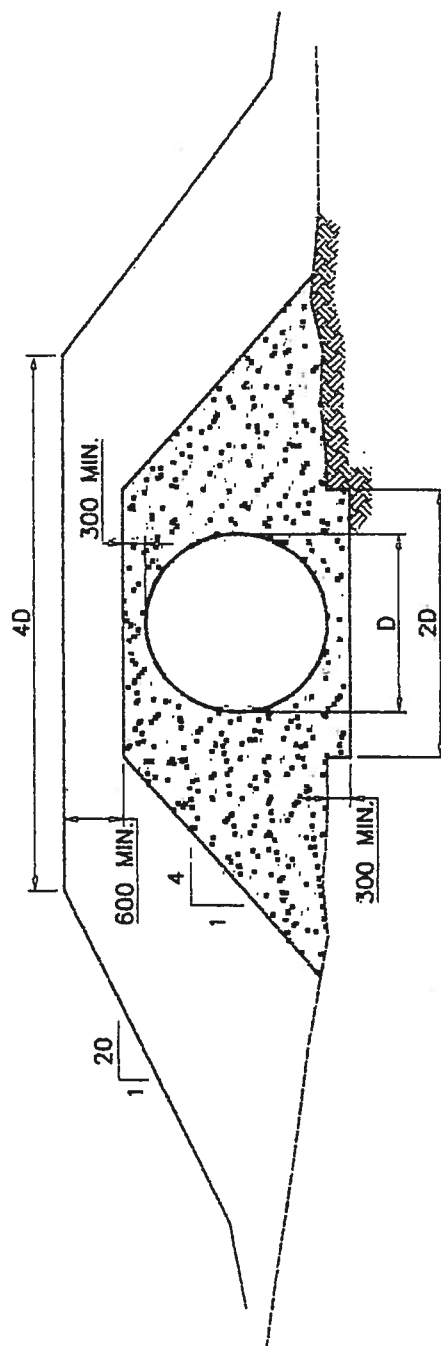
6

DWG. No.

R-7



PLACEMENT IN CUT



PLACEMENT IN FILL

NOTES:

1. SELECT DRY MATERIAL SHALL BE PLACED IN 150mm COMPACTED LIFTS. IF SAND BACKFILL IS USED A 600mm CLAY PLUG SHALL BE PLACED ON INLET AND OUTLET ENDS OF THE PIPE.
2. IN SOFT WET AREAS (i.e. MUSKEG) DEPTH OF SUBCUT BELOW THE PIPE WILL BE DETERMINED BY THE ENGINEER.
3. WHEN PIPES ARE PLACED PRIOR TO EMBANKMENT CONSTRUCTION. A MINIMUM OF 1000mm OF MATERIAL SHALL BE PLACED OVER TOP OF PIPES FOR PROTECTION DURING CONSTRUCTION.

ALL DIMENSIONS IN MILLIMETRES
UNLESS OTHERWISE SPECIFIED

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APPROVED BY:

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DATE:

FEB. 1997

SCALE:

N.T.S.

MD OF BRAZEAU No.77
PUBLIC WORKS DEPARTMENT

TYPICAL CULVERT BEDDING

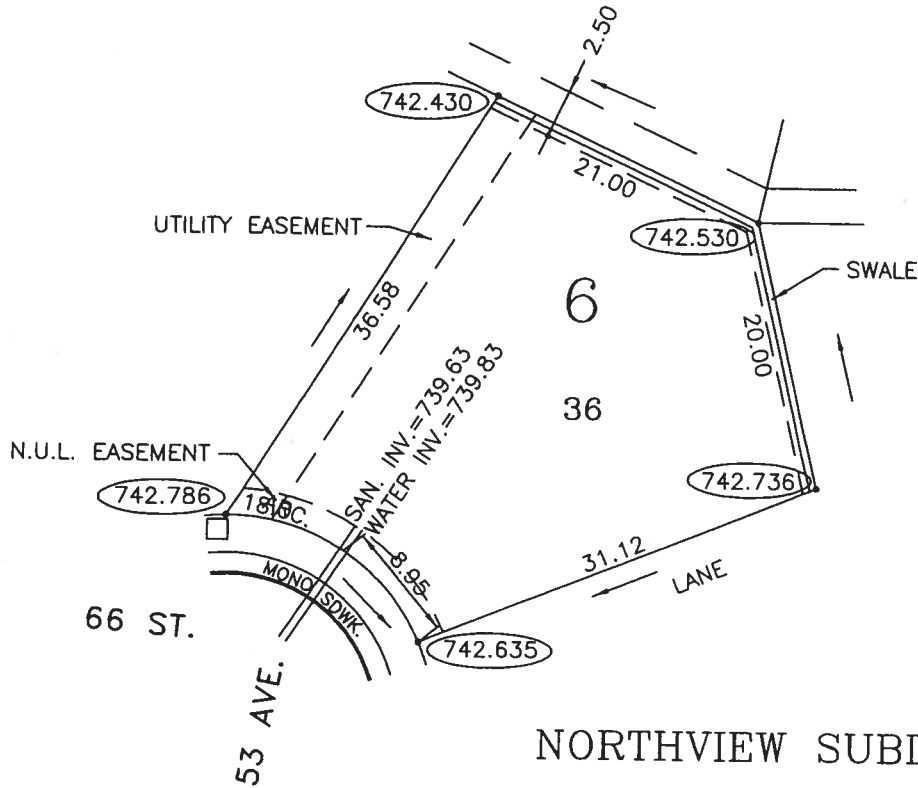
REVISION No.

0

DWG. No.

R-8

LOT 36
 BLOCK 6
 PLAN 832-2553
 EASEMENT PLAN 832-2554



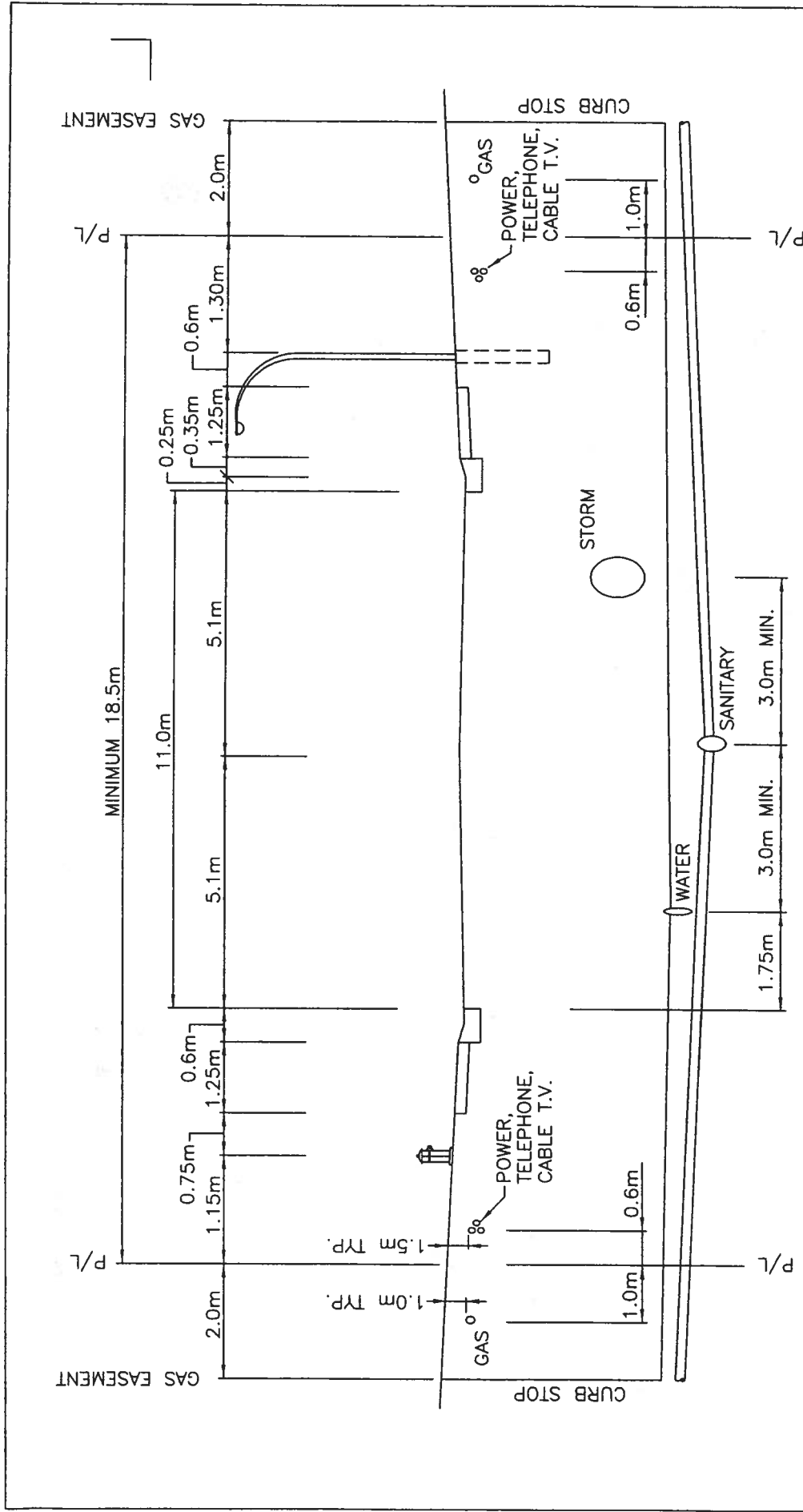
NORTHVIEW SUBDIVISION

LEGEND

DESIGN LOT CORNER ELEVATIONS	742.500
IRON PINS	•
DIRECTION OF DRAINAGE	→
FIRE HYDRANT	⊕
MAIL BOXES	▨
CATCHBASIN	■
LIGHT STANDARD	☆
POWER	□

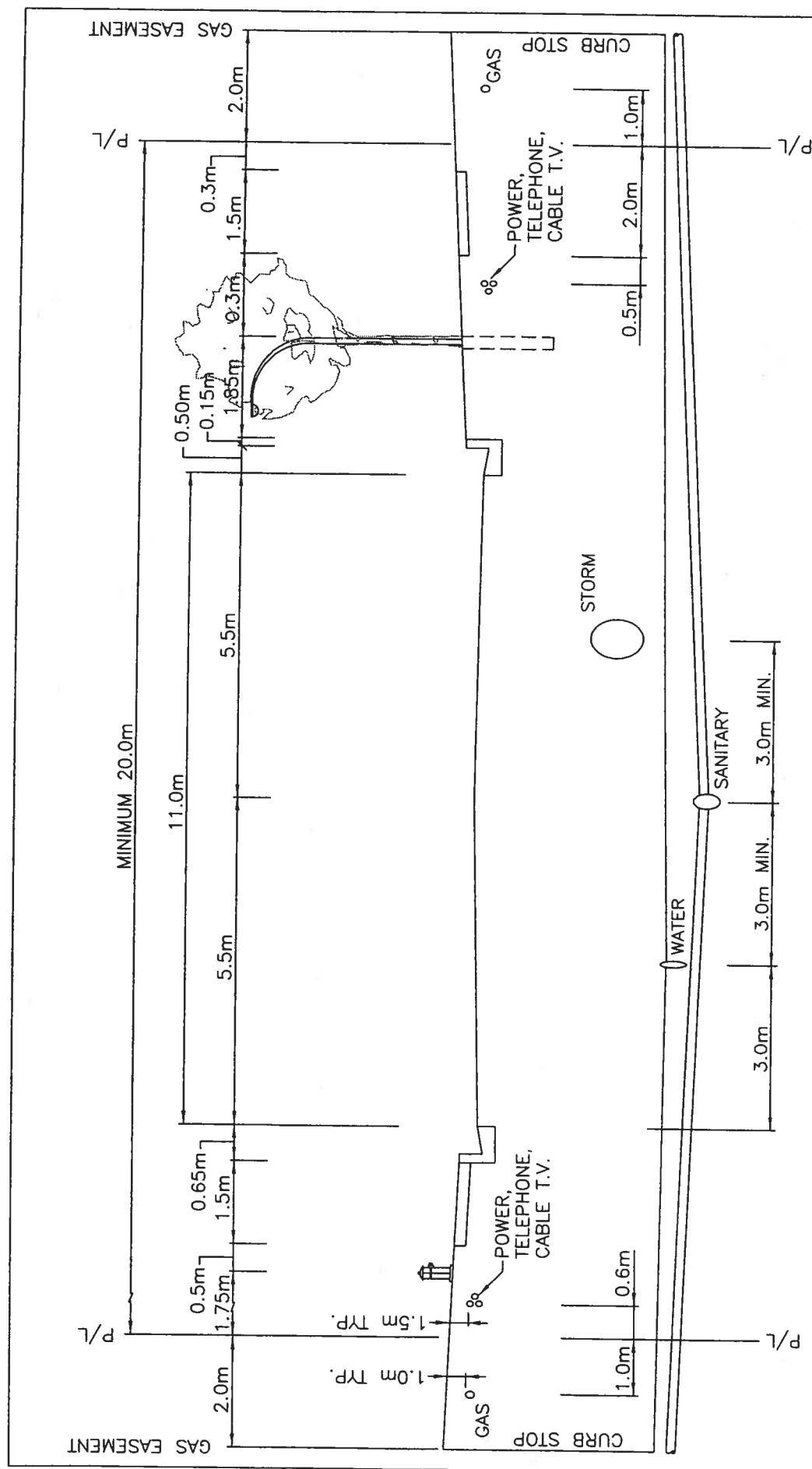
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			TYPICAL LOT GRADING PLAN	
			APPROVED:	STD. DWG. No.
			SCALE: 1:500	T1
			DATE: November, 2001	

PLOT AT 1=0.5



NOTE: IF NO GAS EASEMENT, CURB STOP TO BE INSTALLED ON PROPERTY LINE

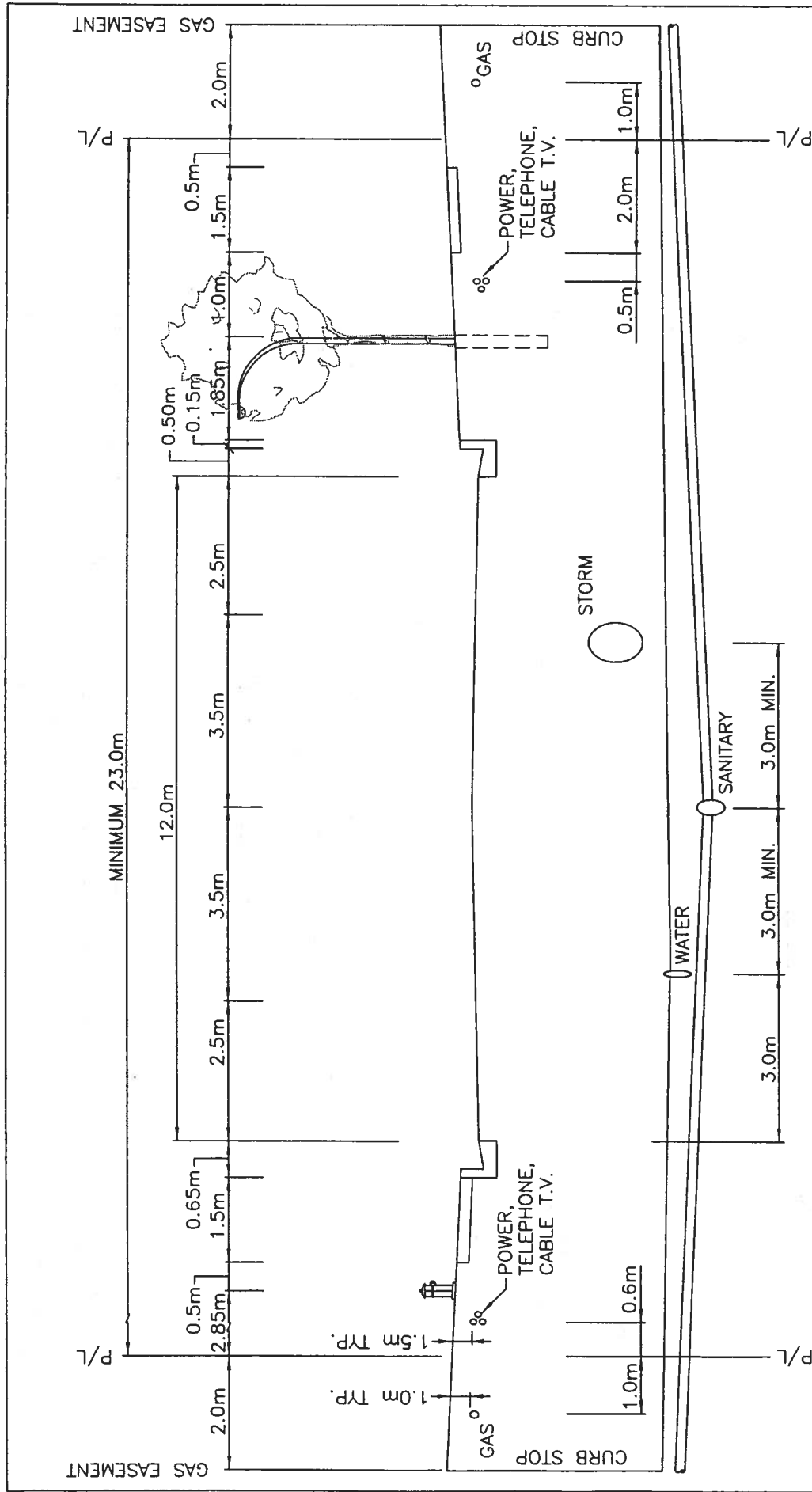
REVISIONS		The Town of Drayton Valley	
Date	Details	LOCAL RESIDENTIAL	
		APPROVED:	STD. DWG. No.
		SCALE: N.T.S.	
		DATE: NOVEMBER, 2001	ττ



NOTE: SIDEWALK MAY BE EITHER SEPARATE OR MONOLITHIC AS REQUIRED BY THE CITY

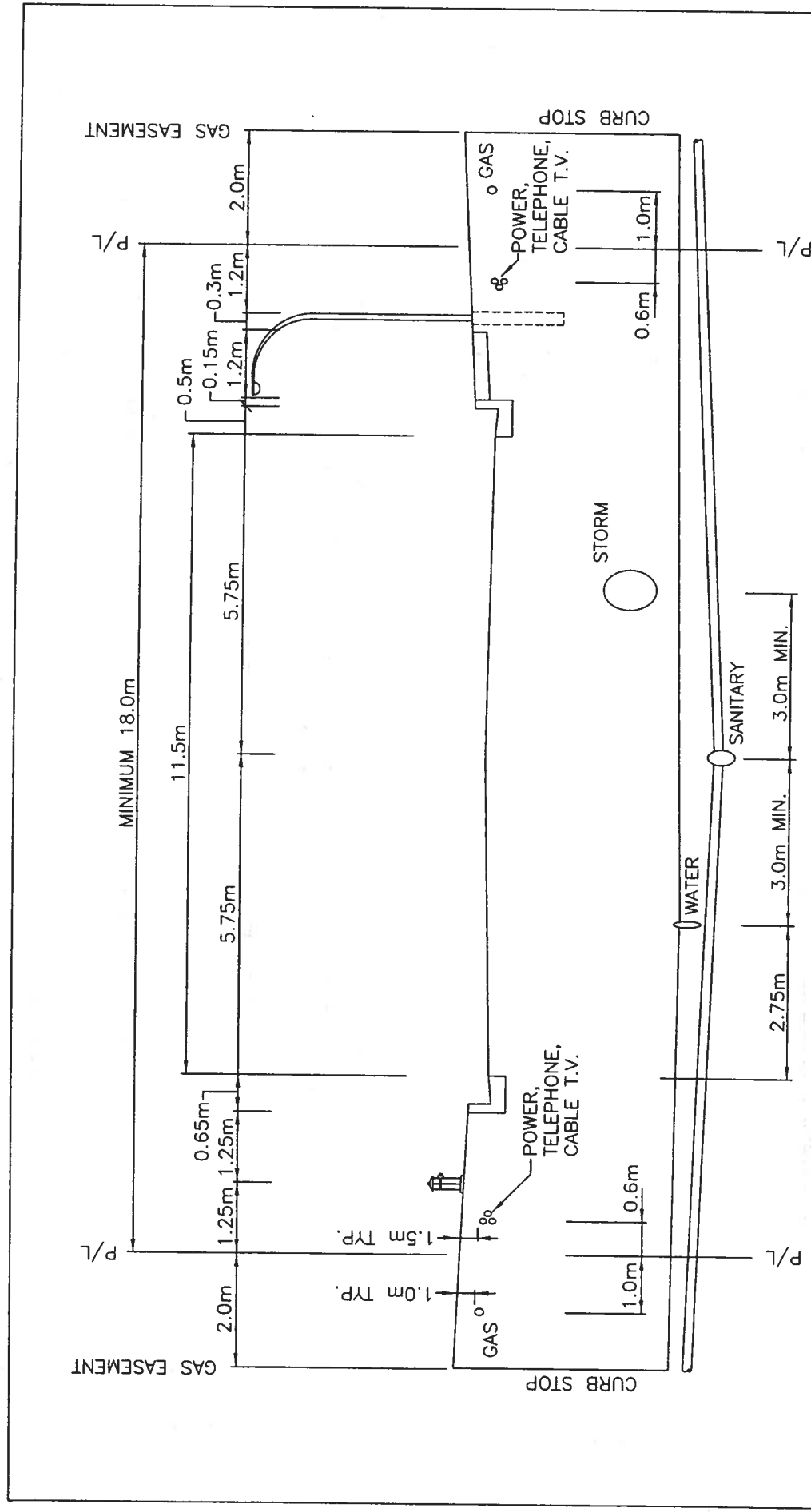
IF NO GAS EASEMENT, CURB STOP TO BE INSTALLED ON PROPERTY LINE

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved	MINOR RESIDENTIAL COLLECTOR	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T3
			DATE: NOVEMBER, 2001	



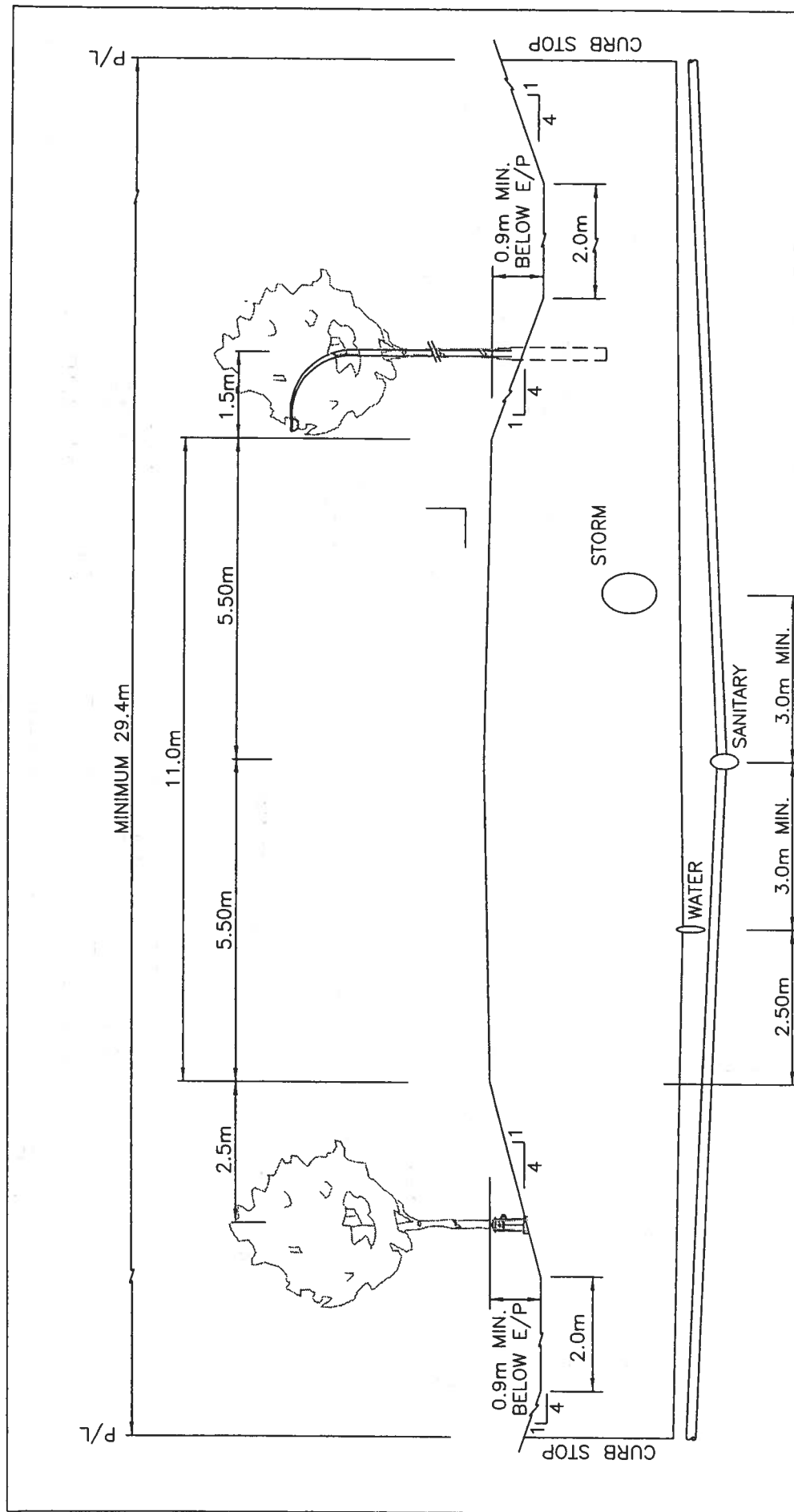
NOTE:
SIDEWALK MAY BE EITHER
SEPARATE OR MONOLITHIC
AS REQUIRED BY THE CITY
IF NO GAS EASEMENT, CURB STOP
TO BE INSTALLED ON PROPERTY
LINE

REVISIONS		The Town of Drayton Valley	
Date	Details	MAJOR RESIDENTIAL COLLECTOR	
		APPROVED:	STD. DWG. No.
		SCALE: N.T.S.	
		DATE: NOVEMBER, 2001	T 4



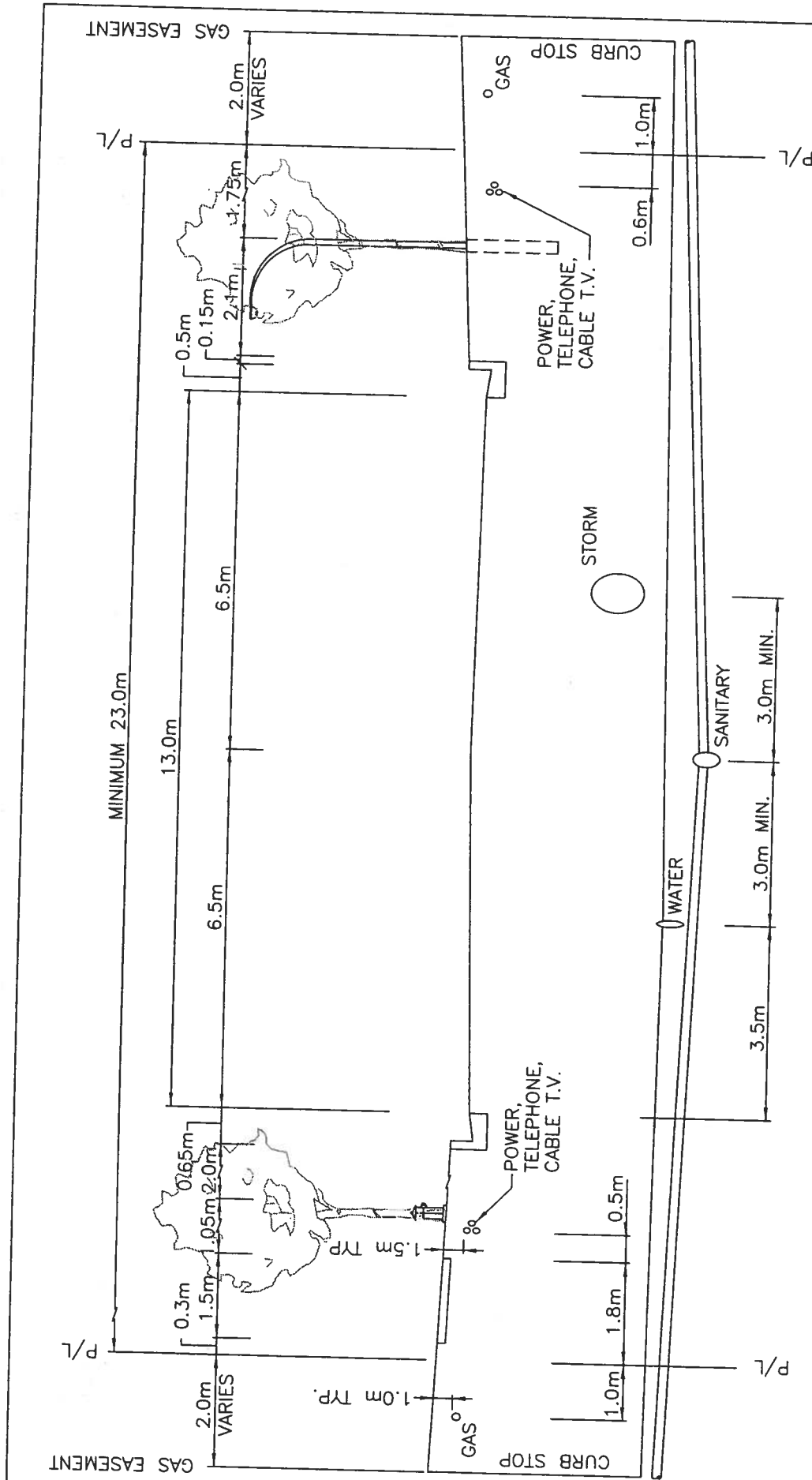
NOTE:
SIDEWALKS MAY BE REQUIRED
AT THE REQUEST OF THE
CITY.
IF NO GAS EASEMENT, CURB STOP
TO BE INSTALLED ON PROPERTY
LINE

REVISIONS		The Town of Drayton Valley	
Date	Details	LOCAL INDUSTRIAL (URBAN)	
		APPROVED:	STD. DWG. No.
		SCALE: N.T.S.	
		DATE: NOVEMBER, 2001	T5



NOTE:
SIDEWALKS MAY BE REQUIRED
AT THE REQUEST OF THE CITY
CENTERLINE OF ROADWAY TO
BE AT APPROXIMATELY SAME
ELEVATION AS PROPERTY LINE
IF NO GAS EASEMENT, CURB STOP
TO BE INSTALLED ON PROPERTY
LINE

REVISIONS		The Town of Drayton Valley	
Date	Details	LOCAL INDUSTRIAL (RURAL)	
		APPROVED:	STD. DWG. No.
		SCALE: N.T.S.	
		DATE: NOVEMBER, 2001	TRC



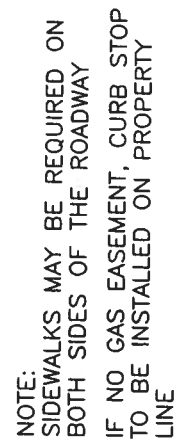
NOTE:
SIDEWALKS MAY BE REQUIRED AT
THE REQUEST OF THE CITY
IF NO GAS EASEMENT, CURB STOP
TO BE INSTALLED ON PROPERTY
LINE

REVISIONS		
Date	Details	Approved

The Town of Drayton Valley

URBAN INDUSTRIAL COLLECTOR

APPROVED:	STD. DWG. No.
SCALE: N.T.S.	T7
DATE: NOVEMBER, 2001	

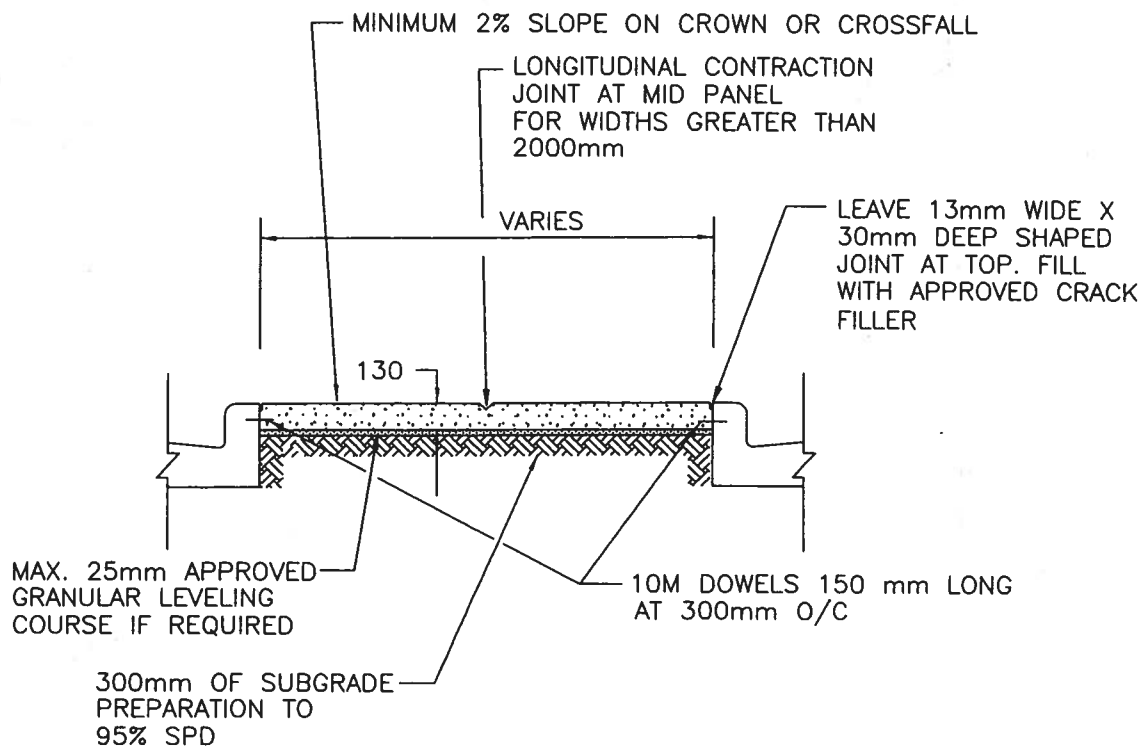


The Town of Drayton Valley

DIVIDED ARTERIAL

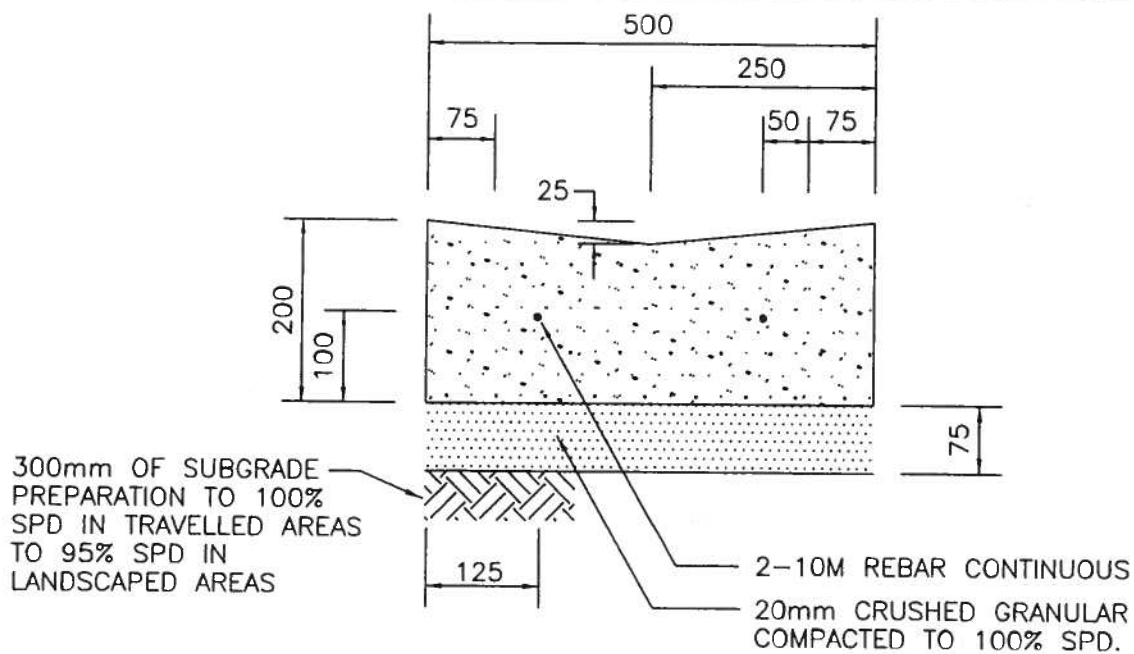
APPROVED:	STD. DWG. No.
SCALE: N.T.S.	T 11
DATE: NOVEMBER, 2001	

T11

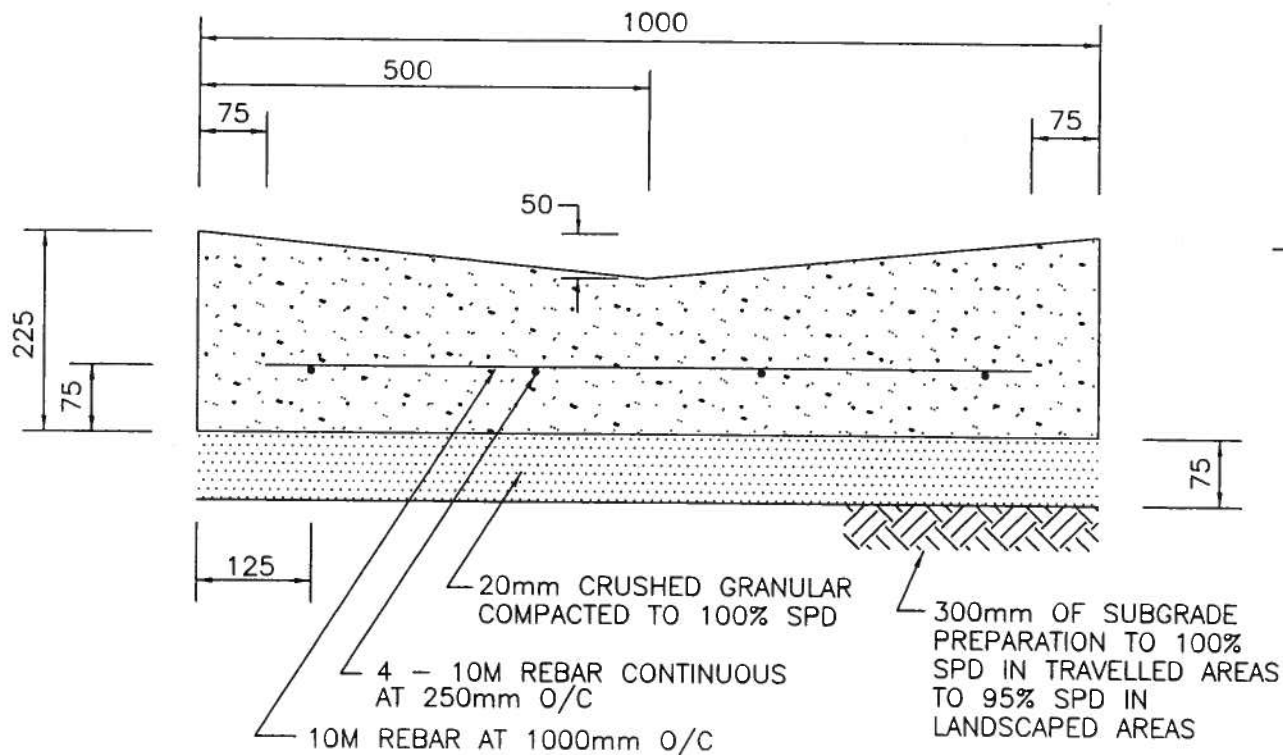


NOTE: TRANSVERSE CONTRACTION JOINTS TO COINCIDE WITH CURB AND GUTTER CONTRACTION JOINTS.

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			CONCRETE MEDIAN	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T12
			DATE: NOVEMBER, 2001	

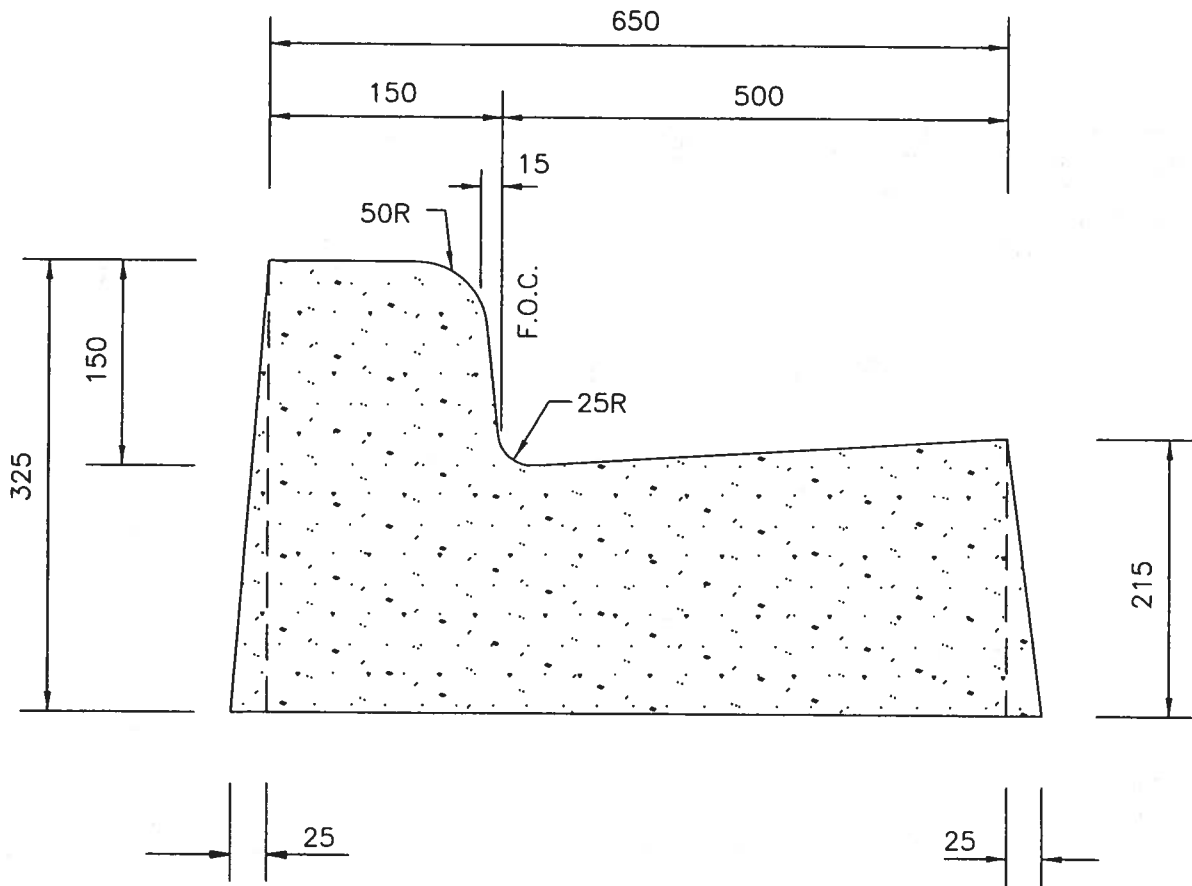


500mm CONCRETE SWALE

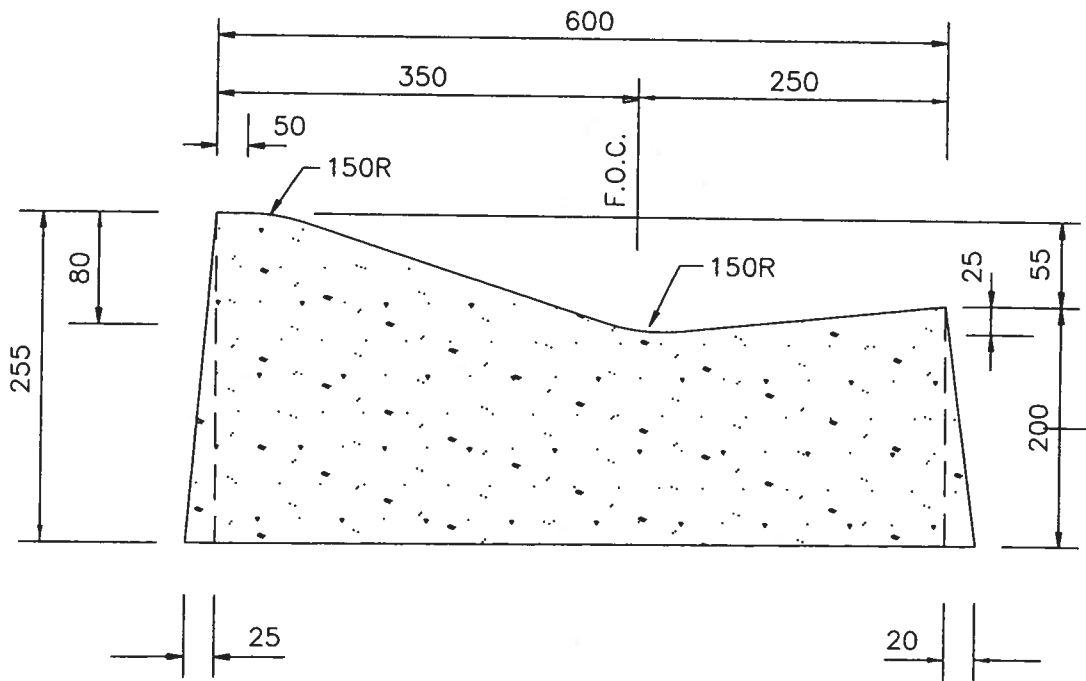


1000mm CONCRETE SWALE

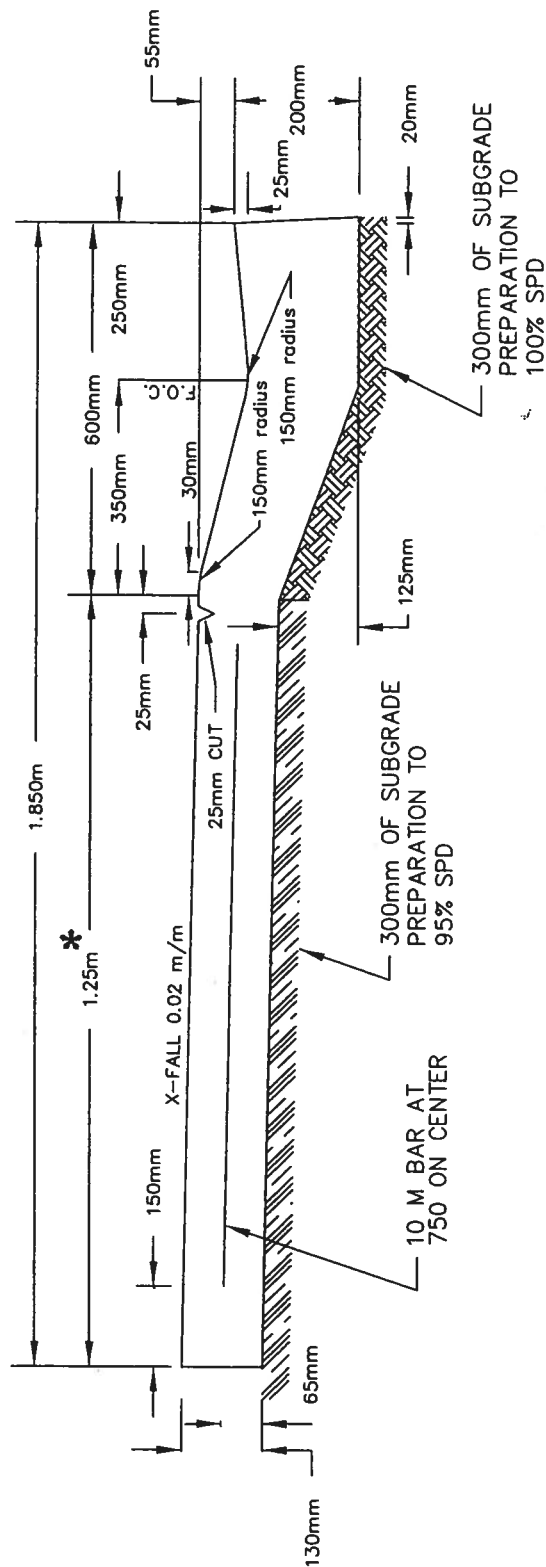
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			CONCRETE DRAINAGE SWALES	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T13
			DATE: NOVEMBER, 2001	



REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			STRAIGHT FACED CURB AND GUTTER	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T14
			DATE: NOVEMBER, 2001	

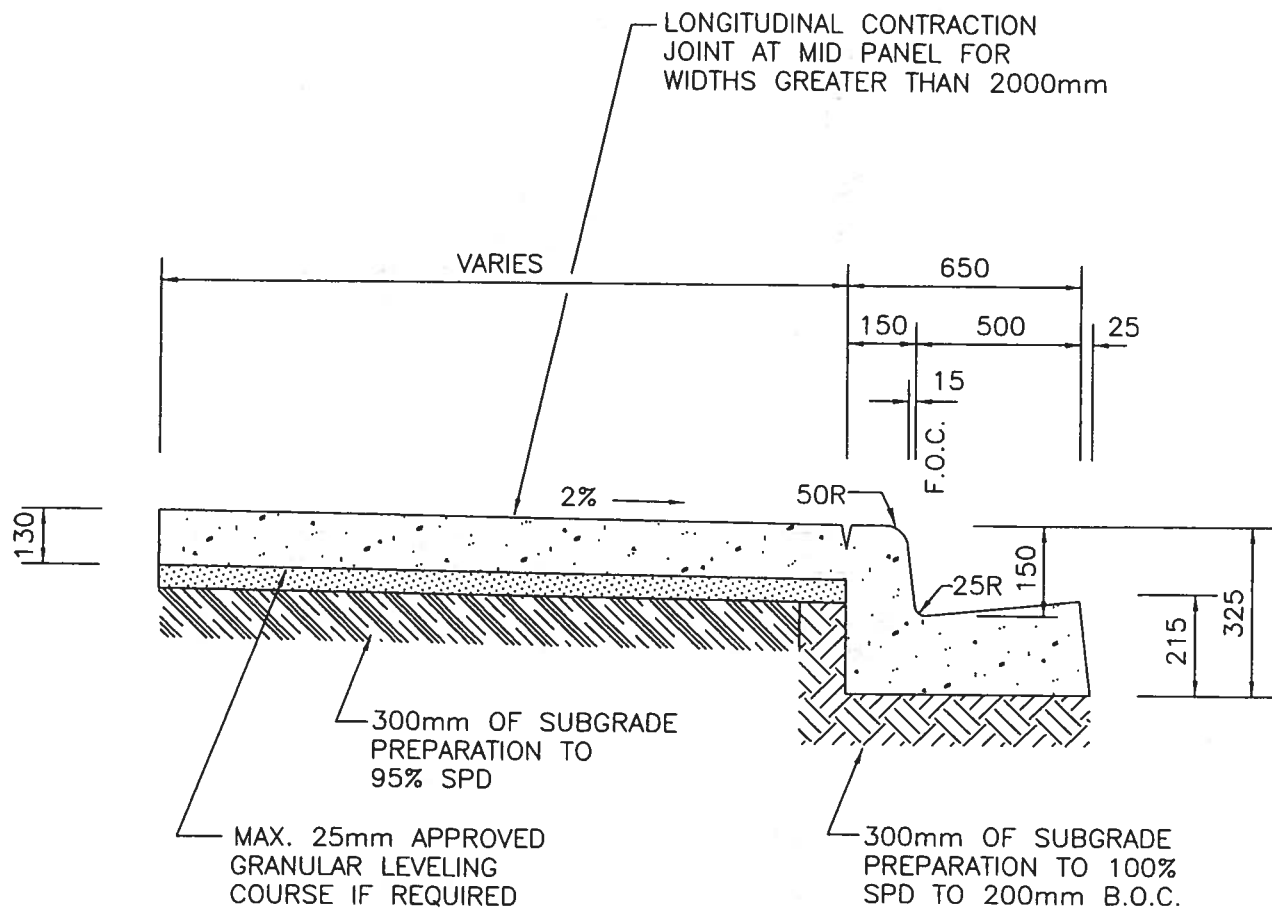


REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			ROLLED CURB AND GUTTER	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T15
			DATE: NOVEMBER, 2001	

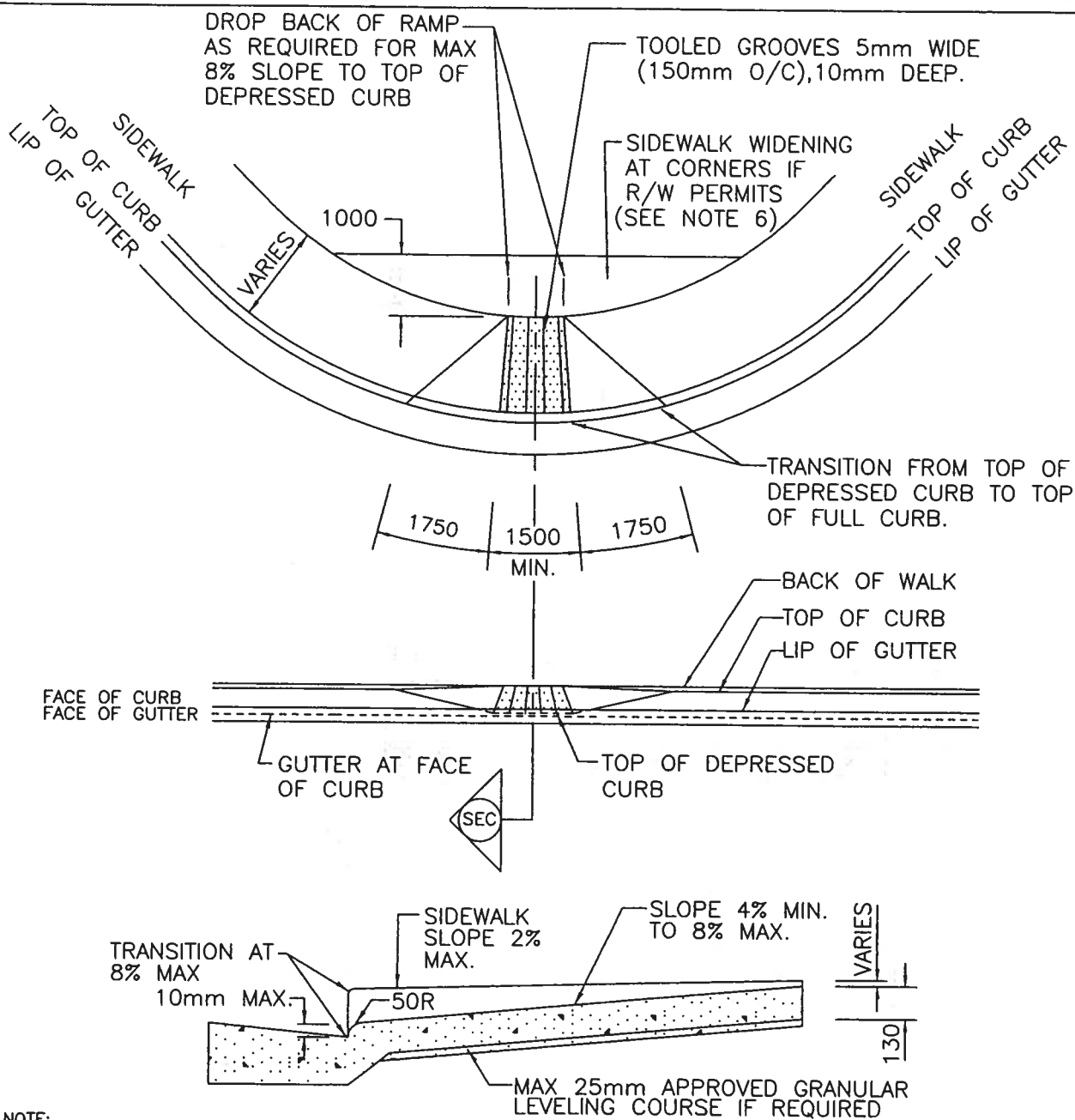


* 1.5m SIDEWALK MAY BE REQUIRED IN HIGH PEDESTRIAN TRAFFIC AREAS

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			ROLLED MONOLITHIC CURB AND GUTTER	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T16
			DATE: NOVEMBER, 2001	



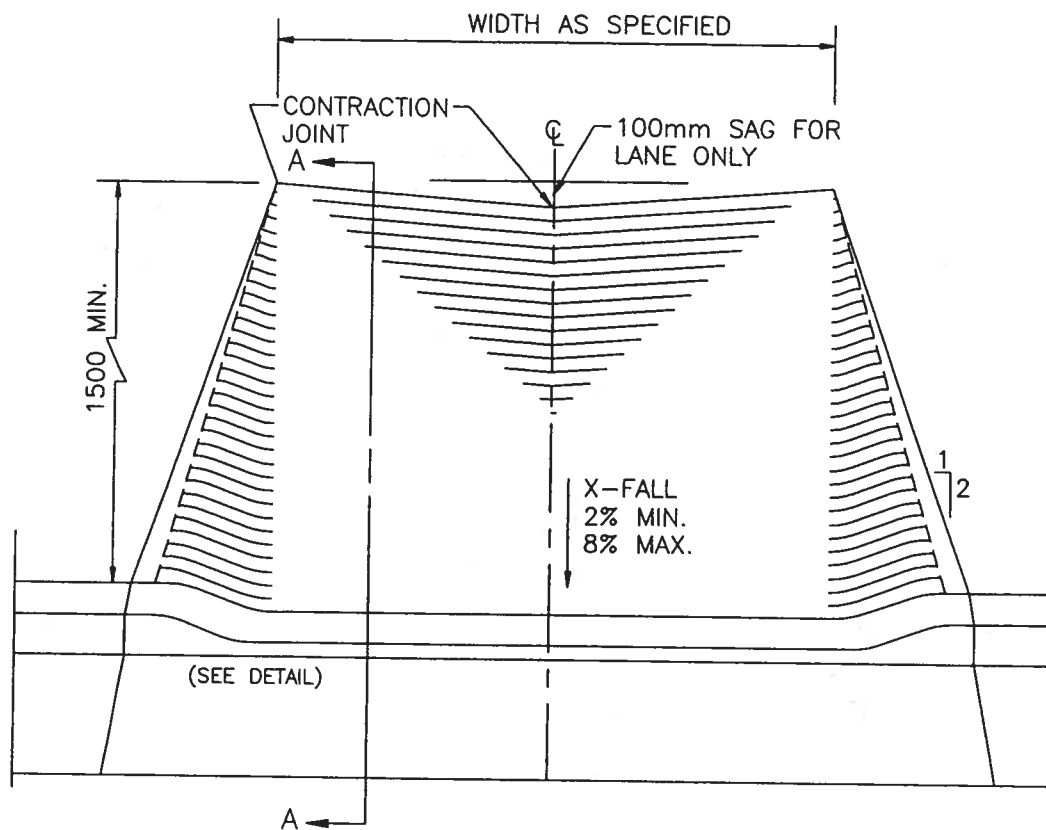
REVISIONS			The Town of Drayton Valley STRAIGHT FACED MONOLITHIC CURB AND GUTTER	
Date	Details	Approved		
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T17
			DATE: NOVEMBER, 2001	



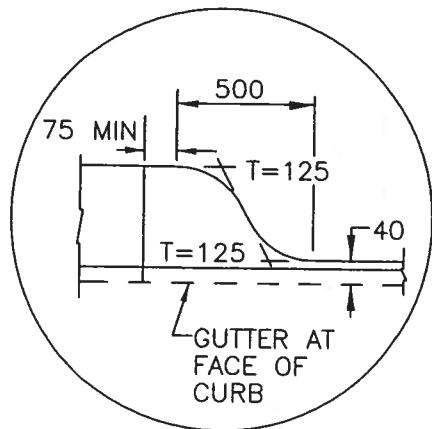
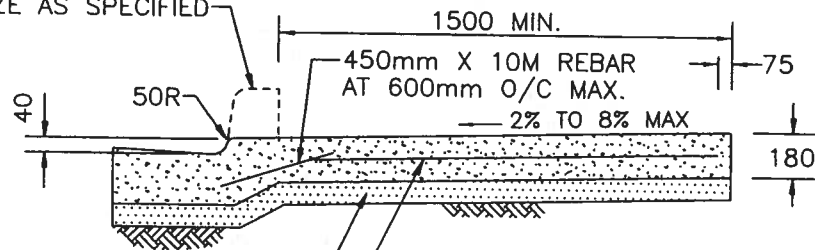
NOTE:

1. POUR CURB AND RAMP MONOLITHICALLY.
2. TRANSITION DISTANCE FROM TOP OF DEPRESSED CURB TO TOP OF FULL CURB VARIES WITH SIDEWALK DEPTH OR CURB HEIGHT.
3. RAMPS FOR USERS OF WHEELCHAIRS/BICYCLES SHOULD BE LOCATED AT ALL JUNCTIONS OF CROSSWALKS AND SIDEWALKS. RAMP MUST BE LOCATED WITHIN A CROSSWALK.
4. GROOVES ON SIDEWALK RAMPS ARE TO ALERT PERSONS WHO ARE VISUALLY IMPAIRED OF THE CURB-CUT AND A STREET CROSSING
5. WHERE CROSSWALKS ARE CONTROLLED BY SIGNALS WITH A PUSH-BUTTON SYSTEM, THE SIDEWALKS AND RAMPS MUST ALLOW ACCESS BY WHEELCHAIR TO THE PUSH-BUTTON.
6. WHERE RIGHT-OF-WAY IS AVAILABLE, THE SIDEWALK IS TO BE WIDENED AT CORNER LOCATIONS AS SHOWN SO THAT AT LEAST A 1.0m WIDTH OF FLAT SIDEWALK IS PROVIDED ADJACENT TO THE RAMP.

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			PARAPLEGIC RAMP	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T18
			DATE: NOVEMBER, 2001	

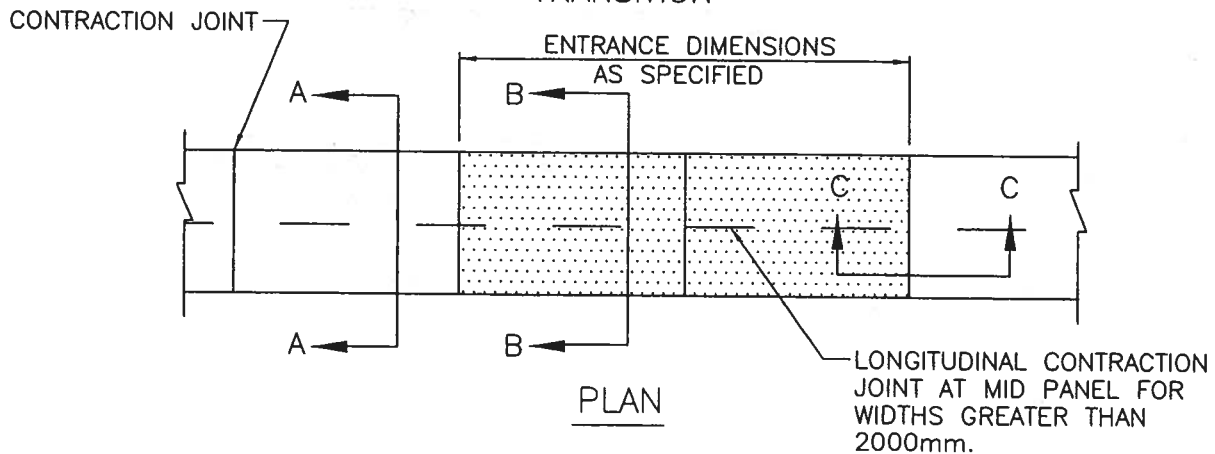
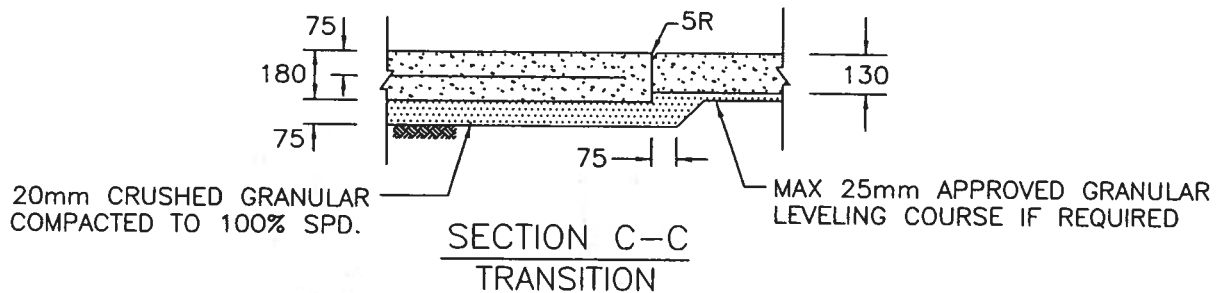
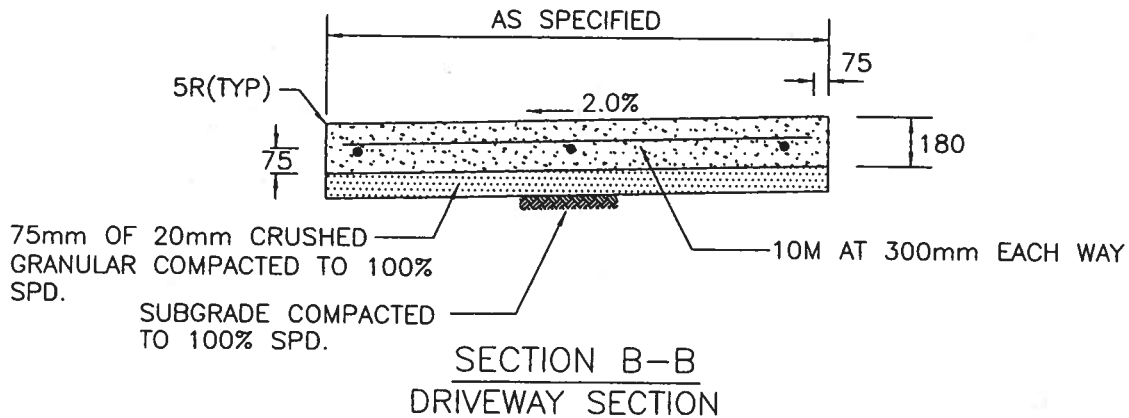
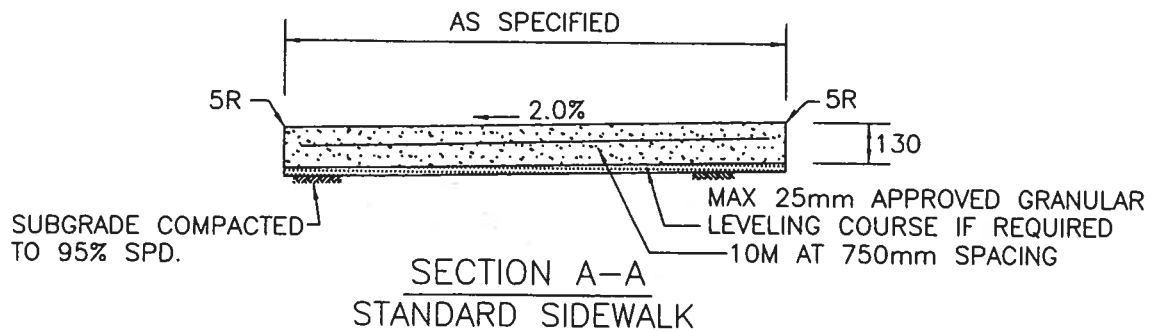


CURB & GUTTER
SIZE AS SPECIFIED

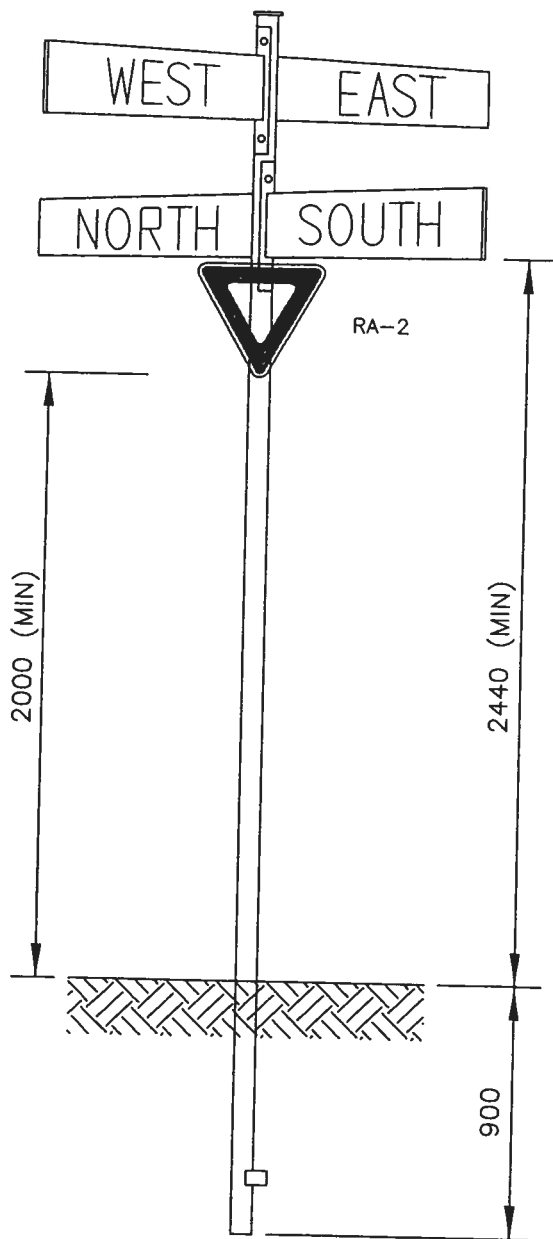


SECTION A-A

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			CONCRETE DRIVEWAY	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T19
			DATE: NOVEMBER, 2001	

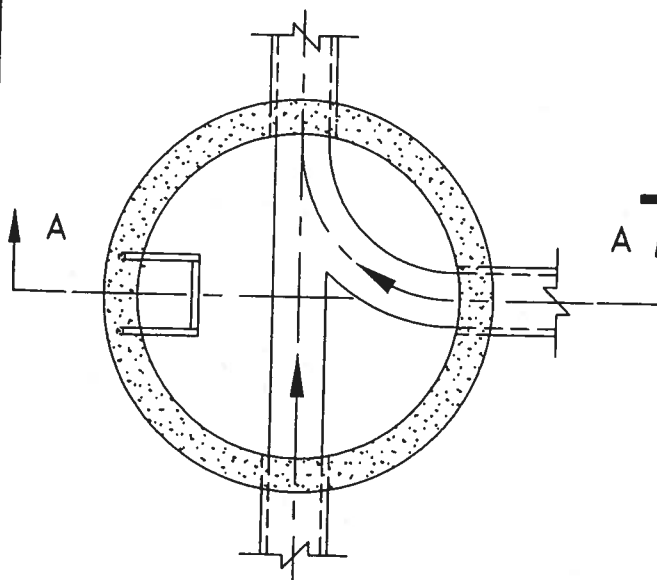


REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			SEPARATE WALK AND DRIVEWAY ACCESS	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T20
			DATE: NOVEMBER, 2001	



- 50mm GALVANIZED SCHEDULE 40 STEEL PIPE OR APPROVED ALTERNATE.
- TOP OF SIGN TO BE 25mm BELOW TOP OF POST.
- HIGH INTENSITY BLADE WITH REINFORCED EDGES. 225mm WIDE FOR ARTERIAL ROADS AND COLLECTOR STREETS. 150mm WIDE FOR LOCAL STREETS.
- ALL HARDWARE TO BE GALVANIZED.
- 3.65m POST IS USED FOR STREET NAME SIGN, OR STOP OR YIELD SIGN.
- 4.25m POST IS USED FOR COMBINATION STREET NAME AND STOP OR YIELD SIGNS.
- POSTS TO BE LOCATED A MINIMUM OF 600mm BACK OF STREET CURB FACE IN URBAN AREAS OR 300mm BACK OF WALK WHERE NO BOULEVARD EXISTS.
- 75mm x 50mm FLAT BAR TO BE WELDED ON POST TO PREVENT SIGN FROM TURNING.

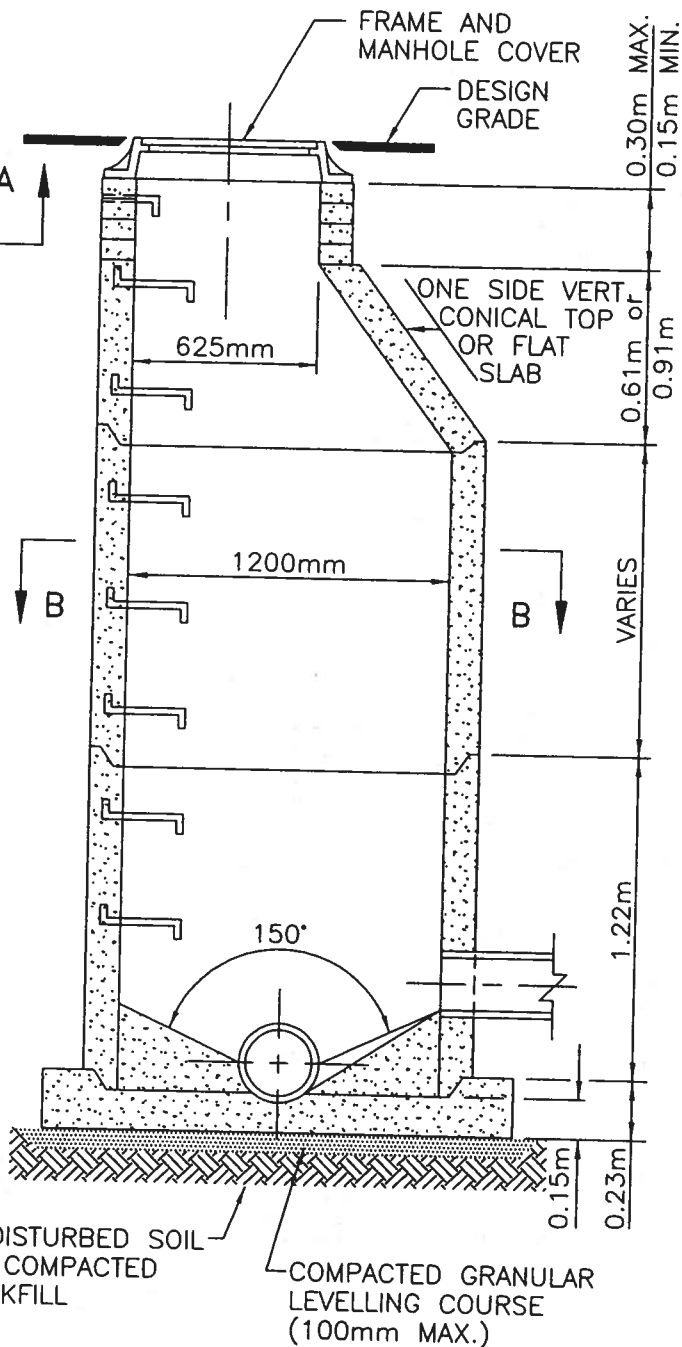
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			STREET SIGN	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	T21
			DATE: NOVEMBER, 2001	



SECTION B - B

NOTES:

1. CAST-IN-PLACE CONCRETE BASE MAY BE USED. CAST-IN-PLACE CONCRETE TO BE TYPE 50 25MPa IN 28 DAYS. CAST-IN-PLACE CONC. BASE TO BE MIN. 150mm THICK AND CONSTRUCTED ON UNDISTURBED SOIL. FOR MH OVER 5.0m IN DEPTH, BASE TO BE REINFORCED WITH 10M BARS AT 250mm EACH WAY. SAFETY PLATFORMS REQUIRED IN MANHOLES OVER 5.0m IN DEPTH.
2. PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT ASTM C478 STANDARDS.
3. STORM MH JOINTS TO BE SEALED WITH CEMENT MORTAR, OR CONFINED O-RING GASKET.
4. SANITARY MH JOINTS TO BE SEALED WITH A CONFINED O-RING GASKET, ASTM C445.
5. CONNECTION OF PIPES TO MH TO BE SEALED WITH CEMENT MORTAR.
6. INLET AND OUTLET PIPES TO BE GROUTED FLUSH WITH WALL.
7. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
8. SAFETY STEP SPACING TO BE EQUALLY SPACED AT A MAX. OF 410mm APART TO WITHIN 300mm BELOW COVER AND TO WITHIN 600mm OF THE BASE OR BENCHING. STEPS TO BE EPOXY COATED EXTRUDED ALUMINUM OR GALVANIZED METAL.
9. COMPACT BACKFILL AROUND MH TO A MIN. OF 95% STANDARD PROCTOR DENSITY.
10. PRECAST INLINE TEE MH's ARE ACCEPTABLE FOR SEWERS 900mm ϕ AND LARGER. CONCRETE BEDDING REQUIRED TO SPRINGLINE OF MANHOLE TEE.
11. NF-39 FRAME AND COVER IN LANDSCAPED AREAS.
NF-80 FRAME AND COVER IN HARD SURFACE AREAS.
NF-90 GASKETED FRAME AND COVER AT SAGS.



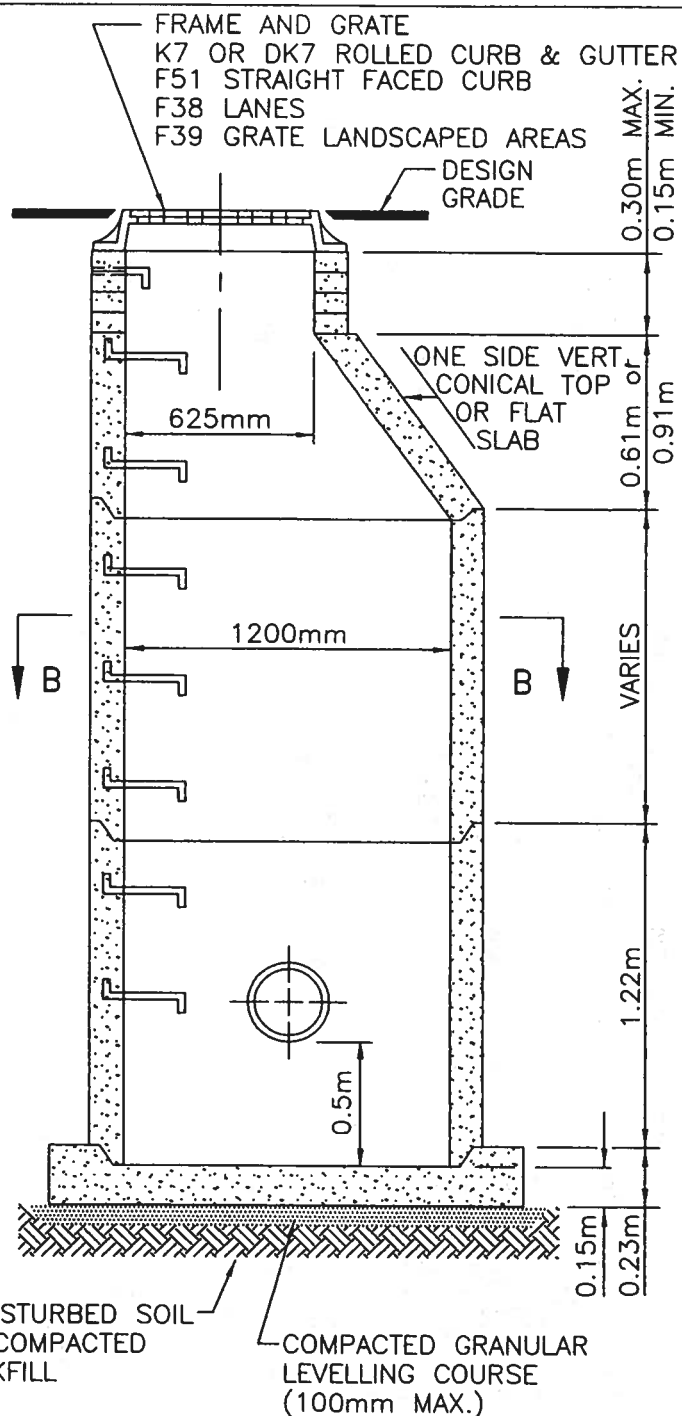
SECTION A - A

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			STANDARD 1200mm MANHOLE	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	U1
			DATE: NOVEMBER, 2001	

SECTION B - B

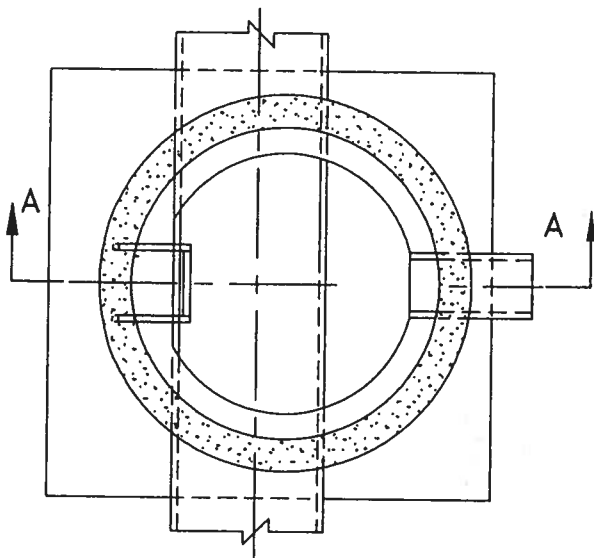
NOTES:

1. CAST-IN-PLACE CONCRETE BASE MAY BE USED. CAST-IN-PLACE CONCRETE TO BE TYPE 50 25MPa IN 28 DAYS. CAST-IN-PLACE CONC. BASE TO BE MIN. 150mm THICK AND CONSTRUCTED ON UNDISTURBED SOIL. FOR MH OVER 5.0m IN DEPTH, BASE TO BE REINFORCED WITH 10M BARS AT 250mm EACH WAY. SAFETY PLATFORMS REQUIRED IN MANHOLES OVER 5.0m IN DEPTH.
2. PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT ASTM C478 STANDARDS.
3. STORM MH JOINTS TO BE SEALED WITH CEMENT MORTAR, OR CONFINED O-RING GASKET.
4. CONNECTION OF PIPES TO MH TO BE SEALED WITH CEMENT MORTAR
5. INLET AND OUTLET PIPES TO BE GROUTED FLUSH WITH WALL.
6. BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
7. SAFETY STEP SPACING TO BE EQUALLY SPACED AT A MAX. OF 410mm APART TO WITHIN 300mm BELOW COVER AND TO WITHIN 600mm OF THE BASE OR BENCHING. STEPS TO BE EPOXY COATED EXTRUDED ALUMINUM OR GALVANIZED METAL.
8. COMPACT BACKFILL AROUND MH TO A MIN. OF 95% STANDARD PROCTOR DENSITY.
9. PRECAST INLINE TEE MH's ARE ACCEPTABLE FOR SEWERS 900mmØ AND LARGER. CONCRETE BEDDING REQUIRED TO SPRINGLINE OF MANHOLE TEE.
10. 0.5m SUMP REQUIRED IN CATCHBASIN MANHOLE.



SECTION A - A

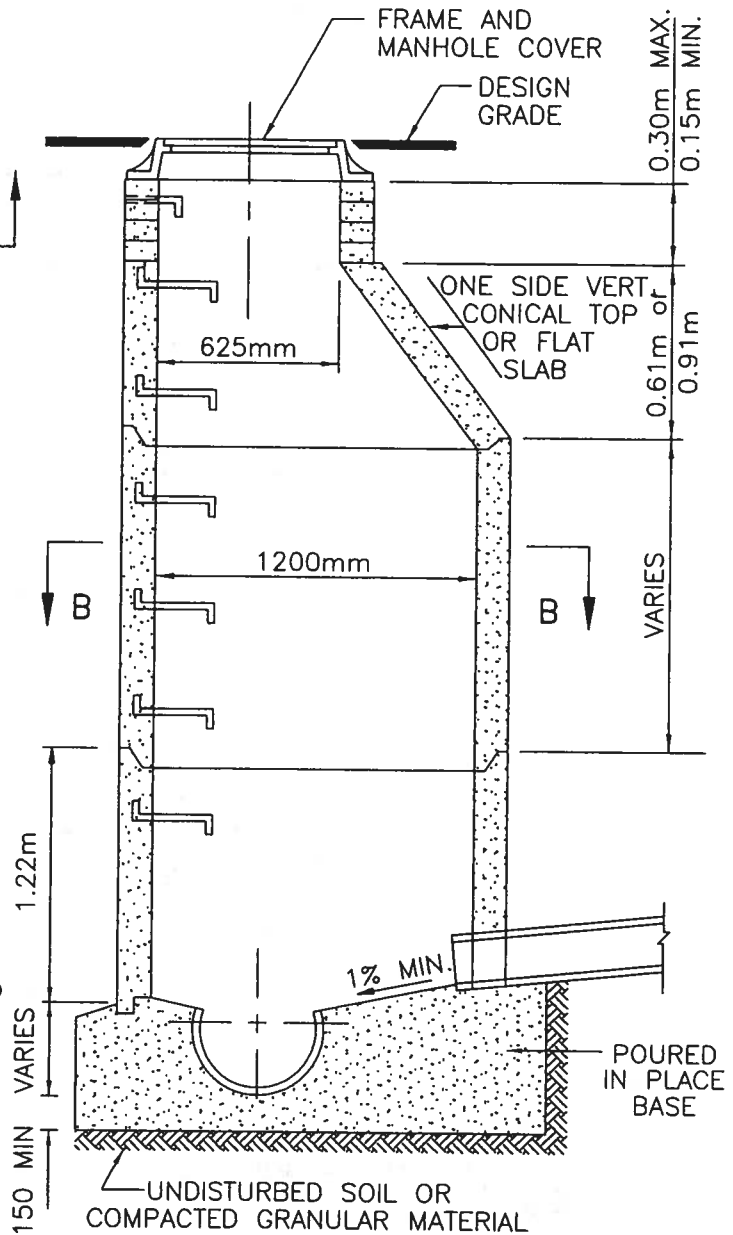
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved	STANDARD 1200mm CATCHBASIN MANHOLE	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	U2
			DATE: November 2001	



SECTION B - B

NOTES:

1. CAST-IN-PLACE CONCRETE BASE TO BE TYPE 50 25Mpa IN 28 DAYS. CAST-IN-PLACE BASE TO BE MIN. 150mm THICK AND CONSTRUCTED ON UNDISTURBED SOIL. FOR MANHOLES OVER 5.0m IN DEPTH, BASE TO BE REINFORCED WITH 10M BARS AT 250mm EACH WAY. SAFTY PLATFORMS REQUIRED IN MANHOLES OVER 5.0m IN DEPTH.
2. PRECAST RINGS, CONES AND BARRELS TO MEET CURRENT ASTM C478 STANDARDS.
3. STORM MH JOINTS TO BE SEALED WITH CEMENT MORTAR, OR CONFINED O-RING GASKET.
4. SANITARY MH JOINTS TO BE SEALED WITH A CONFINED O-RING GASKET,ASTM C445.
5. CONNECTION OF PIPES TO MH TO BE SEALED WITH CEMENT MORTAR
6. INLET AND OUTLET PIPES TO BE GROUTED FLUSH WITH WALL.
7. CHANNELING AND BENCHING TO BE FINISHED TO TROWEL SMOOTHNESS.
8. SAFETY STEP SPACING TO BE EQUALLY SPACED AT A MAX. OF 410mm APART TO WITHIN 300mm BELOW COVER AND TO WITHIN 600mm OF THE BASE OR BENCHING. STEPS TO EPOXY COATED EXTRUDED ALUMINUM OR GALVANIZED METAL.
9. COMPACT BACKFILL AROUND MH TO A MIN. OF 95% STANDARD PROCTOR DENSITY.
10. F-39 FRAME AND COVER IN LANDSCAPED AREAS.
F-80 FRAME AND COVER IN HARD SURFACED AREAS.
F-90 GASKETED FRAME AND COVER AT SAGS.

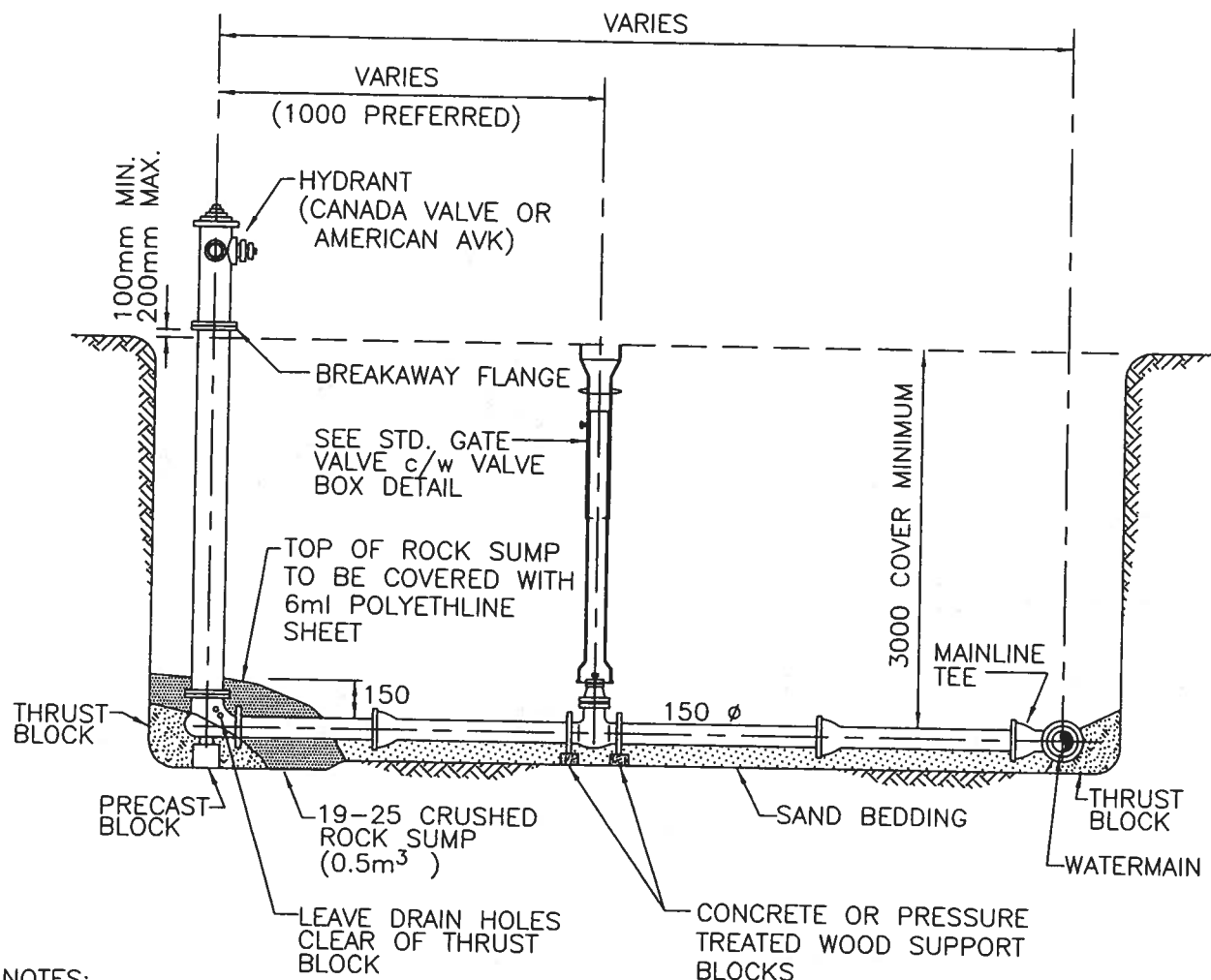


SECTION A - A

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			STANDARD 1200mm PERCHED MANHOLE	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	U3
			DATE: November, 2001	



- | | | | | |
|-----------|---------|----------|------------------------------|---------------|
| REVISIONS | | | The Town of Drayton Valley | |
| Date | Details | Approved | | |
| | | | STANDARD 900mm
CATCHBASIN | |
| | | | | |
| | | | | |
| | | | APPROVED: | STD. DWG. No. |
| | | | SCALE: N.T.S. | U4 |
| | | | DATE: NOVEMBER, 2001 | |



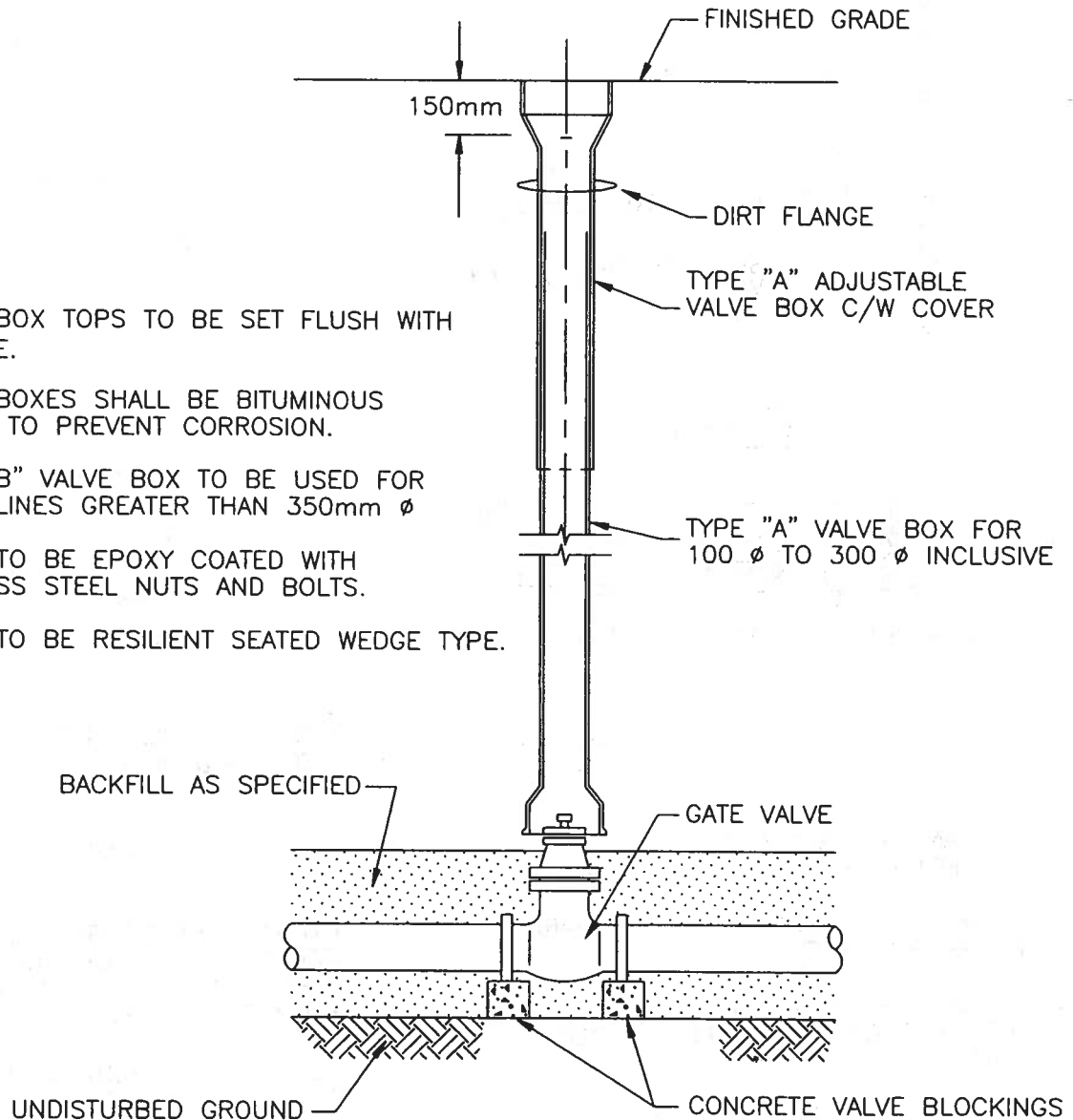
NOTES:

1. HYDRANT AND VALVE TO BE CATHODICALLY PROTECTED WITH A 11KG ZINC ANODE.
2. VALVE TO BE LOCATED IN BOULEVARD WHERE POSSIBLE.
3. HYDRANT TO BE CHROME YELLOW WITH TOPS AND CAPS COLORED IN ACCORDANCE WITH NFPA GUIDELINES.
4. ALL NUTS AND BOLTS TO BE STAINLESS STEEL.
5. HYDRANT MUST NOT RESTRICT SIDEWALK. MINIMUM 0.5m CLEARANCE TO F.O.C. MAXIMUM DISTANCE FROM CENTER LINE OF HYDRANT TO BACK OF CURB IS 3.0m.
6. OPERATOR AND CAPS TO HAVE PENTAGONAL NUTS.
7. HYDRANT SHOULD BE LOCATED SO STEAMER PORT FACES THE ROAD OR MOST ACCESSIBLE SPOT FOR A FIRE TRUCK TO CONNECT.
8. ALL HOSE CONNECTIONS TO HAVE STANDARD CMROSE THREAD.

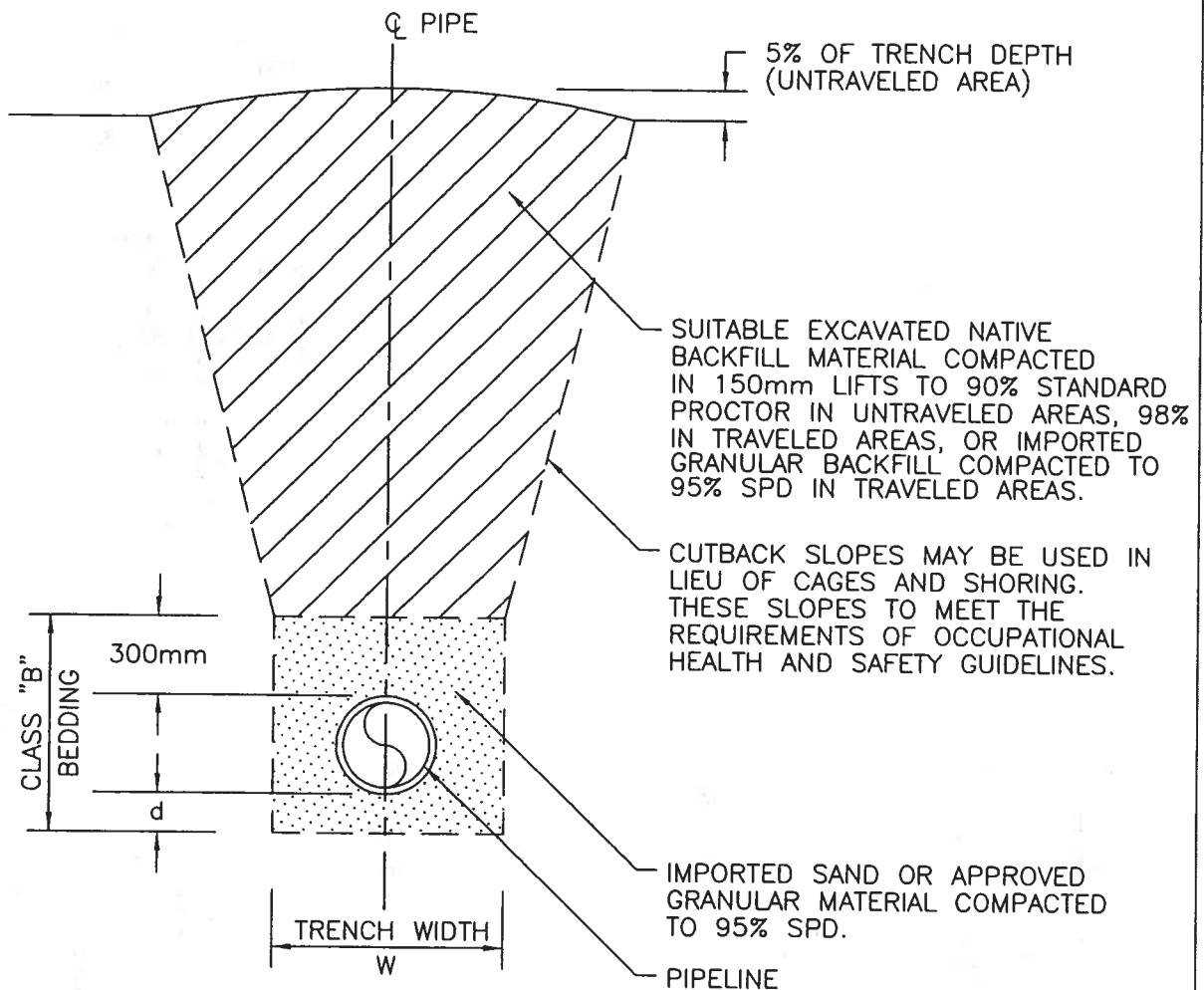
REVISIONS			The Town of Drayton Valley STANDARD HYDRANT CONNECTION DETAIL	
Date	Details	Approved		
			APPROVED: _____	
			SCALE: N.T.S.	STD. DWG. No. U5
			DATE: NOVEMBER, 2001	

NOTES:

- (1) VALVE BOX TOPS TO BE SET FLUSH WITH SURFACE.
- (2) VALVE BOXES SHALL BE BITUMINOUS COATED TO PREVENT CORROSION.
- (3) TYPE "B" VALVE BOX TO BE USED FOR WATER LINES GREATER THAN 350mm ϕ
- (4) VALVE TO BE EPOXY COATED WITH STAINLESS STEEL NUTS AND BOLTS.
- (5) VALVE TO BE RESILIENT SEATED WEDGE TYPE.



REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			BURIED VALVE DETAIL	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	U6
			DATE: NOVEMBER, 2001	

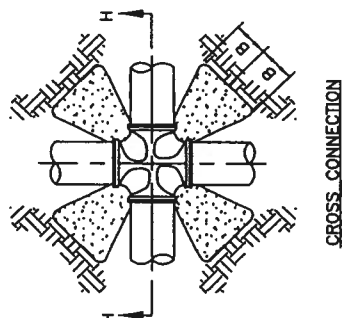


W = MINIMUM TRENCH WIDTH
 = O.D. + 450mm
 O.D. = OUTSIDE PIPE DIAMETER
 I.D. = INSIDE PIPE DIAMETER

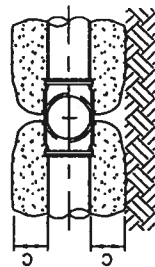
d = DEPTH OF BEDDING BELOW PIPE

I.D. = 675mm OR SMALLER : d MINIMUM = 75mm
 I.D. = 750mm TO 1500mm : d MINIMUM = 100mm
 I.D. = 1650mm AND LARGER : d MINIMUM = 150mm

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			TYPICAL TRENCHING DETAIL	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	U7
			DATE: NOVEMBER, 2001	



CROSS CONNECTION



SECTION H - H

DIA.	RAR	0.156	0.307	0.603	0.788	0.876	0.980	1.114	0.788
m=300	B	200	310	430	440	440	440	500	440
A=0.788	C	75	100	200	300	350	400	400	300

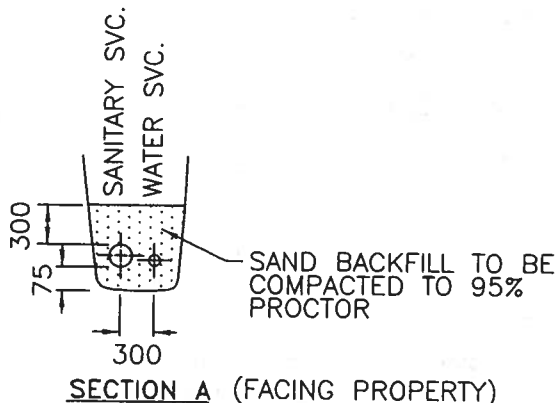
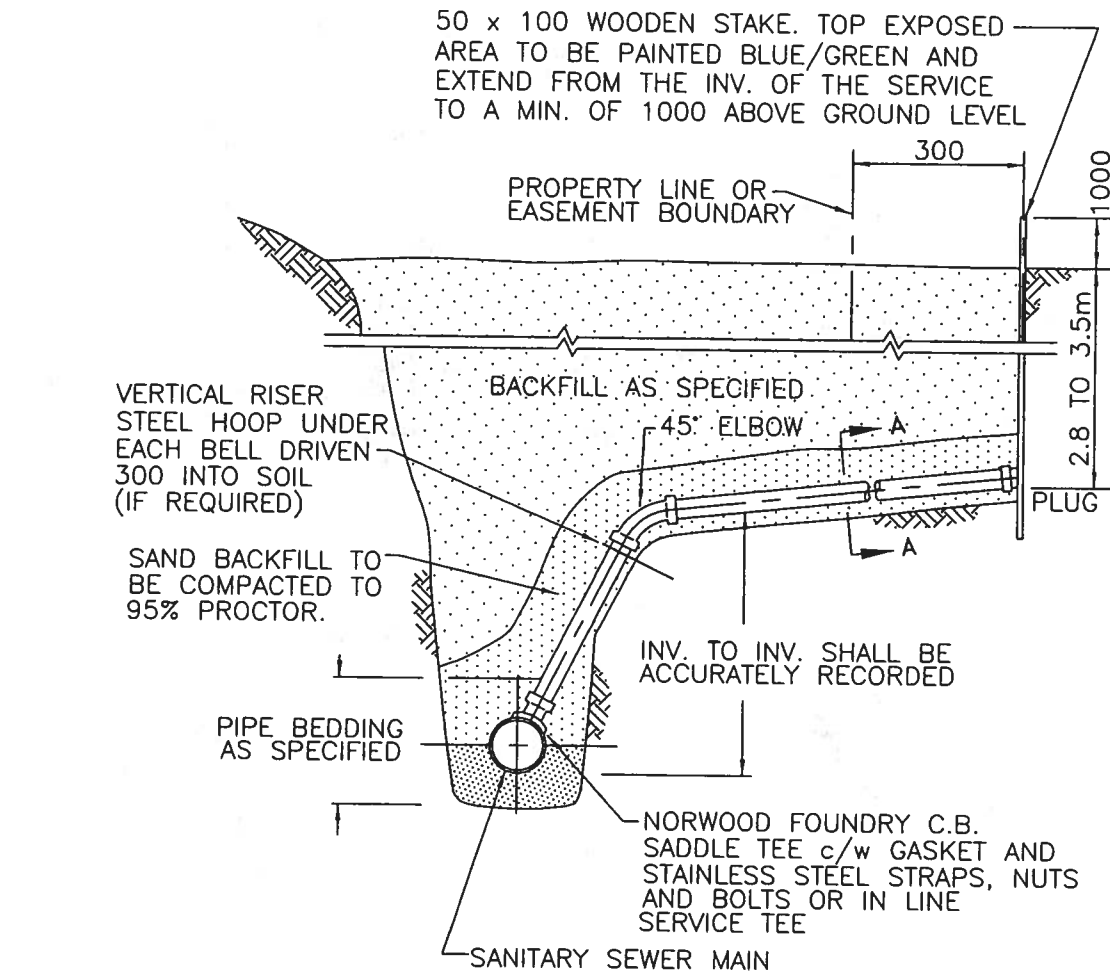
- THRUST BLOCK DESIGNED ON
- 100 K₉₀ ALLOWABLE SOIL BEARING PRESSURE.
- 1.5 FACTOR OF SAFETY
- 1035 K₉₀ PIPE WATER PRESSURE.
- LARGER REACTION AREAS ARE REQUIRED IN POOR SOIL CONDITIONS.

DIA	PAR	0.212	0.418	0.621	1.073	1.183	1.207	1.517	1.073
350	B	200	380	430	510	520	570	570	510
1,073	C	100	100	300	350	400	400	500	350

DIA	PAR	0.277	0.545	1.072	1.401	1.558	1.708	1.881	1.401
400	B	230	455	540	580	600	610	710	580
1,401	C	100	100	300	400	450	500	500	400

DIA	PAR	0.351	0.692	1.356	1.773	1.872	2.160	2.507	1.773
450	B	260	510	610	650	675	700	800	650
1,773	C	100	100	400	450	500	600	600	450

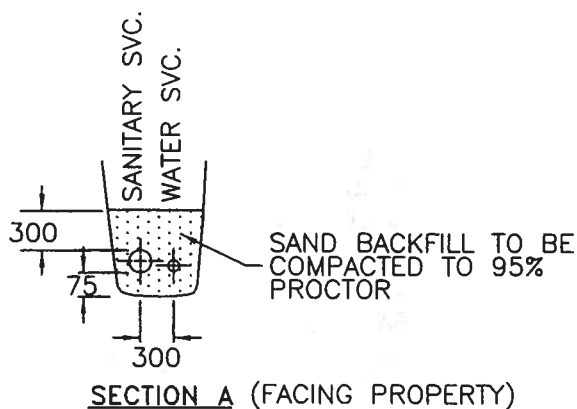
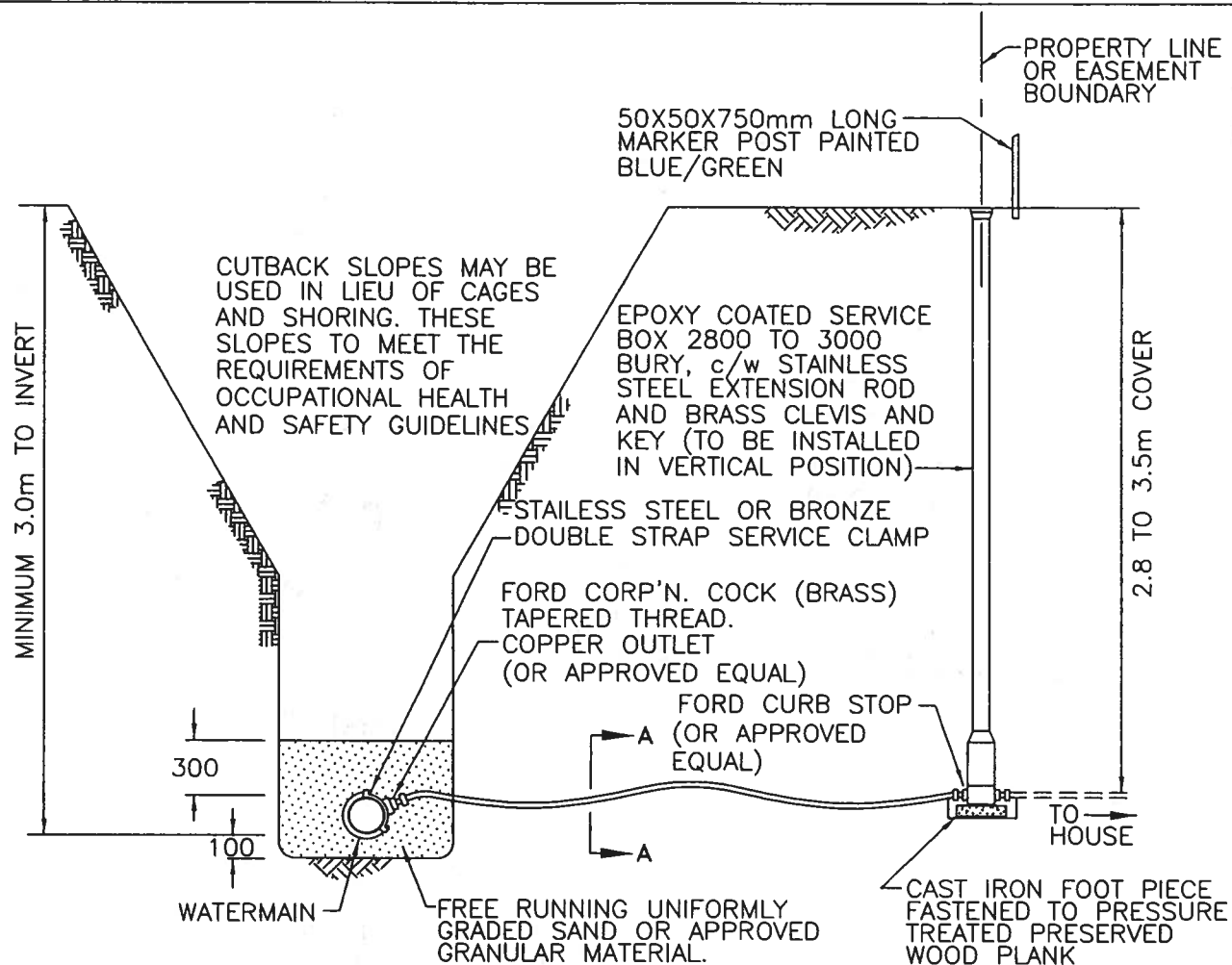
REVISIONS		The Town of Drayton Valley	
Date	Details	Approved	
APPROVED:			STD. DWG. No.
SCALE: N.T.S.			
DATE: NOVEMBER, 2001			U8



NOTE :

1. MIN SLOPE FOR 100mm & 150mm DIA. PIPE IS 2%
2. SERVICE CONNECTIONS SHALL BE MINIMUM 100mm DIA. SDR 35 PVC
3. CITY TO INSPECT ALL RISER INSTALLATIONS PRIOR TO BACKFILLING.
4. WHEN A GAS EASEMENT OCCURS ADJACENT TO THE P/L THE SANITARY SERVICE SHALL BE STUBBED 300mm BEYOND EASEMENT LIMITS.

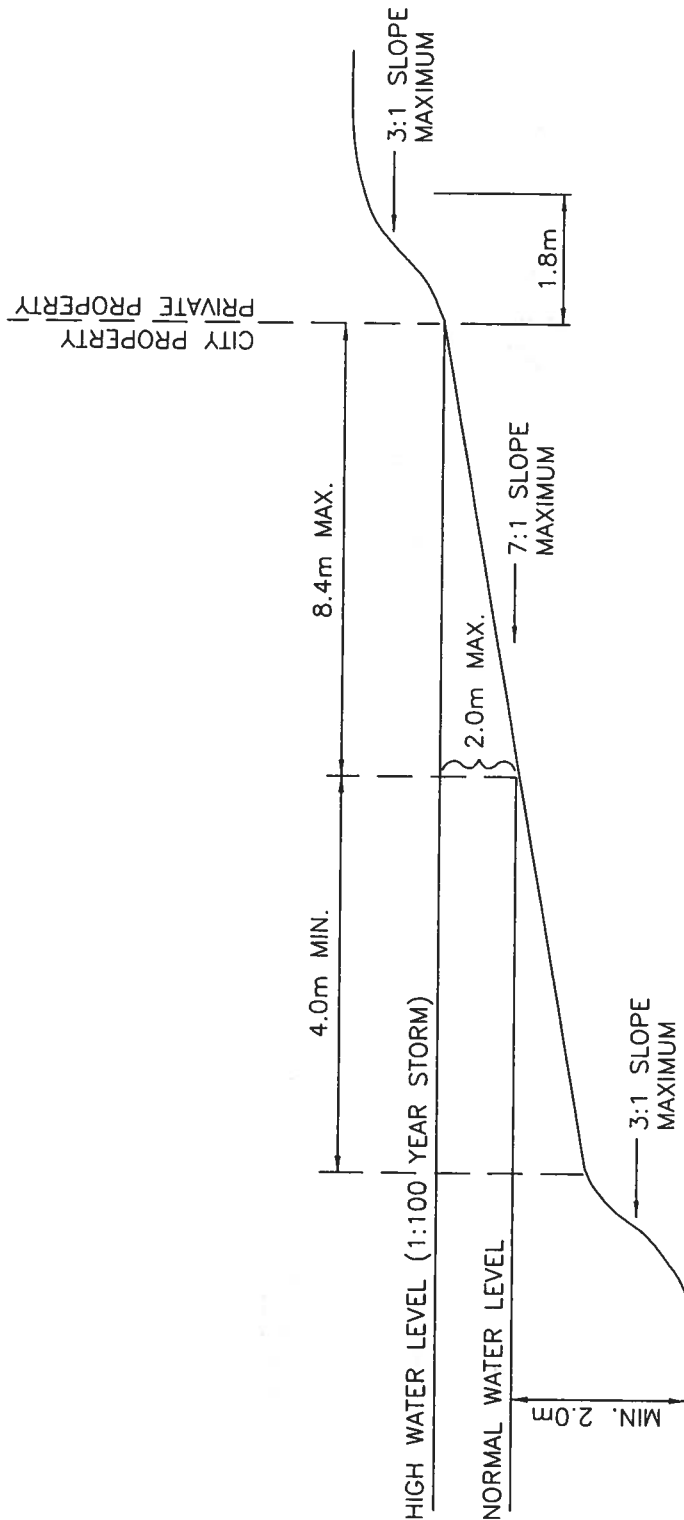
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			STANDARD SANITARY SERVICE CONNECTION	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	U9
			DATE: NOVEMBER, 2001	



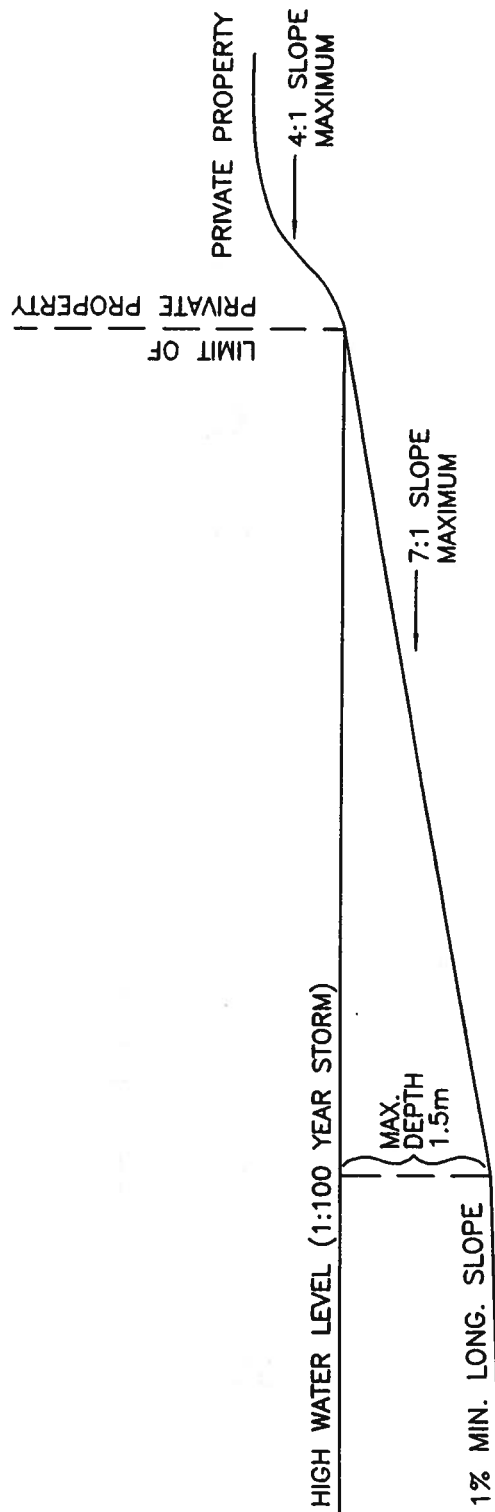
NOTES:

1. WATER SERVICE TO BE TAPPED AT THE 2 TO 3 O'CLOCK POSITION.
2. WATER SERVICE TO BE TYPE K COPPER.
3. WATER SERVICE TO BE SNAKED IN THE TRENCH.
4. WATER SERVICE IS NOT TO BE GOOSENECKED AT THE CORPORATION STOP.
5. CORPORATION STOP AND CURB STOP TO BE CATHODICALLY PROTECTED WITH 5KG ZINC ANODES.
6. ALL FITTINGS TO BE PACKER NUT TYPE, NOT GRIPPER NUT.

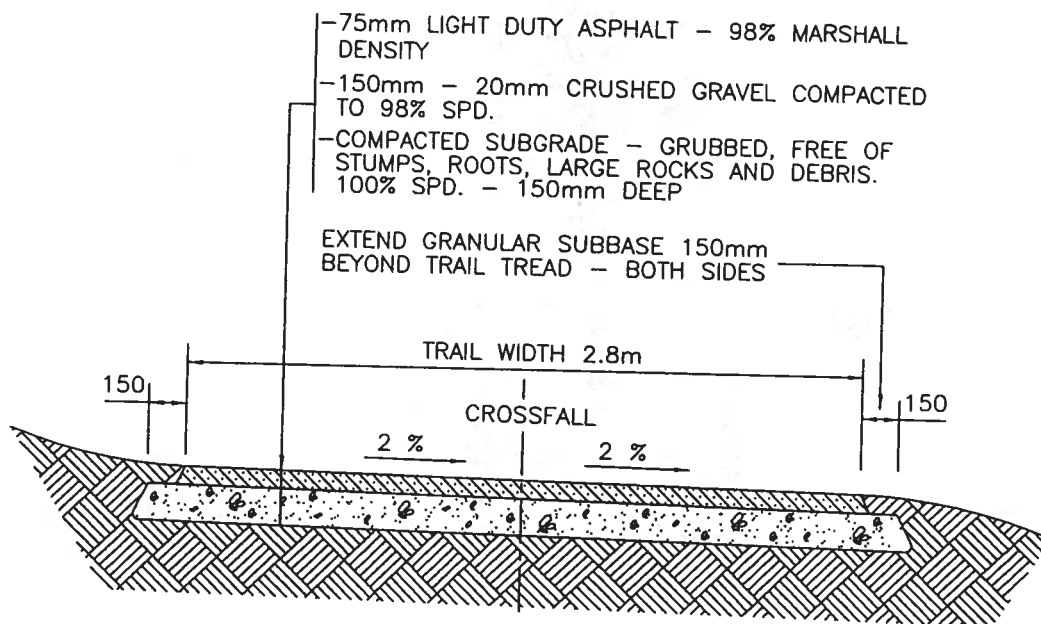
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			STANDARD WATER SERVICE CONNECTION	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	U10
			DATE: NOVEMBER, 2001	



REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			TYPICAL WET POND SECTION	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	U11
			DATE: SEPTEMBER, 2002	

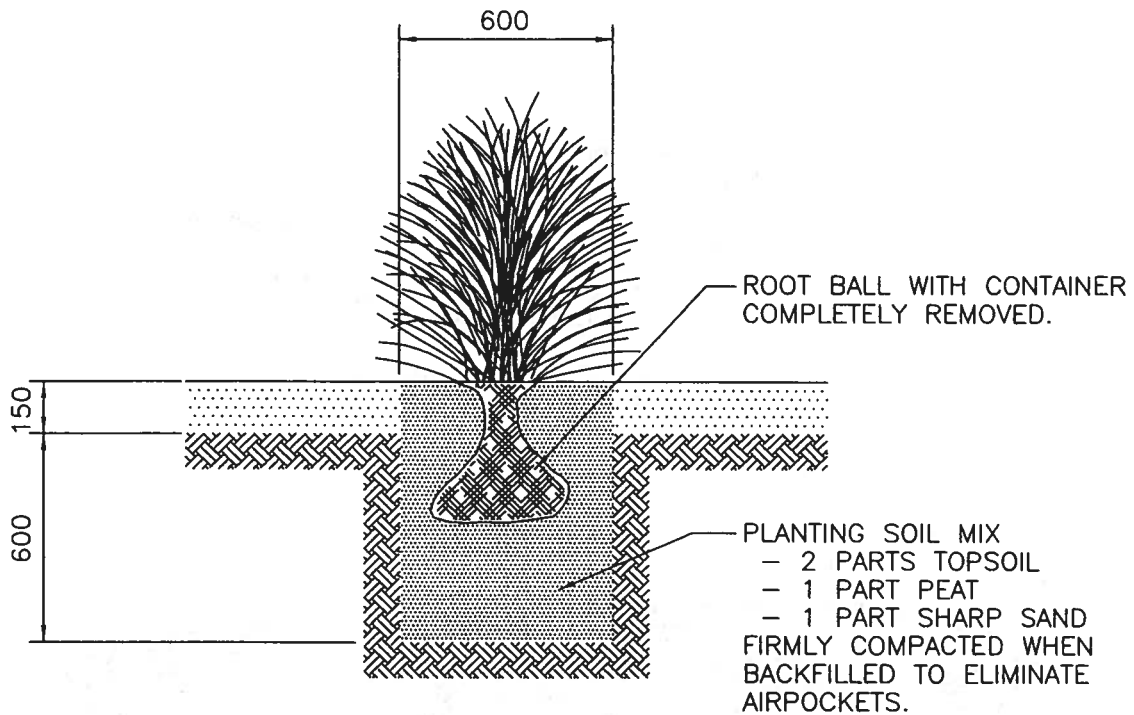


REVISIONS			The Town of Drayton Valley TYPICAL DRY POND SECTION	
Date	Details	Approved		
			APPROVED: _____	
			SCALE: N.T.S.	STD. DWG. No. U12
			DATE: November, 2001	



NOTE: WIDTH AND PAVEMENT STRUCTURE MAY VARY WITH LOCATION: CRITERIA ABOVE ARE MINIMUMS

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			ASPHALT TRAIL DETAIL	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	L1
			DATE: NOVEMBER, 2001	



REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			SHRUB INSTALLATION	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	L2
			DATE: NOVEMBER, 2001	

WIRE, GALVANIZED 9 GAUGE
ENCASED IN RUBBER OR
PLASTIC HOSE AT POINT
OF CONTACT. FASTEN IN
UPPER HALF OF TREE.
FASTEN SECURELY TO
ANCHORS.

CUT AND REMOVE
BURLAP FROM TOP
1/3 OF ROOT BALL

FINISHED GRADE
(TOPSOIL/WOOD CHIPS)

SURVEYOR'S FLAGGING

750mm LONG
METAL TEE BARS

300mm MIN.

PLANTING SOIL MIX

- 150mm MIN., COMPACTED
- 2 PARTS TOPSOIL
- 1 PART PEAT
- 1 PART SHARP SAND

NOTE:

- GUYING REQUIRED FOR ALL DECIDUOUS TREES OVER 100mm CALIPER AND ALL CONIFEROUS TREES EXCEEDING 3.0m IN HEIGHT.
- HIGH USE PLAY AREAS TO HAVE TOP OF STAKE SET BELOW FINISHED GRADE FOR PUBLIC SAFETY.

REVISIONS

Date

Details

Approved

The Town of Drayton Valley

LARGE TREE GUYING

APPROVED:

STD. DWG. No.

SCALE: N.T.S.

DATE: NOVEMBER, 2001

L3

WIRE, GALVANIZED 9 GAUGE
ENCASED IN RUBBER OR
PLASTIC HOSE AT POINT
OF CONTACT. FASTEN IN
UPPER HALF OF TREE.
FASTEN SECURELY TO
STAKES.

CUT AND REMOVE
BURLAP FROM TOP
1/3 OF ROOT BALL

FINISHED GRADE
(TOPSOIL/WOOD CHIPS)

SET TREE STAKE
MIN. 300mm INTO
UNDISTURBED SOIL

MINIMUM 2m LONG METAL
T-BARS.

300mm MIN.
UNDISTURBED SOIL
SOIL

PLANTING SOIL MIX
- 150mm MIN., COMPACTED
- 2 PARTS TOPSOIL
- 1 PART PEAT
- 1 PART SHARP SAND

NOTE:
STAKING REQUIRED FOR ALL DECIDUOUS
TREES LESS THAN 100mm CALIPER AND
CONIFEROUS TREES LESS THAN 3.0m
IN HEIGHT.

REVISIONS

Date

Details

Approved

The Town of Drayton Valley

SMALL TREE STAKING

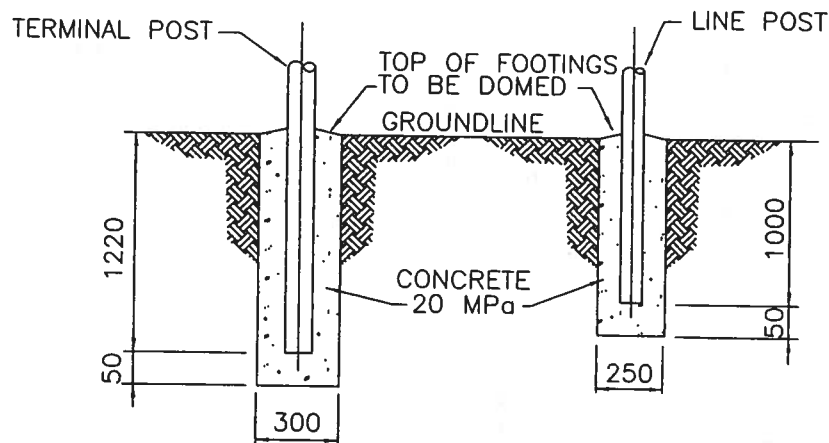
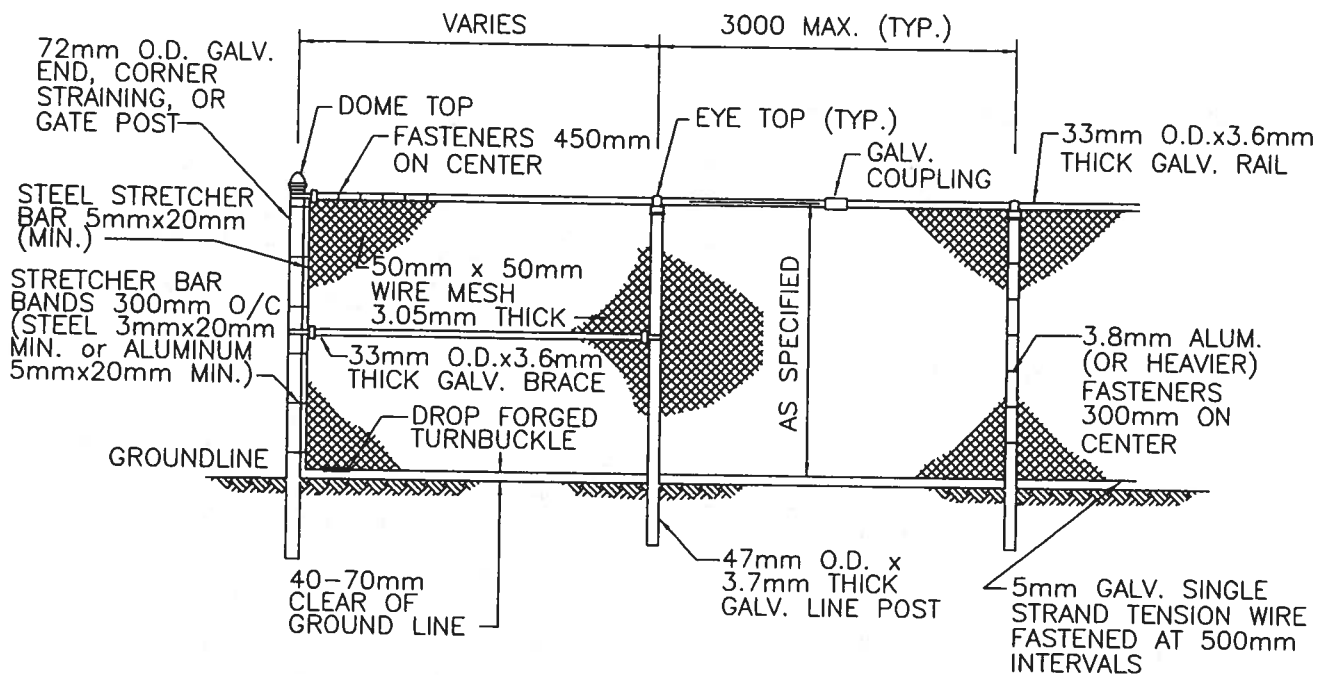
APPROVED:

STD. DWG. No.

SCALE: N.T.S.

DATE: NOVEMBER, 2001

L4



POST FOOTING DETAIL

- 2.7 GATE WIDTH
- 1520 FABRIC HEIGHT
- INSTALL KNUCKLED EDGE AT BOTTOM AND BARBED EDGE AT TOP.

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			CHAIN LINK FENCE	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	L5
			DATE: NOVEMBER, 2001	

SPECIFICATIONS

POSTS:

4"x6" (100mm x 152mm) FULL DIMENSION PRESSURE TREATED PINE. TOP ANGLE CUT.

STRINGERS:

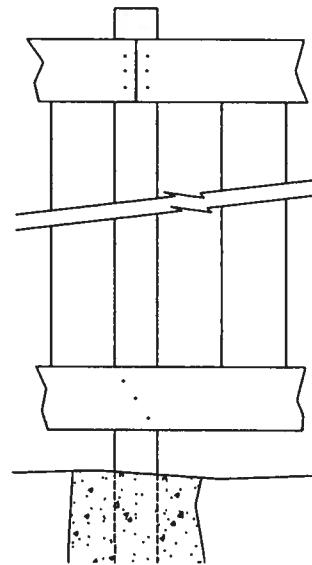
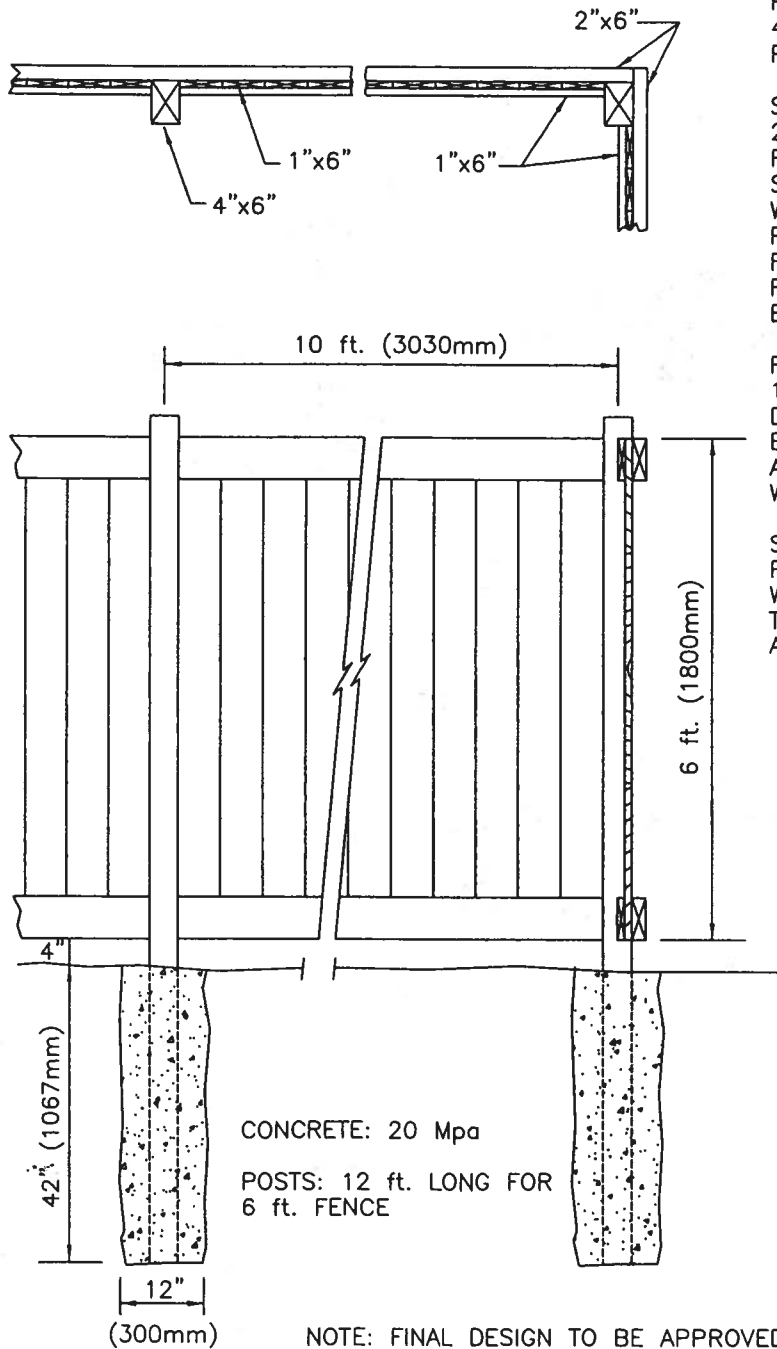
2"x6" (150mm x 152mm) S4S SMOOTH FINISH CEDAR TOP AND BOTTOM OUTSIDE STRINGERS. OUTSIDE STRINGERS ANCHORED WITH 3 - 4" (110mm) GALV. NAILS AT EACH POST CONNECTION. 1"x6" (25mm x 152mm) ROUGH SAWN CEDAR INSIDE STRINGER FASTENED WITH 3" (75mm) GALV. NAILS EVERY 24" (600mm) ON CENTER.

FENCE BOARDS:

1"x6" (25mm x 152mm) FULL DIMENSION ROUGH SAWN FINISH CEDAR-BUTTED TOGETHER. FASTENED TO TOP AND BOTTOM MAIN SUPPORT STRINGERS WITH 2" (50mm) COATED STAPLES.

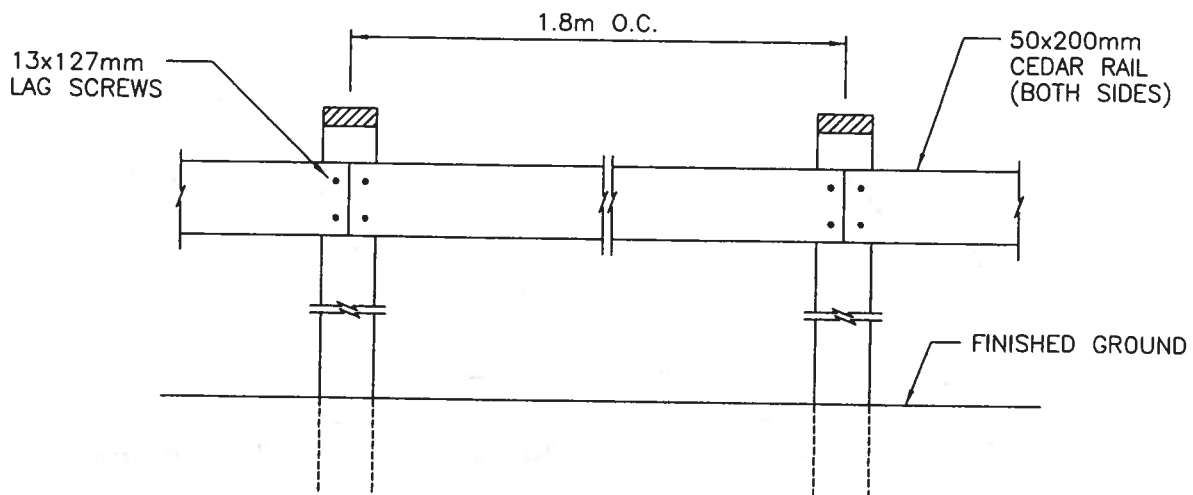
STAINING:

PRESTAINED PRIOR TO CONSTRUCTION WITH ONE COAT SOLID COLOR WOOD STAIN. TOUCH UP OF SCUFFS AND MARKS IN FIELD AFTER CONSTRUCTION.

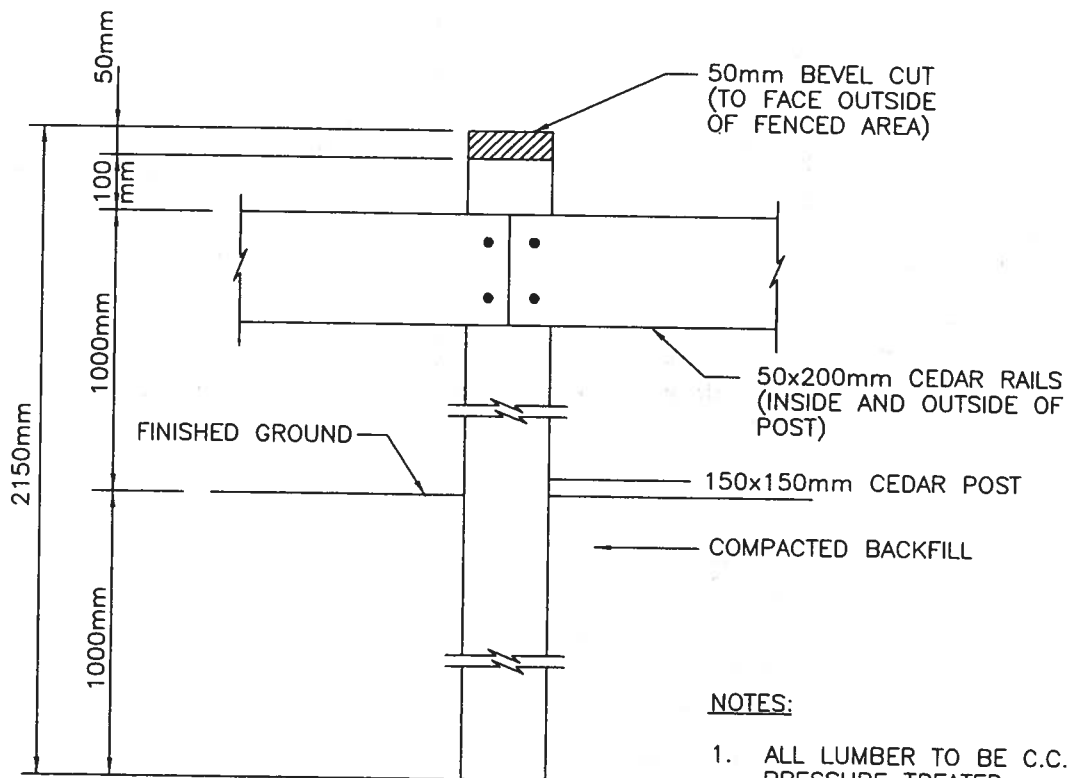


TYPICAL NAILING PATTERN

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			TYPICAL CEDAR FENCING	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	L6
			DATE: NOVEMBER, 2001	



FRONT ELEVATION

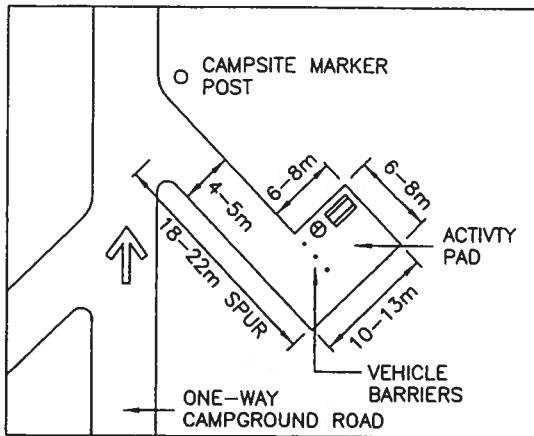


POST DETAIL

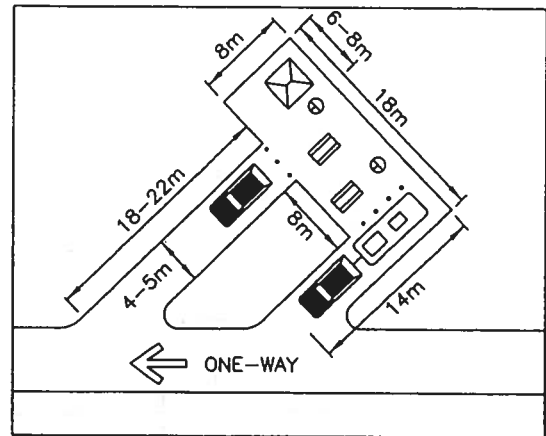
NOTES:

1. ALL LUMBER TO BE C.C.A. PRESSURE TREATED.
2. WHEN FENCE LINE CURVES, POSTS SHALL BE NOTCHED SUCH THAT 50x200mm RAILS LAY FLUSH TO POSTS.

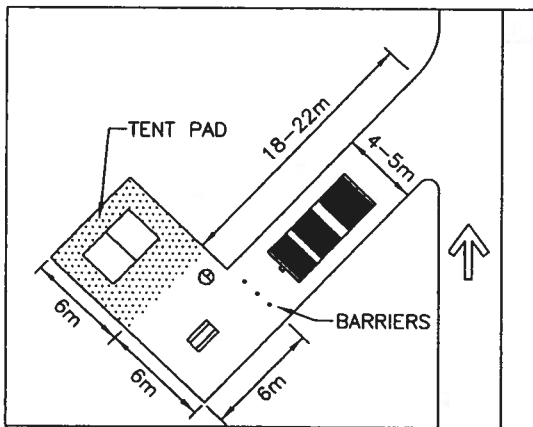
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			TIMBER FENCE FOR OPEN SPACE AREAS	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	L7
			DATE: NOVEMBER, 2001	



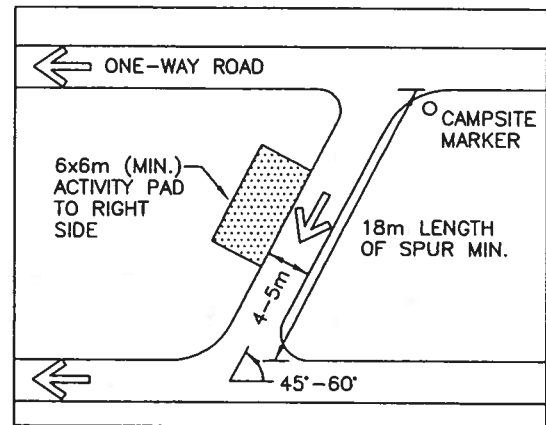
SINGLE BACK-IN CAMPSITE DESIGN



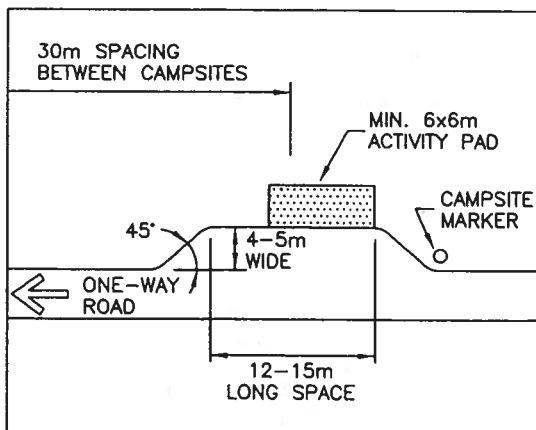
DIMENSIONS OF A DOUBLE BACK-IN CAMPSITE



CAMPGROUND LOCATED AT REAR WITH TENT PAD PROVIDED

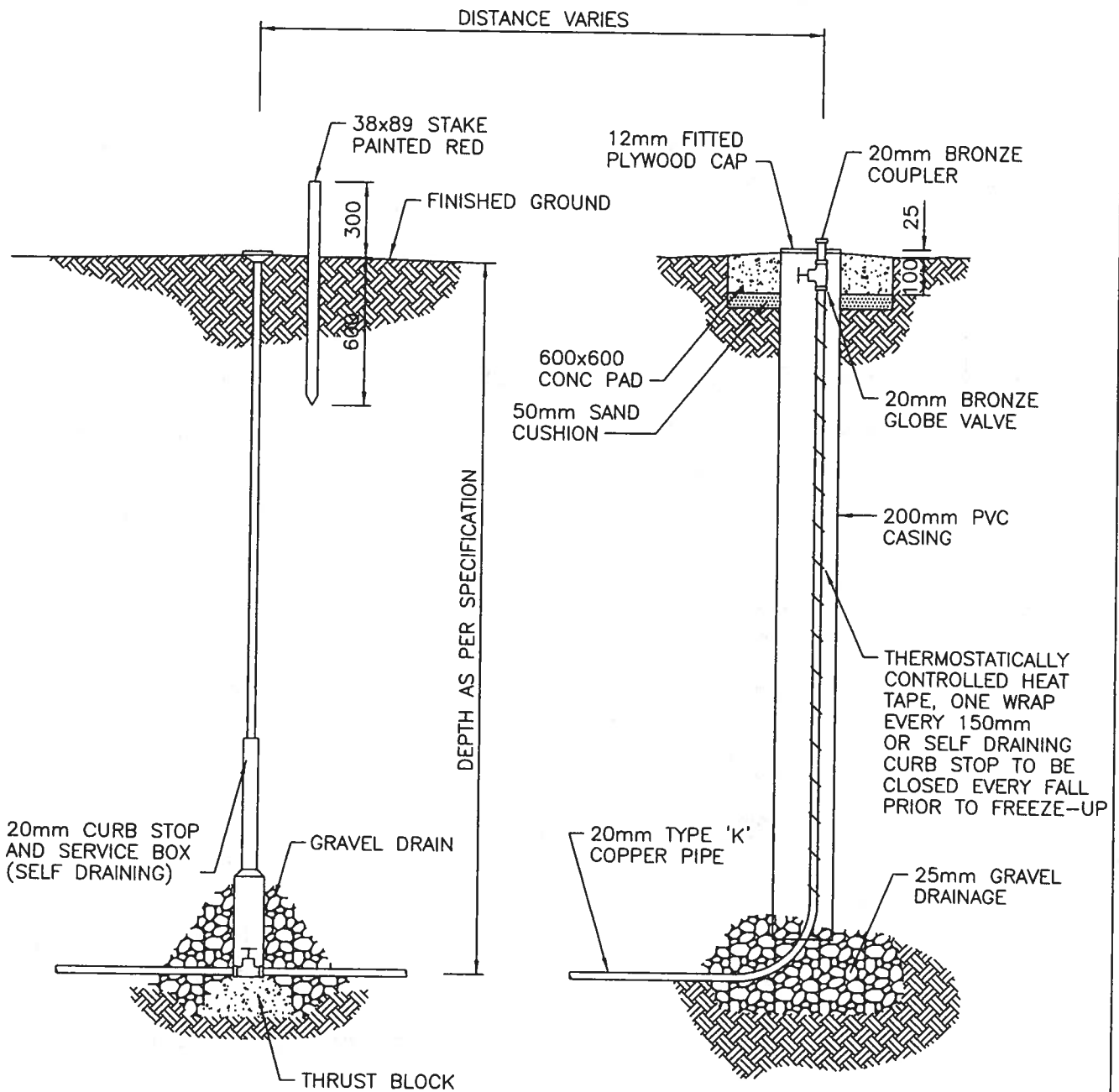


DIMENSIONS OF A PULL-THROUGH CAMPSITE

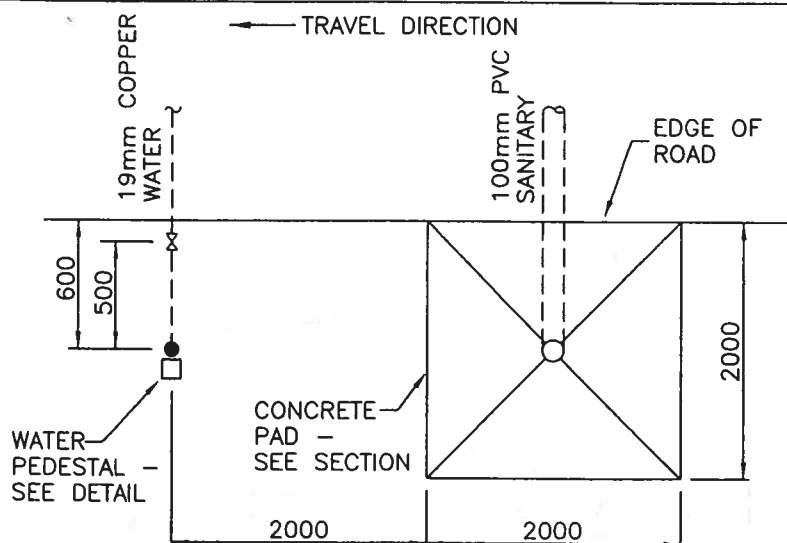


PULL-OVER CAMPSITE DESIGN

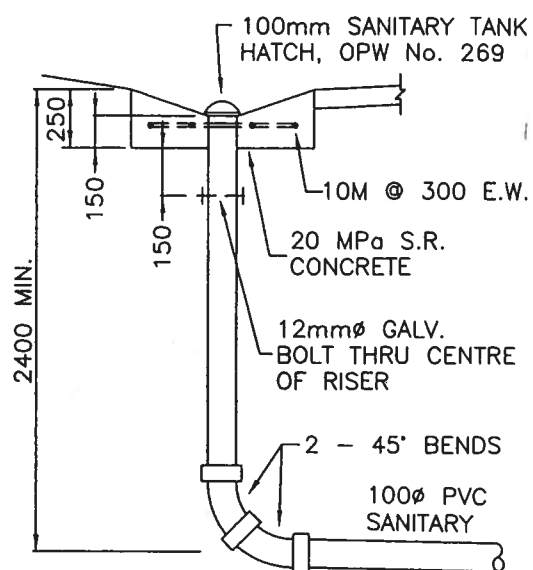
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			CAMPGROUND DETAILS	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	RV1
			DATE: NOVEMBER, 2001	



REVISIONS			The Town of Drayton Valley WATER RISER FOR R.V. HOOKUP	
Date	Details	Approved		
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	RV2
			DATE: NOVEMBER, 2001	

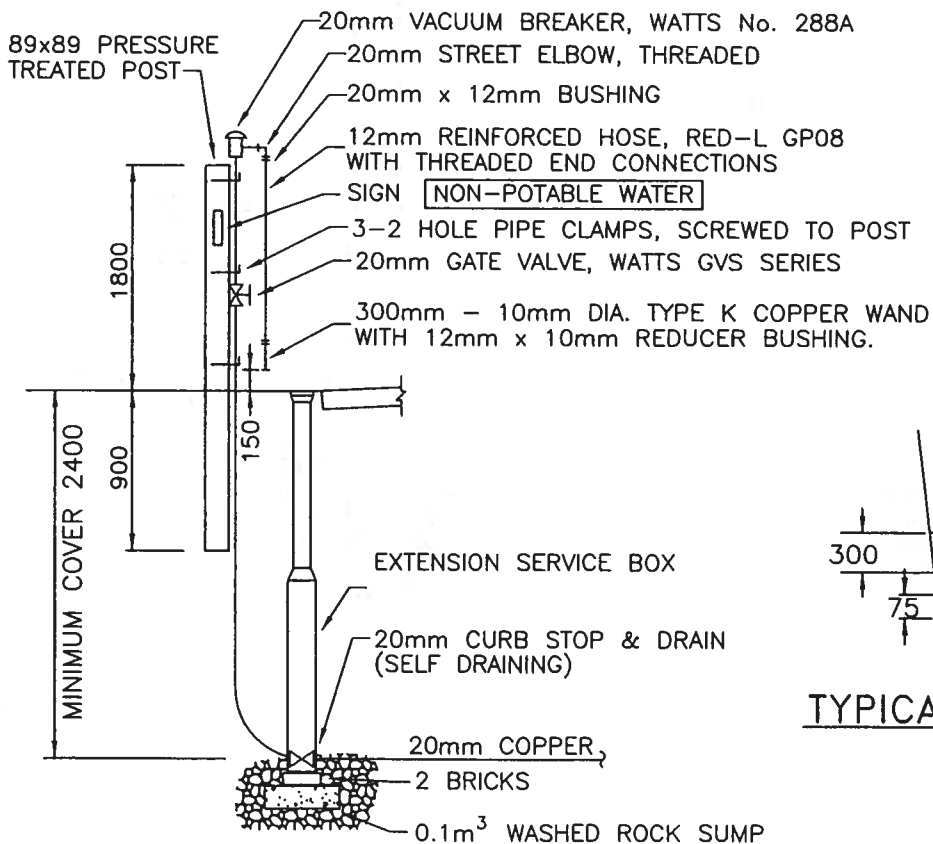


SANI-DUMP SITE

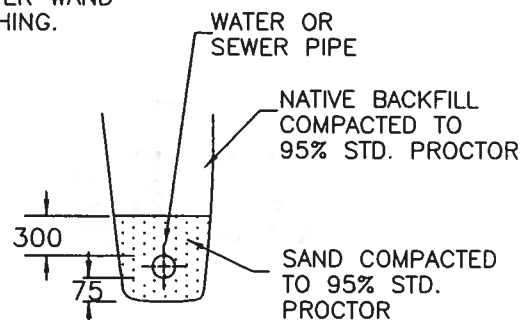


SANITARY PAD SECTION

NOTE: ALL BACKFILL 95% STD. PROCTOR

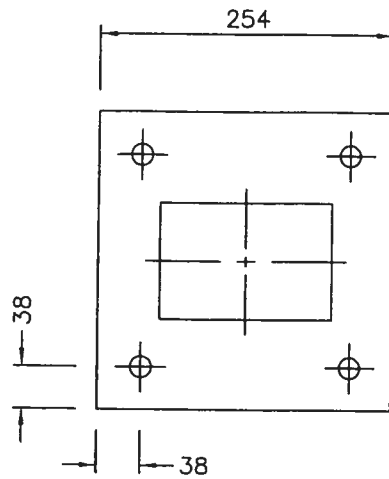


WATER PEDESTAL DETAIL

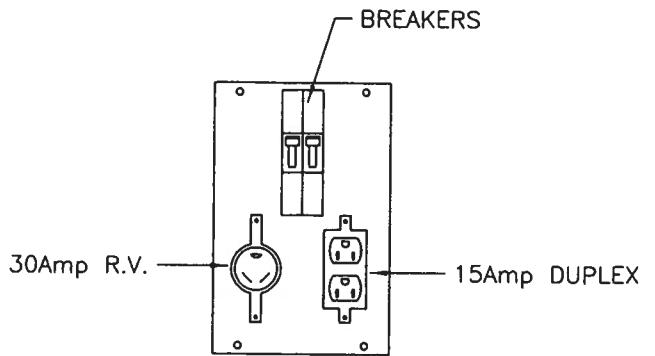


TYPICAL TRENCH SECTION

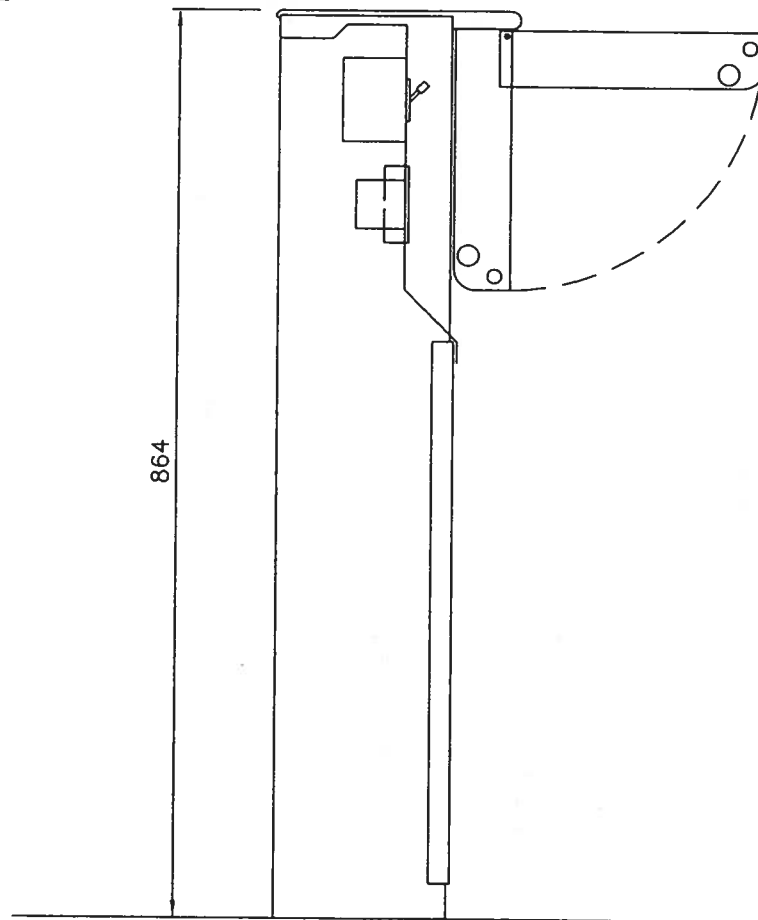
REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			R.V. SANI-DUMP STATION	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	RV3
			DATE: NOVEMBER, 2001	



TEMPLATE

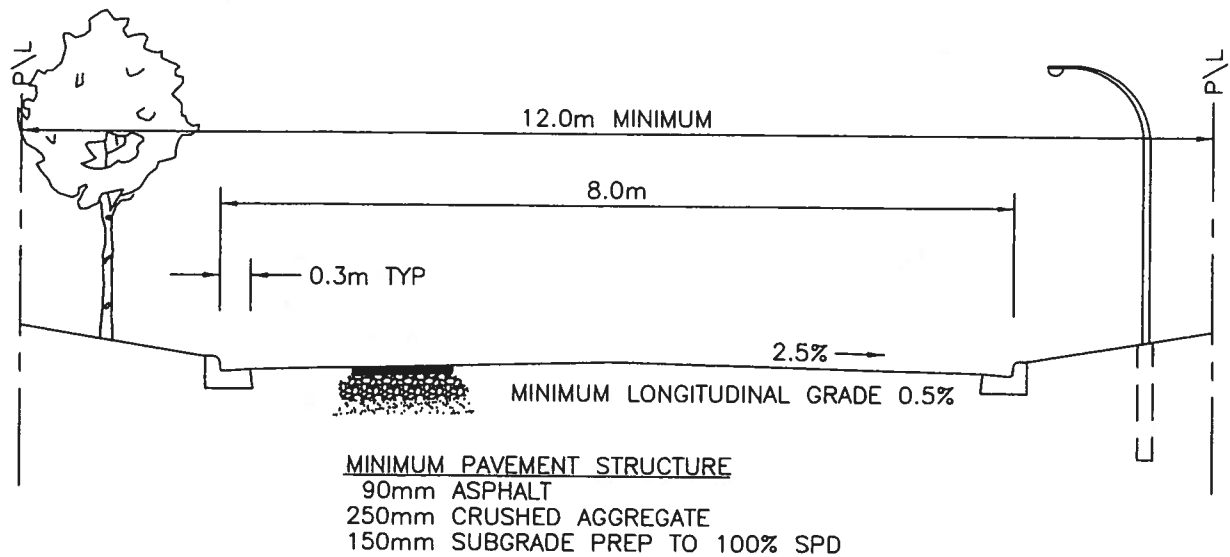


APR-3 INSERT

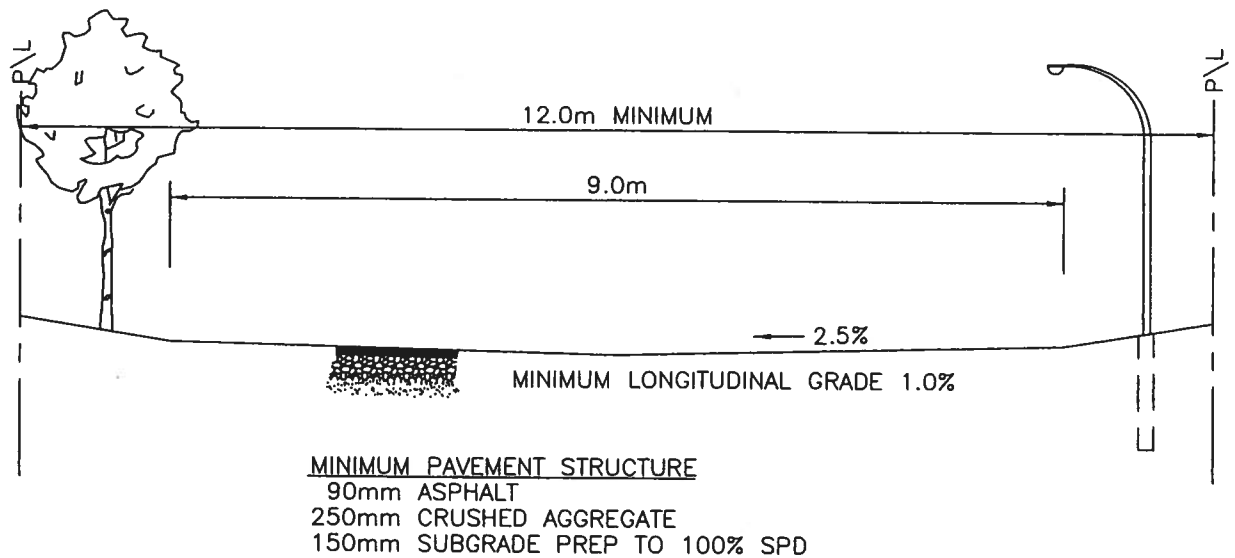


SIDE VIEW

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			ELECTRICAL RECEPTACLE	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	RV4
			DATE: NOVEMBER, 2001	

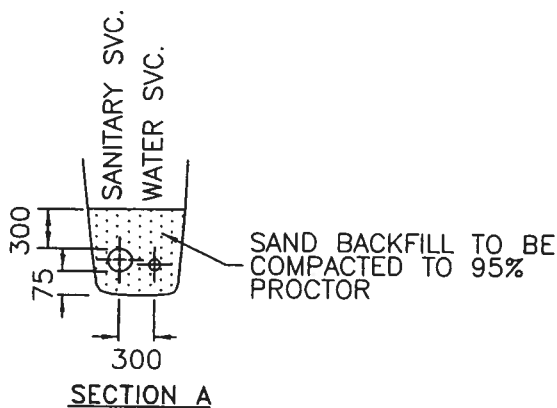
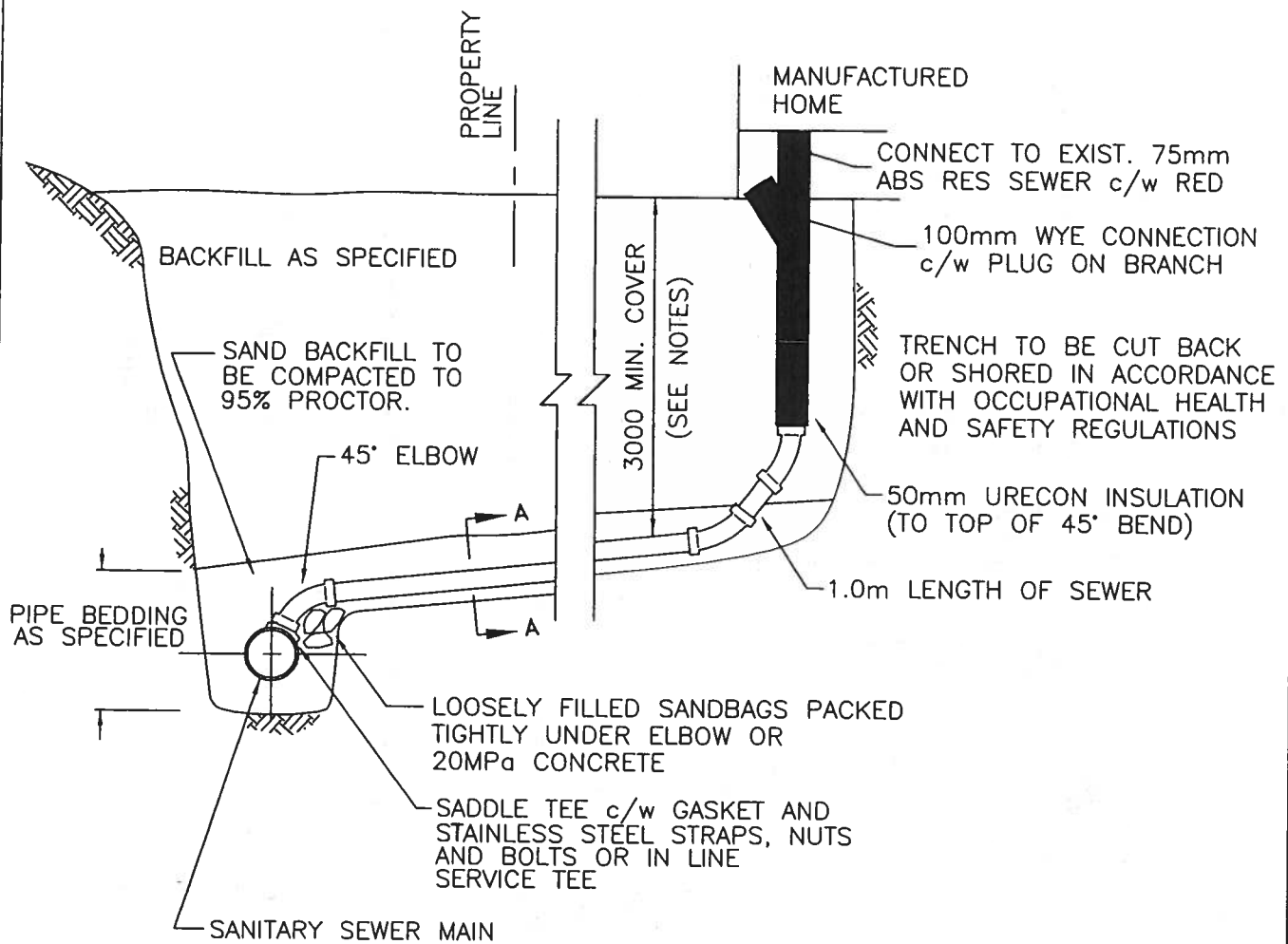


CURB and GUTTER SECTION



SWALE SECTION

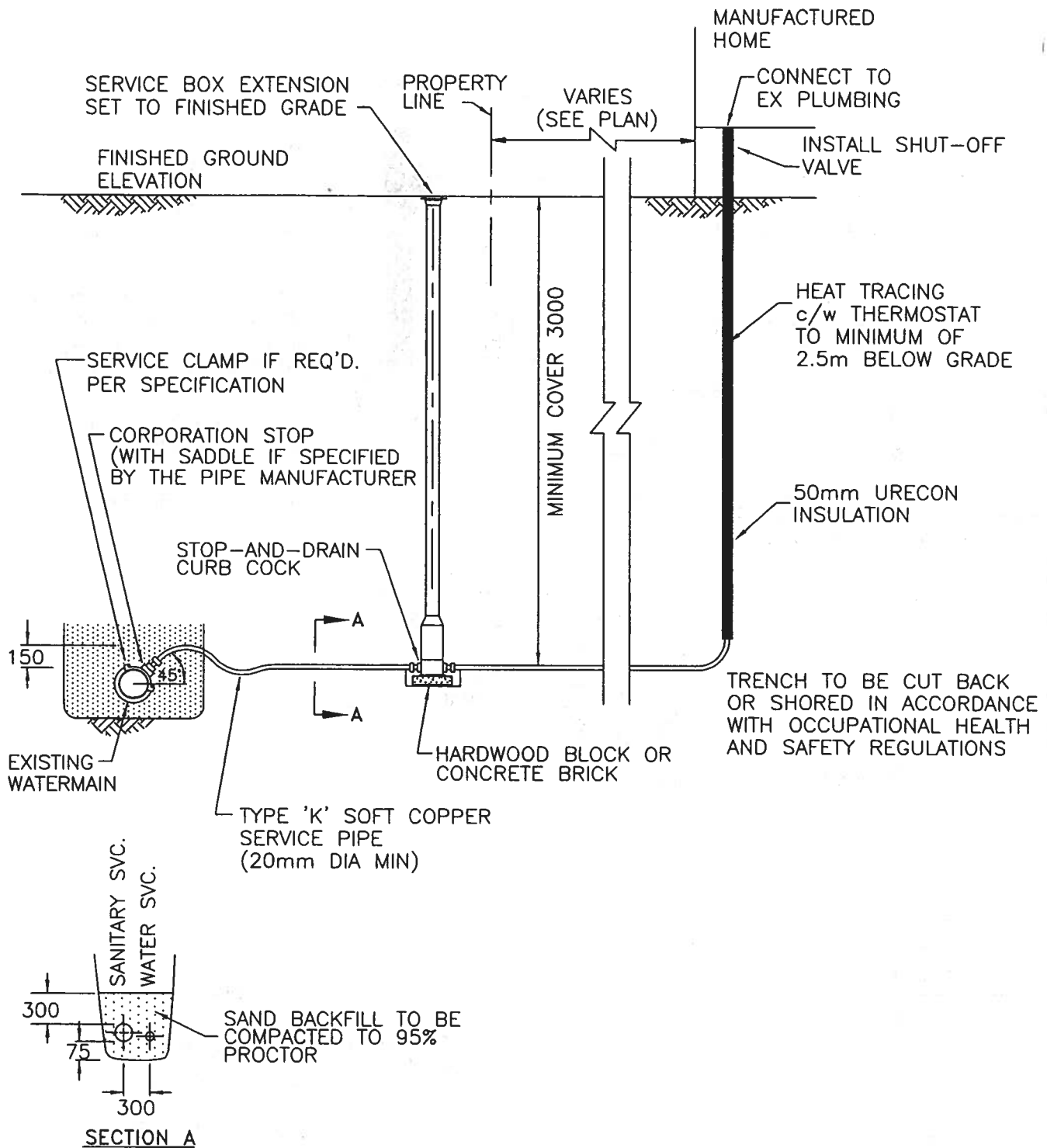
REVISIONS			The Town of Drayton Valley MANUFACTURED HOMES ROADWAY SECTION	
Date	Details	Approved		
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	MH1
			DATE: NOVEMBER, 2001	



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

REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			MANUFACTURED HOME SANITARY SERVICE CONNECTION	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	MH2
			DATE: NOVEMBER, 2001	



REVISIONS			The Town of Drayton Valley	
Date	Details	Approved		
			MANUFACTURED HOME WATER SERVICE CONNECTION	
			APPROVED:	STD. DWG. No.
			SCALE: N.T.S.	MH3
			DATE: NOVEMBER, 2001	